UNIVERSITY OF CAPE COAST

EVALUATING THE TEACHING AND LEARNING OF INTEGRATED SCIENCE CURRICULUM IN BASIC SCHOOLS WITHIN THE ABURA ASEBU KWAMANKESE DISTRICT

SOLOMON ASARE BEDIAKO

2021

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BY

SOLOMON ASARE BEDIAKO

Thesis submitted to the Department of Business and Social Sciences Education, of the Faculty of Humanities and Social Sciences, University of Cape Coast, in partial fulfillment of the requirements for the award of Master of Philosophy Degree, in Curriculum and Teaching.

AUGUST 2021

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ………………… Date: ……………………………

Name: Solomon Asare Bediako

Supervisor's Declaration

I hereby declare that the preparation and presentation of the thesis were supervised per the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: …………................... Date: ……….……....

Name: Prof. Thompson Mumuni

ABSTRACT

Several studies conducted in Integrated Science did not address challenges at the Basic Education sector. To fill this gap in the literature, this current study evaluated the Teaching and Learning of Integrated Science curriculum at the basic education level within the Ghanaian context to investigated the low academic performance using a descriptive survey research design. The sources of data comprised BECE results and questionnaires from teachers. The Stufflebeam context, input, process and product (CIPP) evaluation model served as a guide in structuring the questionnaire. The data were analysed using descriptive and inferential statistics. (Pearson Product Moment correlation) was employed to determine the (bivariate relationship) between the study variables. The study found that learning was activity-based, and students' performance was average. There was a significant relationship between strategies for promoting science learning and academic achievement, teachers vary their teaching strategies, and there were professionally trained science teachers and effective supervision. It is recommended that Ghana Education Service should partner with Non-Governmental Organisations (NGOs) to supply basic schools with the required teaching and learning resources, posting of qualified science teachers and boosting pupil's confidence in learning science. It is also recommended that science symposiums should be organised on regular bases to update science teachers on effective teaching strategies. It is prudent that teachers should adopt effective teaching strategies that promote learning.

KEYWORDS

Academic performance

Curriculum evaluation

Descriptive statistics

Integrated Science

Teaching and learning resources

ACKNOWLEDGEMENTS

This research was made possible by the support and encouragement from my supervisor Prof. Thompson Mumuni of the Department of Basic Education, my head of department, Prof. Joseph Tufuor Kwarteng, Dr. Leticia Bonsu, Dr. Edmond Kwesi Agormedah in the Business and Social Sciences Education Department of the University of Cape Coast. I also extend my profound gratitude to the following lecturers in the Basic Education Department: Prof. Clement Agazo, Nana Dr. Aaron Osafo Acquah, and Dr. Hippolyt Dickson Angbing.

Also, my sincere thanks go to my colleagues, Mr. Samuel Asare and Mr. Felix Arthur, whose advice and prayers have brought me this far. My sincere thanks, also go to Rev. Dr. Mrs. Evon Donkoh, Mr. George Tieku, and Mr. Hammond Isaac Goode of Abura Asebu Kwamankese District Education Office for their assistance in diverse ways towards this cause. Finally, my sincere thanks go to my former headteacher Mr. Samuel Muchia and all the Headteachers and teachers in Abura Asebu Kwamankese District.

DEDICATION

To my mother, Victoria Yeboah, father, Simon Nkrumah, and my senior brothers, Isaac Nkrumah and Francis Nkrumah

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LIST OF ACRONYMS

AAK	Abura Asebu Kwamankese
BECE	Basic Education Certificate Examinations
CIPP	Context, Input, Process, and Product
IRB	Institutional Review Board
ICASE	International Council of Association for Science Education
JICA	Japan International co-operation Agency
NGOs	Non-Governmental Organizations
SPSS	Statistical Package for Service Solution
STM	Science Technology and Mathematics
SISO	School Improvement Support Officers
SMC	School Management Committees
STS	Science Technology and Society
TLRs	Teaching and Learning Resources
UNESCO	United Nations Educational, Scientific and Cultural Organization
UCC	University of Cape Coast
WAEC	West African Examination Council

CHAPTER ONE

INTRODUCTION

Science education is one of the major subjects incorporated within the educational system in Ghana, to train students to acquire the requisite scientific knowledge to enhance and promote economic development in the country. The instructional strategies offered in the various classrooms to train students in science directly affect poor academic performance in the subject within the basic education sector.

This phenomenon directly affects the economic development in the country, as the manpower needed from the scientific sector to boost economic development is inadequate. This is because the number of students that wish to study science related courses at the higher level to support economic development is inadequate (Henriksen, Dillon, & Ryder, 2015; Regan, 2009; Osborne and Dillon, 2008). This relates to the studies conducted (Gilbert, 2006; Holbrook & Rannikmae, 2007; Jenkins & Nelson, 2005) that most students' perceive science as difficult subject and irrelevant for themselves and the society, hence little effort is made by them to study the subject to the highest level.

The present study evaluated the Teaching and Learning of Integrated Science curriculum in basic schools within Abura Asebu Kwamankese District in the Central Region of Ghana. To provide useful information for improving and enhancing the teaching and learning of Integrated Science in basic schools within the District. The study is built on the theories of Kurt Lewin's theory of planned change, Ausubel's learning theory, Piaget theory of cognitive development and Vygotsky's social-cultural theory.

Background to the Study

Integrated Science is an aspect of science education. Cimer, (2007) describes science education as a process of providing scientific knowledge to people in a community to understand their environment and the world. Science education plays a significant role in the development of every nation and this explains why it forms a critical part of the science curriculum especially in Ghana. Advanced countries have benefited from science and technology because science education was given pride of place in their educational system (Chisman, 1984). Study findings (Sackett, Lievens, Iddekinge, & Kuncel, 2017) suggest that science and technology lays foundation for global economic development via advanced knowledge in agriculture coupled with an improved labour workforce which intends to enhance and promote the economic development of every nation. This confirms the study of Idowu, (2011) that the development of a nation is largely dependent on advancement in science and technology and this explains why science education has been given pride of place in education across the world.

The relevance of science education for the world and the society in which we reside cannot be ignored. Feinstein and Kirchgasler (2015) observe that science education fosters critical thinking among active people with regards to life sustainability. Thus, enabling people to build the capacity of critical thinking and analytical procedures that will lead to innovation and problem-solving strategies to support their life. Science promotes and enhances the critical thinking of the learner, which intends to lead to problem-solving skills to enhance and promote national development. In effect science, education contributes to preparing students for science-related careers such as medicine, engineering, industry, and teaching professions which contributes significantly to the development of every nation across the globe (Aikenhead, 2005). Research findings emphasize the significant role of science education in maintaining and strengthening the economic stability of every nation. It is not, surprisingly science plays a significant role in the development of every nation. A study conducted by several scholars (Stuckey, Hofstein, Mamlok-Naaman, & Eilks, 2013) concluded that developing countries need to routinely invest an adequate amount of their educational resources in learners who will eventually embark on science careers to increase the production of goods for an improved standard of living of the people from all walks of life. This will equip learners invariably to a better understanding of applying scientific approaches to make the world a better place for all and sundry.

Several studies (Stuckey, Hofstein, Mamlok-Naaman, & Eilks, 2013) suggest that science learning in basic schools in developing countries is problematic. Underlining factors that makes science learning challenging are the insufficient number of science teachers to prepare students, inadequate physical facilities such as laboratory for practical activities and students less interest and confidence in learning science. Science teaching and learning which supposed to be an activity based subject for easy transfer of knowledge is not being implemented in such a manner. This is as a result of the theoretical approach which dominates the teaching (Yeung, 2003, Adejoh, 2006, Tshiredo, 2013, Daner *et al*., 2014 & Azure, 2015). The less practical nature in teaching Integrated Science in basic schools is a contributing factor to the low academic performance in the subject. This is because science is an activity based subject, which requires hands on practice to facilitate easy understanding of concept taught. It is against this backdrop that Bybee and McCrae (2011) argue that in scientific curriculum and teaching the use of activities serves as the basis for student learning about experimentation to develop their interest in science education.

The repercussion associated with the problems in learning science in schools in Ghana is the poor academic performance in Integrated Science within the Abura Asebu Kwamankese District. This was revealed in the district medium term development report 2018-2021 that students performed poorly in the BECE from 2010-2017. A study conducted by Buabeng (2020) revealed that students performed poorly in the 2016 BECE Integrated Science. In addition to poor performance in Integrated Science, a recent study conducted by Klutse (2021) revealed that students performed poorly in answering high order questions in science. A persistent concern is that science education comprising physics, chemistry, and biology remains unpopular among students at different educational levels, particularly basic schools in Ghana (Hofstein, Eilks, & Bybee, 2011; Holbrook & Rannikmae, 2007). Students' interest in science education remains extremely low and unsatisfactory and this explains why the number of students pursuing science-related careers and disciplines has experienced a drastic decline (Henriksen, Dillon, & Ryder, 2015; Regan, 2009; Osborne and Dillon, 2008). Further, findings (Gilbert, 2006; Holbrook & Rannikmae, 2007; Jenkins & Nelson, 2005) disclosed that students perceive science education as difficult, hence regard the subject as "irrelevant" for themselves and the society. Adu-Gyamfi (2013) in a study's findings corroborated this claim which has already been highlighted by previous research findings. In his study, the least interest in science-related subjects among non-science students is the result of a less practical nature in teaching and learning science.

The quality of science education has been at the forefront of discussions in educational policies across the world particularly regarding student's poor performance in the subject. This has caused the promotion of favourable conditions towards the learning of science which forms the major component in science education. It is through science that attitudes that create the climate for scientific literacy are generated to support students survive in the scientific world. To attain scientific literacy for all students' teachers need to be aware of their students' beliefs in science and strive to make their views more positive in that field (Papageorgiou, Kogianni, & Makris, 2007; Esler & Esler, 2001). This is because most students have less interest in learning science.

It is imperative that stakeholders (policy-makers, managers, and decision-makers in the industry and academicians) both within and outside the educational sphere partner with each other and contribute to the development and effectiveness of the science curriculum. Considering their diverse background, these stakeholders may differ in their goals, objectives, and skills for influencing the teaching, practice, and learning of science. The stakeholders may contribute to, influence the teaching of science and make the subject more enjoyable and relevant.

Curriculum development and implementation have been associated with recent thinking and action on educational concerns and reforms globally, albeit the development process varies among countries. Research findings (Fayomi & Fields, 2016; Osuji, Koko, & Koko, 2018) suggest that curriculum provisions are enormous and profound for effective teaching and learning in schools. This requires the opinions and ideas from stakeholders and individuals as the basis for curriculum development globally. Osuji, Koko, and Koko (2018), maintains that curriculum represents a vehicle through which education is attained. In Ghana, teachers are required to adhere strictly to the West African Examination Council (WAEC) syllabus, because it serves as the foundation for optimal educational goals of the country. Due to the invaluable economic benefits of the curriculum to the nation, science curriculum developers integrate scientific thinking into the curriculum to enable students think scientifically in their work place later in their life to bring transformation to certain aspects of the economy.

Integrated Science education is considered as one of the most effective new ways of providing scientific knowledge to students in an interdisciplinary manner (Sadler, Chambers, & Zeidler, 2004) that will bring better understanding of the real world. A previous study's findings (Adu-Gyamfi, 2014) revealed that the teaching and learning of Integrated Science at the basic level in Ghana is considered an important phase of science education provided, because it lays a solid foundation for students to acquire knowledge and understanding regarding concepts directly linked to science. This is significant because it helps students to understand scientific principles and how to apply these principles in a real-life situation to solve societal problems.

A study conducted (Quansah, Sakyi-Hagan, & Essiam, 2019) concluded that the introduction of Integrated Science as a subject in the Junior High School curriculum in Ghana laid a solid foundation regarding the teaching and learning of science in basic schools. Yet much is not known regarding the teaching and learning outcome. Therefore, there is the need to evaluate the teaching and learning of the course to determine whether it has improved academic performance within the basic sector of education.

Statement of the Problem

Poor teaching strategies in science lessons contributes to low academic achievement in basic schools within the Abura Asebu Kwamankese District, which has been consistent over the years. This phenomenon is associated with studies conducted by researchers globally. Study findings (Majo, 2016) revealed that poor performance in Integrated Science in Shinyanga Municipality includes poor teaching methods, inadequate teaching resources and poor learner's attitude towards science. Studies conducted (Iwowi, Okebukula, Oludotun & Akpan, 1992) further revealed that teaching methods is a major factor that contributes to low performance of learners in science. A recent study conducted outside Ghana by Bibon (2022) in the Philippines further revealed that teachers were less proficient in applying Integrated Science instructional practices to enhance academic achievement. Meanwhile studies conducted (Blazar, 2016; Johnson, 2017) revealed that teacher practices in the classroom contributes greatly to academic achievement.

Even though various attempt has been made by stakeholders of education to bring variations into teaching that will improve academic performance in Integrated Science, but academic performance still remains poor. For instance, a recent studies conducted by Buabeng (2020) on gender performance in Integrated Science clearly revealed that boys and girls performed poorly in the 2016 academic year. In addition, a study conducted by Klutse (2021) also revealed that students performed poorly through high-order activities in science lessons. Some of the factors they identified regarding the poor performance of the students included ineffective teaching strategies and inadequate teaching resources. Moreover, Astrom (2008) in a study established that the number of students who select science-related subjects at a higher level keeps on decreasing due to poor performance. Jenkins & Pell; Osborne *et al;* and Schmidt (as cited in Ogunkola & Samuel, 2011) in their study also suggest that students' interest and attitudes in science education keep on decreasing during their secondary education years due to the nature of teaching and learning the course at the highest level.

The study conducted by Buabeng (2020) has some gaps to fill because the study was related to gender performance only. Studies already conducted in a similar trend always favour males over females. The same results were revealed in the study. Therefore, there is a need to have a study that will evaluate trend analysis for both sexes to devise measures that will favour all learners. The gaps established in the study by Klutse (2021) did not emphasise why students were interested in answering low-order questions as compared to high-order questions. Therefore, there is a need to investigate why learners are interested in answering low-order questions.

Several studies in science have been conducted all over the country with a few being conducted within the Abura Asebu Kwamankese District. The District which shares a direct boundary with the District Capital Cape Coast metropolis lack behind in terms of educational infrastructure that support teaching and learning. Available data released by the District planning coordinating unit (2018) revealed that academic performance in the district is not encouraging, based on the number of students that pass the BECE examination from the 2010 to 2017 academic years. This, therefore, indicates that there is a need to investigate the problem within the teaching and learning of Integrated Science so as to generate remedies to curb the situation.

To address the situation, the government of Ghana in partnership with the Japan International Cooperation Agency (JICA) Science Technology Mathematics (STM) organizes workshops and science forums to train science teachers to enhance and improve the competencies of teachers who handle those subjects. Other interventions include the training of diploma science teachers to replace their Cert “A” counterparts. The introduction of national science and math day to create awareness of the subject and the introduction of a scholarship scheme have engendered students’ interest to pursue courses related to science and mathematics.

Even though much has been done by the government and stakeholders to improve the academic performance of students in science education, yet much is not yet known regarding the effectiveness of these interventions and how it has improved students’ competencies and interest in science-related courses within the basic schools.

Meanwhile, the logic behind curriculum reform from General Science to Integrated Science (Konstantopoulos, 2006) suggests two frameworks on which to judge the importance of achievement. One is the achievement of the reformed curriculum as compared to the previous curriculum. The other is the mean achievement among schools. The investigator in this study is to evaluate the Integrated Science curriculum through the teaching and learning process. By comparing the current curriculum achievement with the previous curriculum based on the framework of Konstantopoulos, (2006). In essence, the study is to explore the current achievement compared to the previous. Data will be collected from Abura Asebu Kwamankese District basic schools on which to demonstrate the philosophy of the achievement gaps.

Purpose of the Study

The purpose of this research is to evaluate the teaching and learning of Integrated Science curriculum of basic schools within the Abura Asebu Kwamankese District in the Central Region of Ghana to ascertain instructional practices on academic performance.

Research Objectives

The objectives of this study were to:

1. examine strategies that are used to ensure effective learning of Integrated Science in public basic schools in Abura Asebu Kwamankese District
2. to ascertain the academic achievement of pupils in Integrated Science in basic schools within Abura Asebu Kwamankese District
3. investigate the relationship between Integrated Science learning strategies and pupils' academic achievement in Abura Asebu Kwamankese District

Research Questions

The following are the research questions guiding the study:

1. What strategies are used to ensure effective learning of Integrated Science in public basic schools in Abura Asebu Kwamankese District?
2. What is the level of academic achievement of pupils in Integrated Science within schools in Abura Asebu Kwamankese District?
3. What is the relationship between Integrated Science learning strategies and pupil's academic achievement in public basic schools in Abura Asebu Kwamankese District?

Significance of the Study

The study demonstrated the effectiveness of integrating teaching activities in science lessons improves academic performance. The study further revealed that academic performance of pupils in Integrated Science has moved from poor to average within the Abura Asebu Kwamankese District. This will inform stakeholders in education to supply basic schools the requisite teaching resources to enable teachers perform activities stipulated in the syllabus to improve academic performance. The significance of the relationship between instructional practices and academic performance was also exhibited in the study. The result would inform authorities in the Ghana Education Service to devise measures to address the challenges impeding instructional practices in Basic schools across the country.

Delimitation

The study is confined to only one district in the Central Region thus, Abura Asebu Kwamankese District and also covers only basic schools. The outcome of the study centred on BECE results and teacher's responses to the questionnaire. Even though the study could have been carried out in several districts in the Region, resource constraints in data collection influenced the investigator to delimit the study to the aforementioned district.

Limitations

The limitations of the study were as follows. First, the answers provided by the respondents could not be authenticated by the researcher because of the format respondents used in providing answers to the questionnaire. Second, the close-ended items in the questionnaires are restrictive because it did not provide the latitude for respondents to express their views. Third, there was the possibility that some of the teachers would be hesitant in expressing their views on certain sensitive issues because of its implications. Lastly, the participants were drawn from only basic schools in Abura Asebu Kwamankese District so the findings might not reflect a total picture of what pertains in schools in other regions.

Definition of Terms

The following terms have been operationally defined.

Curriculum: It is the vehicle through which knowledge and other learning activities are disseminated in educational system (Alebiosu, 2005)

Technology: This refers to the application of scientific knowledge to improve the lives of human beings

Teaching: It is the process of transferring knowledge and experiences from experienced person to a learner in an organised setting.

Stakeholders: This refers to a group or individuals that have direct interest in school performance and management

Scientific literacy*:* This is the ability to apply scientific principles in real-life situations.

Organisation of the Study

The study is organised under five chapters; Chapter One of the study provides of the introduction to the entire study. It also describes the background to the study, statement of the problem, research questions, study objectives and significance of the study. In addition, delimitation and limitations are discussed. Chapter Two deals with literature review, theoretical framework, conceptual framework, and different models of curriculum evaluation governing the study. Chapter Three describes the research methods. This comprises research design, population, sample and sampling procedure, data collection instrument, data collection procedures and data processing and analysis. Chapter Four of the study discusses key findings of the study. Chapter Five summarizes the study, concludes and make suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The current study seeks to evaluate how teaching and learning of Integrated Science curriculum is implemented within basic schools in Abura Asebu Kwamankese District. The focus of the study is to determine how teaching strategies influence academic performance within the basic education sector. This section of the study emphasizes on the studies that has already been conducted similar to the current study, and the gaps that need to be bridged. In addition, this section seeks to find out how previous studies conducted on similar trend findings relates to the current study to make concrete conclusions and recommendations for future studies. The elements pertaining to this section are organised under the following themes: conceptual framework, models underpinning the study and theories guiding the study. Each aspect of the literature is explained within sections in this chapter.

The review of related literature focused on the following issues namely: Teaching and learning of Integrated Science, historical antecedents of integrated science education, models of curriculum evaluation, the Lewin (1947) theory of change, the theoretical basis of Integrated Science curriculum and empirical review of the literature.

Teaching and Learning of Integrated Science

The learning of science in basic schools is a major concern for stakeholders of Education, and to this extent, it has been incorporated into the general curriculum offered in schools. This brings us to the point of why the learning of science in basic schools forms an integral part of the general curriculum offered in the country. Science forms a critical factor for the economic and technological growth of every nation this confirms the study of Adikwu (2012) that it is important for a nation to have a strong commitment to the teaching and learning of science so as to experience economic and technological growth. Educational planners in Ghana have made the learning of Integrated Science compulsory because human existence largely depends on scientific advances and development that will bring productivity in all sectors of the economy.

The teaching of science requires a special approach and techniques because science is an activity-based subject. The method a teacher will select in presenting a lesson largely depends on the situation at hand. For instance, the strategy that will be used in teaching the topic elements and their symbols will be different from teaching chemical compounds, the digestive system of a human being, and simple machines. A study conducted (Black & Wiliam,1998) encourage teachers to use questioning and classroom discussion to improve students' understanding and conceptualization of scientific knowledge in the classroom.

However, if the teachers implementing the curriculum lack in-depth knowledge of the subject itself will make it difficult for learners to understand the concept taught. Studies from Palmer (1991) posit that when teachers do not have the prerequisite background needed to implement the curriculum, there is a considerable problem with regard to the development of student knowledge. Studies from Huntley (1998) stress that input and output factors of the teacher such as teacher quality, mastery of subject content, professional development, and adequate planning period contribute to the successful implementation of the

Integrated Science curriculum. This study seeks to evaluate the proficiency level of Integrated Science teachers regarding teaching and learning in relation to academic performance.

Science as an activity-based subject requires teachers to fully engage learners through hands-on activity so as to develop their interest in the course of study. According to Dewey (cited in Imsen, 2006), individuals learn from experiences they gather from doing things, not by being influenced by external stimulation. It is an important factor to note that during the teaching and learning process, students should be given the maximum opportunity to fully participate in the lesson by allowing them to explore and ask questions about nature and humanity based on their daily encounters (Skolverket, 2018). Study findings from Shamos (1995) posit that there is a need for teachers to stimulate learners' interest in science so as to prepare them to make informed decisions in all societies. Studies conducted by (Lamanauskas, Vilkonienė, 2008) suggest that during the teaching and learning process, there is a need for teachers to use feedback from learners to improve upon the teaching strategy being implemented. This form of activity will help to introduce new scientific ideas into the classroom setting.

This signifies that the teaching and learning of Integrated Science lessons should be activity based which will give room for every learner to put their hands on practice. Studies from Sindhu (2014) revealed that Integrated Science teaching can be successful when teachers go the extra mile beyond the textbook and make classroom learning lively and engaging. This form of activity demonstrated in the classroom will be evaluated in the study, to ascertain its influence on academic performance.

Study findings from Säljö (2015) revealed that the best way to get the attention of learners in Integrated Science is for teachers to vary the teaching activities that will enable learners to have a peer-to-peer discussion which will eventually lead to classroom discussions. This form of activity will introduce new ideas into the classroom. Furthermore, Skolverket (2018) study revealed that Integrated Science teachers should provide pupils with the opportunities to look for answers to questions through practical systematic and investigative work to develop their skills.

Allowing learners to fully participate and perform activities in Integrated Science lessons is embodied in Piaget's constructivist theory which emphasizes that learners learn best when they construct their own conceptual meaning through hands-on practice (Blake & Pope, 2008). Study findings (Blake & Pope, 2008) further claim that effective use of instructional strategies develops learners' cognitive development which could be linked to Piaget and Vygotsky's theory which offers learners the opportunity to construct knowledge through hands-on practice. The use of classroom interactions through activities is essential for promoting active learning in the classroom than just reading books to learners. A study's conducted by Andersson *et al.* (2005) revealed that it is the duty of the teacher to arouse students' interest in learning science through motivation. This is because previous studies conducted revealed that a number of students perceive Integrated Science as difficult, boring, and uninteresting. This assertion is also supported by (Ogunkola & Samuel, 2011) that students perceive science as abstract and difficult. Therefore, this study seeks to evaluate how teachers implement these activities stipulated by the syllabus and their influence on academic achievement.

In other development, while Sjøberg (2005) noted that teachers should take advantage of students' interest and develop it through teaching and learning science Hattie (2012) also stresses the need to take advantage of learners' interest to develop their curiosity to learn more in science. From the point of view of the two researchers, it can be deduced that activities carried out in the syllabus serves as the platform to develop learners' interest in the teaching and learning of Integrated Science. The process involved in Integrated Science teaching and learning evaluation at the basic education level aims to find remedies to the problem at stake which is low academic achievement.

Studies conducted by several researchers (Huntley, 1998; Knudson, 1937; Leung, 2006; Palmer, 1991) revealed that effective implementation of an Integrated Science curriculum depends on various factors including teacher professionalism, planning periods, content preparation and what to teach. These underlining factors form a critical part of the evaluation process in this study because they connect with each other to facilitate effective teaching and learning in the classroom.

There are challenges associated with the teaching and learning of Integrated Science in schools. This assumption is based on studies conducted by researchers (Anamuah-Mensah et al., 2017; Fredua-Kwarteng & Ahia, 2005; Ngman-wara 2015; Parker, 2004; Hill et al., 2005) which highlight that the quality of science teaching and learning could be affected by factors such as content knowledge, pedagogical skills, poor teacher preparation, inappropriate instructional materials, medium of instruction, lack of effective supervision and monitoring, lack of motivation for teachers, inadequate qualified teachers, and pupils poor attitude and interest towards the learning of the subject. Most of the identified challenges pointed out by the researchers form the basis of this study in Integrated Science teaching and learning evaluation to ascertain if the problem still persists and its influence on academic achievement.

Effective use of instructional materials is an important factor that ensures effective teaching and learning of Integrated Science. Studies (Opara & Etukudo, 2014) revealed that adequate instructional materials and strategies give learners the opportunity to use their senses of hearing, smelling, tasting, seeing, and feeling for an easy understanding of the concept taught. Studies from Mudulia (2012) also asserted that textbooks, revision books, laboratory chemicals, and equipment should be available to support effective teaching and learning of Integrated Science. To this end, there is a need to investigate how resourceful these teaching-learning resources are in the classrooms and their influence on academic achievement. This is because the lack of it will likely impact academic performance. Study findings from Idiaghe (2014) revealed that schools without adequate teaching resources performed poorly as compared to their counterparts with adequate resources.

Learning involves a change in attitude or in the capacity to act in a given situation which results from acquired experiences. The change in behavior John Dewey believed that education should be adapted to meet every child's unique abilities. This claim is supported by Erwin & Kipness, (1997) that learners should be supplied with the necessary tools and skills to promote individual growth and development. This requires that integrated science teachers should be supplied with the necessary equipment that is transferrable to learners to facilitate the learning process.

The emphasis here is that the use of activities that promote interaction between teacher and student and vice versa motivate learners to put much effort into learning integrated science. This philosophy is in line with Vygotsky's learning theory which states that we learn first through person-to-person interactions and then individually through an internalization process that leads to deep conceptualization (Blake & Pope, 2008).

The use of outdoor activities which forms part of the teaching and learning activities in the Integrated Science curriculum enables learners to make interconnections with their immediate surroundings and the world for a deeper understanding of the concept taught. Studies from Hofstein & Rosenfeld (1996) revealed that outdoor activities provide a valuable informal science learning platform for learners to acquire knowledge. This assertion is supported by Blom & Fägerstam (2013) that outdoor learning facilitates long-lasting effects on students' cognitive conceptualization through active participants and hands-on practice. It is therefore evident that teaching and learning in Integrated Science go beyond just reading books, but involves the provision of adequate teaching and learning resources, teacher quality, teacher-learner activity, and effective supervision and monitoring as these factors connect with each other to promote the easy transfer of knowledge.

Historical Antecedents of Integrated Science Education

Integrated Science was started in 1969 by United Nations Educational Scientific and Cultural Organization (UNESCO) for member states to promote and enhance scientific literacy within their educational system. A study conducted by Hurd, (1986) revealed that Integrated Science was given much attention in 1970 when the U.S. Advisory Committee in charge of Science

Education for National Science Foundation made a recommendation on a curriculum that has direct links to Science and Technology to be implemented. A teaching body identified as the International Council of Associations for Science Education (ICASE) advocated for curriculum implementation during this era by developing an Integrated Science curriculum to support global scientific development.

Haggis and Adey (1979) suggest that Integrated Science curriculum emerged around the year 1980 when the research was conducted in Science Technology and Society (STS) to identify the production and distribution of scientific knowledge. Similarly, Aikenhead (2003) in his study's findings revealed that the emergence of the term Integrated Science did not mean to change the philosophy of science education but rather to make the subject interesting and applicable to learners.

Models for Curriculum Evaluation

Models of curriculum evaluation are the guides used in determining certain aspects of instruction such as the content, time frame, and manner of presentation to determine the worth of the curriculum. Experts in the field of curriculum evaluation and research have proposed various forms of evaluating curriculum including Integrated Science curriculum. The various models are discussed below.

Bradley's Effectiveness Model

The first model is proposed by Bradley (1985) in his research book Curriculum Leadership and Development. The handbook provides ten (10) main key indicators that are appropriate for measuring the effectiveness of a developed curriculum such as the 2012 Integrated Science curriculum. The indicators are presented in Table 1 using a tick format in response to the questions.

Table 1: Bradley's effectiveness model indicators

Indicator	Description	Yes/No
Vertical curriculum continuity	The course of study reflects the basic school Integrated science curriculum	
Horizontal curriculum, continuity	The curriculum objectives and contents apply to classrooms of the same grade level	
Instruction based on curriculum	Teaching and learning, resources are used to reflect the lesson notes prepared from the syllabus.	
Curriculum priority	An adequate supply of financial support for implementation and placing curriculum topics on school platforms.	
Broad involvement	There is a teacher representative from primary to Junior High School in the curriculum development committees.	
Long term planning	The course of study in the district is subject to review within a period of five (5)-years, based on the theory and philosophy of the district.	
Decision-making clarity	Controversies during the. curriculum development process is the decision of the house and not individual	

Positive human relations	Headteachers and teachers initiated the curriculum development process without breaking communication links during a disagreement.
The approach of theory into practice	The philosophy of education thus vision and mission of the curriculum objectives are exhibited in the district.
Deliberate shift	There is adequate information to prove that stakeholders of education and the public accept the developed curriculum.

Source: "Adapted from" L. H. Bradley (1985) handbook on curriculum leadership and development

Bradley in this model suggested that all indicators that are ticked (No) should be given much attention to turn it positive to improve teaching and learning.

The indicators in the model represent any applicable characteristics of a complex organization such as the Ghana Education Service to be used by educational administrators for evaluation projects. This will release information on the responsive ways of implementing the Integrated Science curriculum. Finally, the indicators are standard for applications in all educational institutions to evaluate subjects such as Integrated Science, mathematics, language, Arts, and any other related field of study.

There should be other forms of soliciting ideas for the evaluation process apart from the tick format being used. This is because an error in responding to the questionnaires might influence the outcome of the entire evaluation. This might restrict proper modification of the curriculum to address the challenges that prevail in the old curriculum. Again resource constraints to satisfy the demand of the respondents to turn things positive might not bring out the relevance of the model.

Tyler's Objectives-Centred Model

The second evaluation model is the one proposed by a renowned curriculum expert Tyler (1950) called the objective–centred model which is implemented globally. The model was developed from Tyler's monograph on ***Basic Principles of Curriculum and Instruction***. The monograph approach works rationally and systematically throughout the following steps:

1. Set behavioural objectives that specify expected content and change in behaviour in the subject.
2. Identify situations that will give room for students to express their behaviour as stated in the syllabus.
3. Select, modify, and construct suitable evaluation instruments, and verify if the instruments are applicable in achieving objectivity, reliability, and validity in the subject.
4. The appraised results are obtained by the application of the modified instruments
5. Compare the results obtained from several instruments and analyse the change that has taken place
6. The analysed results will provide information on the success and setbacks of the implemented curriculum.
7. Use the results to adjust the curriculum to improve teaching and learning.

Even though the model works rationally and systematically the responses collected using the instrument might not bring out the true picture of the evaluation process. This is because there is a different learning environment which will not favour the smooth implementation of the model across the board. There should be an adjustment to the model that can reflect the conditions where the evaluation is conducted.

Stake's Responsive Model

The next curriculum evaluation model is the one developed by Robert Stake (1975) called the responsive model. This model is based explicitly on the assumption which has direct relations with stakeholders of education. Further, this approach relies on measurement precision to boost the usefulness of the findings to those involved in the curriculum development. This model relies on responses from an audience as a source of information to determine the success and failure of the curriculum. The Stake (1975) response model is largely informed by the following guidelines for evaluation:

1. The evaluator should meet his/her clients, staff, and audiences to solicit their opinion on the curriculum.
2. The evaluator should analyse all discussions on the document to determine the scope of the evaluation project.
3. The next step is to clearly state the motive for the evaluation and to seek concerns of those involved
4. The evaluator should observe the program critically to understand its sense of operation and identify any unintended deviations from the planned programme.

5. The evaluator should identify issues and problems that concern the evaluation. In each of the issues and problems identified, develop a design for the evaluation that shows the data required.
6. The evaluator should identify the procedure to acquire the desired data. This is done by employing human observation and judgment.
7. The evaluator implements the data-collection procedures.
8. Finally, the evaluator should assemble the available information into themes and prepares "portrayals" that will communicate the natural ways of thematic reports. This can take the form of videotapes artefacts, case studies, or other "faithful representations."

The reliance on the only audience as a means to evaluate the entire curriculum cannot be conclusive. It is therefore prudent that curriculum implementers (teachers) should be involved in the evaluation process. This form will help to identify the challenges related to the curriculum implementation so that its modification can favour both implementers and learners.

Goal-Free Model

The goal-free curriculum evaluation model was developed by Michael Scriven in (1972). This model has the purpose of determining either assumption of goals is crucial in the evaluation process. In this model, the evaluator functions as an unbiased observer and builds a profile to serve the needs of the group and assess them. The outcome that responds to the encountered necessity on the profile is perceived as useful.

One contribution of this model is to redirect evaluators' and administrators' attention to the significance of an unintended aspect of the curriculum and making them useful in learning. Inability to provide sufficient information in taking concrete decisions is a setback of this model. Further, this model can only be used by experts in detecting the unintended aspects of the curriculum. Finally, there is no explicit direction for developing and implementing this model.

The use of academic goals as the only means to evaluate the curriculum is a setback because several factors influence the outcome of curriculum goals. Such factors need to be considered in the evaluation process. Furthermore, there is a need to evaluate the input factors of the curriculum to assist with its modification.

Eisner's Connoisseurship Model

The connoisseurship evaluation model was developed by Elliot Eisner in 1979 from his background in aesthetics and art education. The model was developed from an assumption of two related constructs, thus connoisseurship and criticism. The process of using perceptual memory, thus drawing from experience to appreciate what is significant is referred to as connoisseurship in the model. It is the ability to perceive particulars of the educational life and understand how it forms part of the classroom setting. Criticism in this model is the art of disclosing qualities connoisseurship perceives.

Eisner's connoisseurship model consists of three aspects. The first aspect is descriptive, which seeks to describe the qualities involved in educational rules and regularities underlying its development. Interpreted as the second aspect explore and develop alternative explanations in social phenomena through the knowledge generated from the social sciences. The last aspect is evaluative, which makes the judgment on educational processes to provide the grounds for making proper choices. The significance of the model is how it breaks from the traditional scientific models and offers a different view of evaluation. However, critics fault its methodological rigour, but Eisner refutes such claims.

As already pointed out the application of the model is rigorous. The involvement of a third person to perceive what is good in the educational setting and bring it to use before being criticised will take several years. Furthermore, the application of the model involves a lot of people to cover a wider scope of the area during the evaluation process.

Stufflebeam's Context, Input, Process, Product Model

This model is represented by the abbreviation CIPP (Context, Input, Process, Product**)**. In 1971 a Phi Delta Kappa committee chaired by Daniel Stufflebeam was set up to address the weaknesses that exist in Tyler's objective-centred model. The committee findings came up with a new version of the model called the context input process product (CIPP**)** to address weaknesses in Tyler's model. This model is accepted globally and used by educationalists due to its smooth evaluation process. One contributing factor of this model is the importance attached to evaluative data for making a decision and providing remedies to the identified problem which is a deficiency in Tyler's model.

Figure 1: (CIPP) model *"Adopted from" Amberhartwell A journey through Evolution of Educational Task design*

The CIPP abbreviation is explained as follows: the first (C) represents **context evaluation** is a form of continuous assessment to identify the problem in context for active decision making to achieve the objectives of the curriculum. The second (I) describes **input evaluation** which assesses alternative decisions put in place in achieving the curriculum goals. The third (P) express **process evaluation** is to ensure that the means to achieve the curriculum goals are implemented and suggest modification if there are hindrances in achieving the curriculum goals. The last (P) exhibit **product evaluation** which has the purpose of comparing the actual ends of the curriculum with the intended ends and suggests a series of recycling decisions to support the success of the curriculum.

The use of only evaluative data as a source of providing remedies to the identified problem might not be the only right source that can provide a solution to the identified challenges regarding curriculum implementation. The current study is situated in the CIPP model based on the following fundamentals of the model. The **context evaluation (C)** is to enable the researcher to identify the problem in a context which is a low academic achievement in Integrated Science and make recommendations to improve the situation. The **input evaluation (I)** assesses the various input factors put in place to support the successful implementation of the curriculum such as teacher factor, teaching and learning resources, effective supervision and activities carried out in the syllabus. The first (P) **process evaluation** is to ensure the means to achieve the curriculum goals. The means to achieve the curriculum goals largely depend on effective teaching and learning which this study seeks to investigate and make suggestions if need be. The **product evaluation** focus on comparing the performance of BECE to the national standards set by the Ghana Education Service, if learners are meeting that set target. Suggestions are made to improve the situation if there are challenges impeding the smooth implementation of the curriculum.

Lewin (1947) theory of change

The theory was pioneered by German-American psychologist Kurt Lewin in 1947. This theory creates the notion that change is essential, then moves towards that change and solidifies the change that takes effect. A study conducted by scholars (Shiundu & Omulando, 1992; Otunga, Odero, & Barasa, 2011) revealed that education cannot be perfect for all ages, for the reason that education keeps on changing. A research finding from (Fullan & Pomfret, 1977; Fullan, 1982; Fullan, 2007) suggests that curriculum innovation is the act of introducing a new curriculum, whiles curriculum reform is a general improvement in the existing curriculum. To this study, the General Science curriculum was reformed to Integrated Science on the assumption of the Lewin theory of change.

The theory is defined by four principles in the change they are field theory, group dynamics, action research, and 3-step model to change.

Field theory: this emphasizes the need to understand change and mapping out the complexity of the field in which it occurs. This might reflect the school environment, teachers, and groups in education where the change is likely to take effect.

Group dynamics: these are the forces operating within the group in deciding to accept the new curriculum or reject its implementation. Lewin

(1947) advised that to understand behaviour that relates to change, the whole psychological field must be studied completely.

The 3-step Model to change that comprises the unfreeze, transition, and refreeze is displaced in figure 2. The three stages could be interpreted as having a large cube of ice, but realize you prefer the shape of a cone instead, first you need to melt the ice to make it amenable to change (unfreeze). The ice collected as water is then moulded to the desired shape of a cone and solidified (refreeze).

Concerning the Integrated Science curriculum, the previous curriculum which was General Science is the (ice block) has to be dissolved (unfreeze) to implement an Integrated Science curriculum (refreeze). The period within which teachers changed from the previous curriculum (General Science) to the new curriculum (Integrated Science) is the transition stage. After accepting the new curriculum, teachers will start researching into that field.

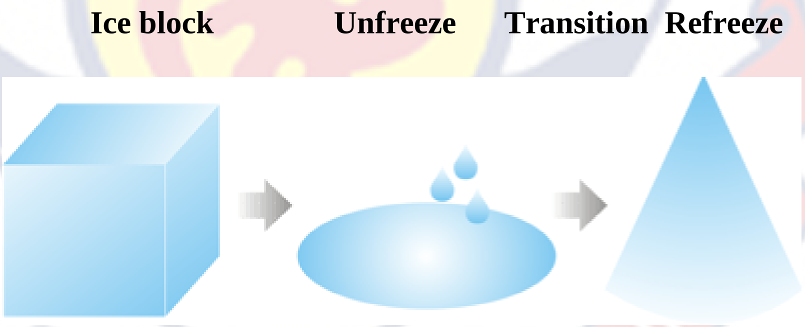

Figure 2: *Kurt Lewin 3-Step Model of Change: "Adopted from" Thompson*

In the unfreezing stage, restraining forces are minimized by the application of stimulating phases of the situation to those involved to recognize the need for change. Thus, normally before a new curriculum reform is implemented workshops and symposiums are organized to inform stakeholders and teachers about the need for change.

The transition stage is the movement of teachers involved to the desired level. Here teachers are educated and convinced to accept the change. The three main activities to perform during the transition process are urging receivers of the need to consider change as important and accepting it and finally getting them involved in the quest for the new change.

The refreezing stage occurs after the change has taken effect. It has the purpose to stabilize the new equilibrium resulting from the change by balancing both the driving and restraining forces. Over here the necessary logistics to aid in the new curriculum implementation is supplied to curriculum implementers to facilitate the implementation process.

Theoretical Bases of the Science Curriculum

Theory in research concerns how knowledge is formulated and organised based on certain assumptions of education, society, and humans. Theories related to this research were formulated by Ausubel's learning theory, Piaget's theory of cognitive development, and Vygotsky's social-cultural theory. Their theories fall in the domain of constructivist that sees the learner as an active participant in the teaching and learning process. Integrated science lessons mostly involve a lot of activities that put the learner at the centre of the learning process to participate in all activities. The constructivist theory does not only help learners to construct meaning but also guides them to change their attitudes towards learning from experienced people. Through the assistance offered by more experienced people in the teaching and learning process.

A study conducted by (Brooks & Brooks, 1999; Driver, Asoko, Leach, Mortimer, & Scott, 1994) Suggests that curriculum developers should shape the curriculum to reflect the learner's knowledge in the affective domain. This claim supports the constructivist theorist that pays much attention to attitudes, experiences, and interests of learners in the teaching and learning process.

Allowing learners to participate and perform activities in Integrated Science lessons is embodied in Piaget's constructivist theory which emphasizes that learners learn best when they construct their conceptual meaning through hands-on practice (Blake & Pope, 2008).

The Piaget theory has the challenge of guiding the physically challenged learners to fully participate in all the activities performed in the class. This implies that such learners will lack behind when there are activities on hands-on practice. Further, it can be theorised that learners have some background knowledge that is transferable to the new learning situation. This can be theorised in the Ausubel learning theory by providing learners with effective basic structures on which to build new concepts from their background knowledge. The theory acknowledges that learners acquire knowledge by exposing them to the relevant resources rather than allowing them to discover the resources. This implies that exposing learners to effective teaching resources and allowing them to manipulate them can lead to the acquisition of new ideas which can be related to the new concept being introduced.

Vygotsky (1986) theory states that knowledge is constructed or shaped through social interactions. This theory is applied in the Integrated Science curriculum where students are assigned in groups to perform an activity. This bridges social interactions between the good and slow learners as they work in groups. The theory has the challenge, where learners can copy unacceptable behaviour from their colleagues when they perform activity groups. A study conducted by Driver *et al*., (1994) revealed that social constructivist theories support learners to construct meaning through interactions with colleagues, materials, observation, and exploration of events.

Strike and Posner (1992) in their study finding suggests that informal science experiences lay a critical foundation for deep conceptual understanding of science. This claim is applicable in the science curriculum within the context, where students informally eat a balanced diet, feed domestic animals, manipulate cell phones, switch off and on electrical gadgets are activities that form part of the Integrated Science curriculum.

Integrated Science Curriculum Evaluation

Integrated Science curriculum evaluation is considered an important matter earlier, by many researchers to ascertain the effectiveness of the curriculum (Yeung, 2003, Adejoh, 2006, Tshiredo, 2013, Daner, Wang, Xie, & Chim, 2014 and azure, 2015). For example, studies conducted by Yeung, Daner *et al.*, and Tshiredo, invariably indicated that there is a correlation between resources offered to learners to practice during science lessons and teaching practices.

However, because most of the studies were conducted within the Asia context, a similar study would be relevant outside the Asia province to ascertain if different results could be established. The studies conducted by (Yeung, 2003) and Daner *et al.* (2014) employed mixed methods to ascertain the effectiveness of the Integrated Science curriculum implemented in the Chinese context. For instance, while Yeung, studied in Hong Kong Junior Secondary Schools, Daner sun *et al*, studied in Eastern Zhejiang Junior Secondary Schools both in China, (Asia). Adejoh, (2006) and Azure (2015) on the other hand studied in Senior Secondary Schools in West Africa, thus Nigeria and Ghana to evaluate the

Integrated Science curriculum. However, their research did not suggest the effectiveness of their study on Junior High Schools.

This has caused a similar study on the Junior High School curriculum using quantitative methods within the Ghanaian context. Also, Yeung and Daner *et al.* conducted their study on 50 male students, 46 female students, and teachers using a series of classroom observation instruments and interviews on randomly selected participants, that was designed to reflect the Chinese research standards. Adejoh, studied 50 secondary schools using probability proportionate sampling technique and Azure, studied 350 secondary school students using observation, hypothesis testing, classifying, taking measurements, and reports to ascertain the effectiveness of the curriculum.

The first study by Adejoh, used a smaller sample size as compared to the second study by Azure. However, the findings from their study differ because the second researcher employed a large sample size that will bring a diversity of responses from a larger population. This will provide detailed information about the relevance of the Integrated Science curriculum. The qualitative method employed by Adejoh has the challenges of using smaller sample sizes that will not help researchers to capture a larger proportion of the population to ascertain the effectiveness of the Integrated Science curriculum. In this vein, there is the need to conduct a study that employed a large sample size to ascertain the effectiveness of the Integrated Science curriculum at the basic level. Moreover, the studies by Yeung, Adejoh, Tshiredo, Daner *et al.*, and Azure consistently revealed that teachers offer fewer opportunities for students to practice during Integrated Science lessons.

However, as indicated earlier, while Yeung, (2003), Adejoh, (2006), Tshiredo (2013), Daner *et al*. (2014) surveyed a small sample of teachers and students regarding the effectiveness of the Integrated Science curriculum, Azure (2015) on the other hand, utilized the descriptive survey design and stratified sampling method to select a large sample size for the study. But because the latter researcher Azure used a larger sample size, the findings will provide a variety of information concerning the effectiveness of the Integrated Science curriculum as compared to the first study because of the responses from a larger population than the findings from a smaller size. Nonetheless, the results of Azure and Adejoh did not provide details concerning basic school Integrated Science curriculum effectiveness. Thus, there remains a need for a study to be conducted to evaluate the basic school Integrated Science curriculum to ascertain its effect on academic performance.

Teaching Strategies in Integrated Science

Preliminary studies conducted on the various kinds of teacher practices offered by Integrated Science teachers in a way that affect academic achievement in the subject, researchers (Yeung, 2003, Adejoh, 2006, Tshiredo, 2013, Daner *et al.*, 2014 & Azure, 2015) indicated in their study finding that most Integrated Science teachers adopt the theoretical instructional approach to support students in learning Integrated Science. For example, Yeung, used a multi-method design incorporating documentary analysis, planner interviews, teacher surveys, and interviews, quasi-experimental studies, and student interviews to collect both qualitative and quantitative data to evaluate the new Junior Secondary Science curriculum in Hong Kong. In contrast, Daner *et al.*, ten years later used a series of classroom observation instruments for collecting and analysing data on teachers' performance on lesson presentations.

Teacher verbal behaviour, instructional organization, instructional content, and student verbal behaviour and learning activities were examined to explore Integrated Science instruction in Junior High Schools in Eastern Zhejiang (China). Sample sizes utilized in their study advocate that Yeung, sample size was much larger than the studies of Daner *et al.* The relevance of large sample size is that in studies such as Yeung, that were conducted in the sizable geographical area there will be a diversity of constructive responses from a large group of people. This will in effect provide different views on Integrated Science teaching strategies utilized in the various classrooms. Likewise, because most of the studies were conducted in the Asian province, it is very prudent for similar studies to be conducted if there would be comparable findings in other socio-cultural contexts.

Nevertheless, there is a prospect that variations will turn up from the findings in Asia and that of Ghana due to the differences in the socio-cultural background of students. However, both studies did not use a large sample size to evaluate instructional strategies in Integrated Science lessons due to the multi-method nature of their study. Study's findings from Azure on the other hand differed because the researcher employed a descriptive survey alongside a stratified random sampling method to select 350 senior secondary school students to explore their views on the Integrated Science curriculum. The study revealed that Students were not much involved in activities as suggested by the Integrated Science curriculum; thus teachers deliver lessons without performing the right activities prescribed by the curriculum. Despite numerous perfect processes involved in the multi-method research, individual differences might influence the instructional strategies of teachers. There is the need for similar studies to be conducted outside Asia to determine if there will be variations in the findings because the previous studies were conducted within Asia. However, Asian, African, and European contexts are likely to differ because of the differences in their socio-cultural contexts and diverse backgrounds.

Studies conducted by Yeung, (2003), Daner, *et al*, (2014), and Azure (2015) consistently revealed that students were offered less time to practice in Integrated Science lessons. Studies from other sources differ because the first studies revealed that the theoretical approach dominates the science lessons. Meanwhile, the findings of Tshiredo (2013) and Adejoh (2006) revealed inadequately qualified manpower to handle the subject and inconsistency between urban and rural schools' science resource equipment. Therefore, teaching strategies and academic performance in Integrated Science cannot be globally equal. Nonetheless, because most of the studies were conducted within the Asian and African context, it is quite prudent to determine if similar results could be found in other socio-cultural contexts. In addition, due to the multi-method nature employed in their study, it is relevant for a subtle study to be conducted in Integrated Science curriculum evaluation through the quantitative method that will provide descriptive detailed information about a large sample of respondents. The application of the quantitative method is inclined to discover the characteristics that are immanent in teaching strategies and academic performance in Integrated Science.

Studies conducted in the African province inevitably acknowledge that teachers' practices during Integrated Science lessons offer learners less opportunity to practice due to inadequate teaching and learning resources. For example, some researchers (Adejoh, 2006, Tshiredo, 2013 & Azure, 2015) affirmed in their research that the majority of Integrated Science teachers adopt a theoretical approach in teaching due to inadequate resources. While Adejoh and Tshiredo utilized ethnographic research procedures such as observations and interviews as a tool for data collection from participants. Azure, further utilized stratified random sampling techniques and descriptive research methods to select 350 secondary schools' students in the study. But because of the nuanced nature of the multi-method design, Azure further reported that students read textbooks while teachers explained some of the concepts. All the studies did not centre on the instructional strategies implemented in the Junior Secondary Schools in Ghana and elsewhere. This deficit in their study has caused a study in the Junior Secondary Schools to explore this bewildering issue.

Effectiveness of Integrated Science Instructional Materials

Preliminary studies conducted by researchers (Ifeoma, 2013, Arisa, Umanah, 2015, Effiong & Egiri, 2015, Asrizala, 2018, Yeboah, Usman, & Wontepaga, 2019) revealed that instructional materials enhance academic performance in the Integrated Science curriculum. For instance, Asrizala *et al*, study conducted in Indonesia, revealed that the integration of instructional materials in an Integrated Science curriculum encourages students to connect learning material in a real-world context to make learning more meaningful. The study's participants consisted of 28 students the researchers employed descriptive statistics analysis, normality test, homogeneity test, and paired comparison test to conduct the study. However, the researchers failed to address the issue of inadequate supply of teaching instructional materials in Junior High Schools.

Several studies were conducted in Africa (Ifeoma 2013, Arisa *et al*, 2015, Egiri & Effiong 2015 & Yeboah *et al*, 2019) on the effectiveness of instructional materials consistently revealed a positive achievement when students are exposed to instructional materials. For instance, a study conducted (Ifeoma 2013 & Arisa *et al*, 2015) on the effectiveness of instructional materials in Integrated Science lessons at the Junior High Schools in Nigeria consistently revealed that the use of instructional materials have favourable effects on students' academic achievement in Integrated Science, females score higher mean than males indicates that instructional materials support female students to perform better in science and finally students perform better at different age level when introduced to instructional materials. The researchers employed a quasi-experimental design. However, both studies failed to address the issue of inadequate instructional materials in the African continent upon several recommendations from researchers. Moreover, the researchers should have reduced their sample size to employ mixed methods to elicit more information on the effect of instructional materials in Integrated Science lessons. In addition, both studies failed to address the effect of inadequate instructional material at the primary school level that forms the foundations of education.

On the other hand, Effiong and Egiri (2015) conducted a study on the impact of instructional materials for Senior Secondary Schools' biology students in Nigeria. The study finding revealed a positive achievement in students when exposed to instructional materials in science lessons. A descriptive statistical method was used in the study. The participants were 25 students and 5 teachers. However, the researcher should have increased the sample size to capture other science-related fields in the Senior Secondary School. In addition, the study should have been conducted in fewer resource schools in deprived communities to ascertain the level at which effective use of teaching resources can influence academic performance. furthermore, the researchers could have employed a mixed method due to the small sample size to dive deep into the study.

Yeboah *et al*, (2019) from Ghana conducted a recent study on the appropriate use of instructional resources to enhance learning at the primary level. The study revealed that improvised instructional materials promote and enhance academic performance at the primary level. The study was qualitative using exploratory and descriptive approaches. The scope of the study should have been extended to cover the Junior High Schools to increase the supply of improvised teaching resources at the junior high level.

Theoretical Framework

The theories that framed the current study included Ausubel's learning theory, Piaget's theory of cognitive development, and Vygotsky's social-cultural theory. These constructivist theories have incited the Integrated Science curriculum extensively. The theory operates on the concept that the learner acquires knowledge during the learning process.

The concept of knowledge construction in the constructivist theory is the position that teachers in Integrated Science are advised to implement in the classroom. Thus, Integrated Science teachers are to use activity-based learning which is more interactive to facilitate the construction of knowledge. Driver *et al*., (1994) in their study revealed that social constructivist theory supports learners to construct meaning through interactions with colleagues and materials. The effectiveness of Ausubel, Vygotsky, and Piaget's constructive theory is to empower Integrated Science teachers to present the essential teaching and learning activities with its complementary instructional strategies that will help learners to construct knowledge during curriculum planning. Further, the theory serves the purpose of assisting and guiding researchers concerning Integrated Science teachers' application of instructional strategies and instructional materials within a particular social-cultural context. The relevance of the theories as a guide to the researcher can be associated with what a stick does for a blind person. In recent times various forms of constructivist theory have emerged with a different outlook on how learners can construct knowledge in Integrated Science. Piaget's theory (1972) and Vygotsky's theory (1978) fall in the category of constructivist and social-cultural theory in learning respectively. In constructivist theory, the child is considered a solitary learner that constructs knowledge during play with peers. In Vygotsky's social-cultural theory learners can construct knowledge through the activities they perform with their colleagues during Integrated Science lessons. The aforementioned theories are relevant in the Integrated Science curriculum as they form the foundations underlying the principles of constructivist teaching in Integrated Science lessons. These theories constitute the framework of this study to evaluate teaching instructions, teaching resources, and teaching outcomes.

Conceptual Framework

The conceptual framework depicts the expectations of research by defining the variables and mapping out how they relate to each other. The conceptual framework underpinning this study is presented in Figure 3

Figure 3: Conceptual Framework of the study

In this conceptual framework, there were two kinds of variables, namely the independent variable and the dependent variable. The strategies for learning Integrated Science constituted the independent variable while academic achievement was the dependent variable. The strategies for learning science entailed effective use of teaching and learning resources, teachers varying their teaching strategies, learning activities carried out as outlined in the syllabus, specialization of teachers in science, and regular supervision of science lessons. The dependent variable, on the other hand, was the academic achievement of the pupils. This was based on the BECE performance of the pupils in 2017, 2018, and 2019 academic years.

Summary of Empirical Review

The review of empirical research in the entire study unveils three important aspects within the Integrated Science curriculum that promote and enhance academic achievements by several researchers over the years. These are Integrated Science curriculum evaluation, instructional strategies in Integrated Science, and instructional resources in Integrated Science.

The teaching and learning of science is a major concern for stakeholders in education because it is seen as a medium that can bring transformation in all sectors of the economy. Science is an activity-based subject that requires a special approach to teaching. Factors that affect effective teaching and learning of Integrated Science are teachers' content knowledge, inappropriate instructional materials, lack of effective supervision and pupils' poor attitude and interest towards the learning of science. Integrated Science was started in 1969 by United Nations Educational Scientific and Cultural Organization (UNESCO) for its member states. The term Integrated Science does not change the philosophy of science education but makes the subject interesting and applicable to learners. Integrated Science is significant in the development of the economy as seen in the Information Communication and Technology (ICT) sector. The creation of awareness and practice of simple hygiene and strengthening the Agricultural sector.

The curriculum evaluation process is the mechanism used for judging how the curriculum is implemented formally in achieving academic goals. The essence of the curriculum evaluation process is to guide and direct learners on the desired way of achieving scientific literacy.

Models of curriculum evaluation are the guides used in determining certain aspects of instruction to determine the worth of the curriculum. Some of the models discussed are Bradley's effectiveness model (1985), Tyler's objective-centred model (1950), Robert Stake's responsive model (1975), Scriven's goal-free model of (1972), Eisner's connoisseurship evaluation model of (1979) and Stufflebeam CIPP (Context, Input, Process, Product) model of (1971). Theories discussed in the literature were Kurt Lewin's theory of 1947, Piaget's theory of cognitive development, Vygotsky's social-cultural theory and Ausubel's learning theory.

Studies conducted on Integrated Science curriculum evaluation revealed that there is a correlation between resources offered to learners to practice and teaching practices. Preliminary studies conducted on teaching strategies in Integrated Science revealed that teachers adopt the theoretical instructional approach in teaching. Several researchers concluded that instructional materials promote learning. The conceptual framework was guided by two variables namely the independent variable which involves teaching-learning activities and the dependent variable which is academic performance.

This study seeks to address the gaps in the literature already highlighted where most of the studies conducted on Junior High Schools were within the Asian province precisely China. This study focuses on Junior High Schools in Ghana which is found within the African continent to ascertain if similar findings would be established.

The few similar studies conducted in West Africa by Adejo and Azure only focused on Senior High Schools which revealed that inadequate resources influence the application of the theoretical approach in teaching. However, this study wishes to address this gap by focusing on Junior High Schools to ascertain the effectiveness of teaching and learning of Integrated Science curriculum.

The study findings established that basic school science teachers are fond of using a lot of activities in teaching which was not highlighted by the previous studies conducted at the Senior High Schools. It is evident from the findings that basic school teachers involve students in performing activities outlined in the syllabus. It has improved academic performance from the lowest level to the average status. This is an indication that when teachers and learners are highly involved in performing activities it influences academic performance.

The next gap in literature the study wishes to address is the size of the sample size used by the previous studies. Smaller sample sizes were used by the previous researchers to ascertain the effectiveness of the Integrated Science curriculum. Even though Azure used 350 participants, the current study used a large sample size of 85 teachers and 506 students totalling 591 to cover a larger population to ascertain the teaching and learning of Integrated Science in Basic schools.

CHAPTER THREE

RESEARCH METHODS

Introduction

This part of the study emphasizes the methodologies employed to determine how the study was executed. They include research paradigm, research approach, sampling procedure, study context, population, data collection procedure and data analysis. Finally, ethical considerations governing the study are also highlighted in this section.

Research methodology is significant in every research endeavour because it is employed in a study to determine, select, process, and analyse information about the topic. A study conducted by Ojo (2009) further argued that research methodology is a system of explicit rules and procedures in a study, against which claims of knowledge are evaluated.

Research Design

A research design is the overall plan for conducting a study so as to obtain answers to the questions being studied and for handling the difficulties encountered during the research process (Polit & Beck, 2018). A research design is described as the controlling plan for a research study in which the methods and procedures for collecting and analysing information to be collected are specified. Therefore, the research design involves all the appropriate strategies that are selected to connect the various part of the study to address the research problem. Hence, the research design entails measurement, data collection, and analytical procedures.

This study adopted the descriptive research design. The descriptive survey research design seeks to describe and interpret what exists in its present condition, attitudes, practices and beliefs (Seidu, 2007). The descriptive survey is an important method that is commonly used in educational research because in education most of the issues that are researched into are usually descriptive in nature (Ary, Jacobs, Razavieh, & Sorensen, 2006). This design was deemed appropriate because the researcher was interested in the description strategies that teachers adopt to enhance the learning of Integrated Science, the level of academic achievement among the pupils as well as the relationship between strategies for teaching science and academic achievement. Another rationale for the choice of the descriptive survey is contained in the views of Babbie (2010) that survey research in general offers advantages in terms of economy, the amount of data that can be collected, the chance to sample a large population, and the standardization of the data collected.

Furthermore, a descriptive survey affords the use of multiple instruments such as questionnaires, tests, and interviews to gather information from participants (Ary *et al.*, 2006). Therefore, this design lends itself to mixing data sources to provide a more complete and comprehensive account of the variables in investigation (Bryman, 2015). Specifically, a cross-sectional survey type of descriptive design which requires that data are collected once at a particular time (Creswell, 2012) and used. Therefore, the questionnaire which is a primary data was used to collect data once and secondary data on the BECE from 2017 to 2019 were also collected once.

Philosophical Underpinning

The study was guided by the positivist research philosophy. This philosophical thought is based on quantitative data and observation with the goal of being independent from subjective opinions (Bryman & Bell, 2011).

These authors further add that positivist philosophy is the natural science procedure for collecting data about an observable reality and searching for regularities and relationships to create generalizations. Therefore, it is said that positivist researchers adopt a structured methodology to facilitate replication (Gill & Johnson, 2010). In addition, a positivist approach to research is conducted in a value-free manner, and the outcome is entirely objective. Saunders, Lewis and Thornhill (2012) note that a central part of positivism is testing theories and generating hypotheses.

From these descriptions, it is deduced that the positivist epistemological viewpoint suggests that the only authentic knowledge is derived from structured and controlled procedures as contained in the natural sciences like Chemistry, Biology, and Physics. In essence, social scientists are required to adopt laid-down processes to arrive at tenable knowledge.

With the positivist tradition, this study would require the use of structured questionnaires to gather quantifiable data for statistical analysis to test theories and hypotheses. Despite the assertion that positivism helps to arrive at objective findings, the positivist view has been criticized as superficial because it is unable to arrive at in-depth knowledge (Cavana, Delahaye & Sekaran, 2001). Despite this flaw, the researcher adopted this philosophy because it was deemed most appropriate for testing the research questions outlined in the study.

Research Approach

The study employed a quantitative research approach for data analysis. Tavakol and Saunders (2014) pointed out that quantitative studies are involved in examining how and why events differ. According to McMillan and

Schumacher (2010), quantitative approach emphasizes objectivity when measuring and interpreting a phenomenon. In the quantitative methodology, the researcher uses statistics and surveys with the aim to generalize the findings to a greater extent (Shiu, Hair, Bush, & Ortinau, 2009). Due to the quest to generalize to a wider population, quantitative methodology accommodates a large sample size (Shiu *et al.*, 2009). It is used to test theories and examine relationships between variables (Grove, 2011).

The quantitative approach has weaknesses. According to Macnee and McCabe (2008), the quantitative research is unable to consider the individuality of human experience. Creswell and Plano Clarke (2011) add that the quantitative research is seen to be weak in understanding the context or setting in which people talk and the voices of respondents are accordingly not directly heard. However, the researcher adopted the quantitative approach because of the numeric data collected through the use of questionnaires. Again, the quantitative approach was chosen by the researcher because it highlights significant discoveries and generates objective facts that can be conveyed through figures and statistics (Bhasin, 2020).

Study Context

The movement of residents from deprived communities to communities where there are opportunities is a common phenomenon in Ghana. This situation brings in its wake several challenges. The economic disparity between Cape Coast metropolis and other districts in the Central Region in terms of school infrastructure and teaching-learning resources is likely to impact negatively on students' academic performance in Integrated Science. In essence, the current study seeks to find out the level of academic achievement of Junior High School students' in Abura Asebu Kwamankese District.

In the 2021 Population and Housing Census, the total population size of Abura Asebu Kwamankese District stands at 124,465 with the male population being 59,644 which represents 48% and the female 64,821 which also represents 52% of the total population. The AAK District is relatively less endowed with natural resources. As a consequence, a majority of the populace work within the informal sector such as small-scale farming, petty trading, and fishing. By implication, a majority of the people fall within the low-income bracket.

The district currently has (104) public basic schools. And the sample of the study was drawn from these schools. The study focused on the evaluation of Integrated Science curriculum in Junior High Schools. The participants of the study were drawn from 85 public basic schools within the Abura Asebu Kwamankese District.

Population

A population is the pool of individuals from which a statistical sample is drawn for a study (Agyedu, Donkor, & Obeng, 1999). For this study, Integrated Science teachers and pupils in the Abura Asebu Kwamankese District were considered to be the population because they were of interest to the study. Also, the population included schools from seven (7) education circuits in the Abura Asebu Kwamankese District. The target population comprised 85 teachers in 2020 academic year and 5060 pupils in 2017, 2018 and 2019 BECE, totalling 5145. The target population of the pupils was distributed as 1700 in 2017, 1650 in 2018, and 1710 for 2019.

Sample and Sampling Procedure

A sample size of 591 participants composed of 85 teachers and 506 pupils was used for the study. This sample size was appropriate for the study based on the suggestion of Asamoah-Gyimah and Duodu (2007) that a sample size of 10% to 30% of the population is representative in quantitative studies. This study used 10% of the target population for the study.

Sampling is a technique employed in a study to systematically select a relatively smaller number of representatives from a pre-defined population to serve as the subjects for observation or experimentation regarding the objectives of the study (Amengor, 2010). Even though all the subjects in the Abura Asebu Kwamankese District were eligible for this study, a sample was taken to represent the population. The census sampling technique was used to select the teachers while the stratified random sampling technique was used to select the students.

Census sampling involves collecting information from each and every person of interest in a study (Babbie, 2010). This sampling strategy was used to select all the Integrated Science teachers in the district so as to capture everybody's opinion about science learning in the district. This sampling strategy was employed because the researcher believed that every science teachers' opinion counts in analysing the constructs under investigation. Additionally, the researcher realised that the number of teachers were few relative to the number of pupils. Therefore, all the 85 teachers in the district were selected to participate in the study. The distribution of teachers is shown in Table 2 on the next page.

Table 2: Sample Distribution of Teachers

Circuits	Population size	Sample size
A	10	10
B	13	13
C	13	13
D	12	12
E	14	14
F	12	12
G	11	11
Total	85	85

Source: Researcher's Computations, 2020

The stratified random sampling was used to select the pupils. In this sampling technique, subjects are selected in such a way that the existing subgroups in the population are replicated in the sample (Mugenda & Mugenda, 2009). Therefore, this sampling technique requires that the population is put into subdivisions, and selection of participants are carried out in each group to constitute the sample. This sampling strategy was used to select pupils where they were categorized based on their circuit, and a random sampling was done in each circuit to select the participants. For instance, in Circuit A, the percentage of the population was 14%. Therefore, using the same proportion in the sample size, 71 participants were selected for Circuit A. The Distribution of the pupil's sample is presented in Table 3.

Table 3: Sample Distribution of Pupils

Circuits	Population size	% of total population	Sample size
A	720	14	71
B	725	14	71
C	715	14	71
D	685	14	71
E	735	15	76
F	720	14	71
G	760	15	76
Total	5060	100	507

Source: Field Data, 2020

Thereafter, the researcher proceeded to determine the sample size for each circuit, calculated the proportion of male and female pupils in each circuit, and used the proportions to select the pupils. For instance, Table 4 showed that in Circuit A, there were 389 males which represented 54% of the total population in Circuit A (720), whilst the remaining 331 constituted 46% of the total population in the circuit. Therefore, 54% of the sample size for Circuit A (71) resulted in the selection of 38 males in this circuit, while 33 females (46% of 71) were selected from this circuit. These procedures were applied in the selection of males and females in each circuit.

Table 4: Distribution of Pupils and Sample Size

Circuits	Population size	Sample size	Number of Males (%)	Male sample size	Number of females (%)	Female sample size
A	720	71	389 (54)	38	331 (46)	33
B	725	71	413 (57)	40	312 (43)	31
C	715	71	372(52)	37	343(48)	34
D	685	71	377(55)	39	308(45)	32
E	735	76	375(51)	39	360 (49)	37
F	720	71	346(48)	34	374(52)	37
G	760	76	403(53)	40	357(47)	36
Total	5060	507		267		240

Source: Field Data, 2020

The simple random sampling was used in selecting the individual pupils from the schools in the circuits to give all pupils an equal and independent chance of being selected for the study (Ary *et al*., 2006). Particularly, I followed the lottery method in simple random sampling in selecting the individual participants for the study. In this process, I labelled the pupils with codes, placed these codes in a container, and shuffled them thoroughly. Then, I picked the codes randomly so that those codes that were picked to represent the participants involved in the study.

Data Collection Instrument

Data collection instruments are the tools used to collect information in research or the methods employed to collect research data (Zikmund, 2003). Structured questionnaire was used for data collection. Structured questionnaire requires respondents to respond to a series of pre-developed questions posed by the researcher and the response pattern has also been pre-determined (Polit & Beck, 2018). Therefore, a structured questionnaire limits the answers provided by the respondents to those specified by the researcher. The questionnaire was chosen because it is quicker to administer to a large sample, ensures anonymity, and it is more convenient for respondents (Bryman, 2015). Particularly, the utilization of structured questionnaires enhances the objectivity in data gathered and supports statistical analysis (Polit & Beck, 2018).

Self-constructed questionnaire was used because there was no known questionnaire at the time of the study that captured the variables of interest. The items in the questionnaire were based on a 5-point Likert scale (Likert, 1932) such that from 1 to 5 with 1 being strongly disagree and 5 being strongly agree. The participants were required to select one option of each item to reflect their perception. The variables in the questionnaires included regular supervision of science lessons, effective use of TLRs, teachers varying teaching strategies, activities are carried out as in the syllabus, and specialization in teaching science.

The regular supervision of science lessons on the questionnaire was used to determine the level at which science lessons were supervised by headteachers and school improvement support officers (SISO). The effective use of teaching and learning resources (TLRs) on the questionnaire was used to ascertain the level at which teachers make effective use of the teaching resources to explain the concept in science and make the lesson practical. The activities carried out as in the syllabus on the questionnaire were used to determine the level at which activities performed by the teachers are in line with those suggested by the syllabus. The specialization in teaching science on the questionnaire was used to determine teachers' content knowledge in science. There were 3 items for each variable, totalling 15 items.

Pre-testing of the instrument

Scholars like Bryman and Bell (2011) advocate that research instruments are pre-test before administration to eliminate ambiguities and errors in data collected and to ascertain the validity and reliability of the instruments. The pre-test was carried out in Kommenda-Edina-Eguafo-Ebirem (KEEA) District because it is considered to have similar characteristics with the study area. The pre-test involved 17 teachers based on the recommendation of Cooper and Schindler (2011) that a minimum of 10% of the sample size should constitute the sample for the pre-test.

Validity

According to George and Mallery (2010), validity refers to the degree to which instrument accurately measures what it intended to measure. The questionnaire was assessed for face validity and content validity. Face validity refers to whether the instrument appears as though it is measuring the appropriate construct (Polit & Beck, 2018). Face validity and content validity were determined in this study.

Face validity refers to whether the instrument appears as though it is measuring the appropriate construct (Polit & Beck, 2018). For face validity, the questionnaires were given to colleagues on the master's programme to examine whether they were in line with the research questions. Their views on the length of some items and ambiguities were considered in fine-tuning the instruments.

Content validity is defined as the adequacy of items of an instrument in measuring the concept under study (Polit & Beck, 2018). The instruments were given to my supervisor and lecturers who have knowledge in the issues under study to determine its content validity as suggested by Borg and Gall (2003) that content validity of an instrument is guaranteed through expert judgment. These experts made suggestions that were applied in reshaping the instruments.

Reliability

Reliability refers to the consistency of results if a study is repeated, and is concerned with stability, internal reliability and inter-observer consistency (Bryman & Bell, 2012). The reliability of the questionnaire was determined through internal consistency of the items where Cronbach's alpha coefficients were computed. For internal consistency, the questionnaire was administered once, and the Cronbach alpha for each variable was computed and presented in Table 5

Table 5: Reliability Test

Variables	Cronbach's Alpha
Regular supervision of science lessons	.953
Effective use of TLRs	.953
Teachers varying teaching strategies	.952
Activities are carried out as in the syllabus	.964
Specialization in teaching science	.971
Overall internal consistency	.967

Source: Field Data, 2020

The results revealed that coefficients of 0.953, 0.953, 0.952, and 0.964, 0.971 as well as 0.967 for regular supervision, effective use of TLRs, varying teaching strategies, activities carried out as in syllabus, specialisation as well as overall internal consistency. Cronbach's alpha has a range of values between 0.00 and 1.00, and a value greater 0.7 is acceptable (Bryman & Bell, 2010). Based on these results, it was concluded that the reliability of the questionnaire was adequate.

Data Collection Procedures

Polit and Beck (2018) explain that data collection is the gathering of information needed to address a research problem. The researcher acquired ethical clearance from the Institutional Review Board, University of Cape Coast, then an introductory letter was secured from the Department of Basic Education, University of Cape Coast which gave me access to the schools. A research permit was also obtained from the AAK District Directorate of Education.

Data collection was carried out in two phases. Data collection through the use of the questionnaires was done at the first phase, while BECE results of the pupils were gathered at the second phase. The researcher personally administered the questionnaires to the respondents who filled and return them immediately. However, participants who were unable to complete the questionnaires were encouraged to complete them within one week. The researcher made follow-ups through telephone calls and text messages. At the second phase, the researcher collected the BECE results of the pupils in 2017, 2018, and 2019 academic years in Integrated Science from the District Directorate of Education.

Data Processing and Analysis

Data analysis involves the process of visualizing, cleaning, interpreting, and analysing data to make the data meaningful (Rice, 2009). The returned questionnaires were screened, and those that were not responded to or poorly answered were eliminated. The survey data were coded and entered into (SPSS) version 26. The data were explored to identify missing data and outliers using descriptive statistics. Both descriptive and inferential statistics were used to analyse the data. Descriptive statistics enabled the researcher to reduce, summarize, and describe quantitative data obtained from empirical evidence (Polit & Beck, 2018). The variables for the analysis were the data obtained from teachers through questionnaire, which is the independent variable and BECE results for academic performance which forms the dependent variable. The two variables were processed into tables and charts to provide overview of the outcome.

In order to determine the bivariate relationship between the study variables, Pearson Product Moment correlation was employed because it is suitable for determining the bivariate correlation between two variables

(Bryman, 2015). The correlation coefficient ranges between -1 and +1, and when it approaches +1 it indicates positive strong correlation, and when it approaches -1 it indicates negative strong correlation (Pallant, 2016). A value of 0 indicates no correlation between the two variables. The strength of the correlation coefficient was based on Pallant's (2016) recommendation that, correlation coefficients in the range ±0.10 to ±0.29 is weak, ±0.30 to ±0.49 is moderate, and ±0.50 to ±1.0 is strong.

Test of Assumption

According to Pallant (2016), data distribution as part of data analysis shows the range of scores on variables in a study and how the scores are distributed using normal distribution curve. This author explains that, data are normally distributed when most of the values are close to the mean with few values at extreme ends of the distribution. The Kolmogorov-Smirnov test was used to test the normality of the data to complement the standard deviation scores, and the findings are presented in Table 6.

Table 6: Normality Test Results

	Kolmogorov-Smirnov[a]		
Variables	Statistic	df	Sig.
Regular supervision of science lessons	0.319	85	0.080
Effective use of TLRs	0.292	85	0.074
Teachers varying teaching strategies	0.318	85	0.079
Activities are carried out as in the syllabus	0.273	85	0.126
Specialization in teaching science	0.264	85	0.156

Source: Field Data, 2020

The findings in Table 6 showed that the p-value for each variable was greater than 0.05 ($p>0.05$), which implied that the data for each variable were normally distributed.

Ethical Consideration

Research ethics is a system of moral values that is concerned with the degree to which research procedures follow professional, legal and sociological obligations to the study participants (Polit & Beck, 2018). Ethical issues such as confidentiality, anonymity, and informed consent were ensured in the study.

Informed consent means that participants have adequate information regarding the research, are capable of understanding the information and have the power of free choice, enabling them to consent or decline participation in the research (Polit & Beck, 2018). The researcher obtained informed consent from the research participants by explaining in detail the nature and purpose of the study, and the importance of their participation were given. Informed consent was maintained when the participants were assured that participation in the study was voluntary and failure to comply would not result in any penalties.

Anonymity occurs when even the researcher cannot link a participant with the information for that person (Polit & Beck, 2018). To ensure anonymity, the names of respondents were not written on the questionnaires, and participants' names were not mentioned in the final report.

Confidentiality is maintained when participants are protected in a study such that individual identities are not linked to the information provided, and are never publicly divulged (Polit & Beck, 2018). Data from the questionnaire were protected with a password on a computer, and the filled-in questionnaires were destroyed after the study to ensure confidentiality.

Common Method Bias

Common method bias in research normally occurs when a researcher obtains data from the same person or sources using the same method (Podsakoff and Organ, 1986). To check this phenomenon in the study.

The primary data which is the independent variable was obtained from teachers using questionnaires on different occasions and analysed separately. The secondary data which forms the dependent variable was also obtained differently from the District Education Directorate using students' BECE results. The students were not directly involved in the study nor were they interviewed for their teachers to be aware that they are part of the study, for them to influence each other on the responses.

Furthermore, the coding for the analysis of the two variables was different, bringing a variety of results from the analysis. For example, whiles the responses on the questionnaire were coded using strongly disagree to strongly agree within a five-point Likert scale. The BECE was coded as (highest, higher and high) as high, (high average, average, low average) as average and (low, lower and lowest) as low to bring a different interpretation of the outcome that will deal with common method bias. Finally, to deal with data entry errors outliers were determined using the minimum and maximum values on the descriptive statistics which indicated that all the values were within the range of scales used in the analysis.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter of the study presents factual results and discusses the findings based on the outcome of the study. The chapter is presented in two phases. The first part dwells on the results of the study, and the second part discusses the findings of the study. The first part focused on analysing data to answer the research questions in relation to the study. This was followed by descriptive statistics to identify how the various teaching strategies are being implemented in the classroom. Findings from the academic performance of BECE were then reported in relation to the study and finally, the relationship between the study variables and academic performance was also reported using a correlation coefficient. The later part of this section focuses on discussing the findings from the data analysed.

Results

Research Question 1 - What strategies are used to ensure effective learning of Integrated Science in public basic schools in Abura Asebu Kwamankese District?

The focus of this research question was to investigate strategies that are used to ensure effective learning of Integrated Science in public basic schools in Abura Asebu Kwamankese District. The variables included in the analysis were effective use of teaching and learning resources, teachers varying their teaching strategies, learning activities carried out as outlined in the syllabus, specialization of teachers in science, and regular supervision of science lessons.

Descriptive statistics including the mean and standard deviation were used to analyse the data.

Descriptive statistics employed to investigate the teaching strategies that are used to ensure effective learning of Integrated Science in public basic schools. Standard deviation scores and mean scores was used to analyse the variables in relation to effective learning of Integrated Science. The details of the results are presented on table 7 below.

Table 7: Descriptive Statistics for Strategies in Learning Integrated Science

Variables	Mean	SD
Activities carried out as in syllabus	4.23	.722
Teachers varying teaching strategies	4.08	1.046
Regular supervision of science lessons	4.03	.956
Effective use of TLRs	3.83	1.122
Specialization in teaching science	3.21	1.091

Source: Field Data, 2020

The findings in Table 7 revealed that the standard deviation value for each variable was less than 2, hence the researcher concluded that the normality of the data was confirmed as recommended by Verma and Abdel-Salam (2019). The findings showed that the teachers rated highest on activities that were used in teaching science as found in the syllabus (M=4.233, SD=0.722), followed by the teachers varying their teaching strategies (M=4.083, SD=1.046), regular supervision of science lessons (M=4.033, SD=0.956), effective use of teaching and learning resources (M=3.833, SD=1.122), and teachers' specialisation in teaching science (M=3.217, SD=1.091).

The research question 2 seeks to find out the level of academic achievement in Integrated Science within public basic schools from 2017 to

2019. A descriptive statistic was employed using frequencies and percentages to determine the level of achievement within Abura Asebu Kwamankese District. The details of the results are presented in table 8

Research Question 2 - What is the level of academic achievement of pupils in Integrated Science in public basic schools in Abura Asebu Kwamankese District?

The focus of this research question was to examine the level of academic achievement among the pupils in the schools. In line with the 9-point scale used in determining the grades of pupils in the BECE, including highest, higher, high, high average, average, low average, low, lower, and lowest. However, these grade points were recorded in this analysis such that highest, higher and high were recoded as high; high average, average, low average were recoded as average; and low, lower, and lowest were recoded as low. The researcher employed descriptive statistics including frequencies and percentages to analyse the data so as to provide answers to this research question. The findings of the analysis are presented in table 8 below.

Table 8: Descriptive statistics to determine the Levels of Academic Achievement among Pupils

Academic Year	Levels	Frequency	Percent	Valid Percent	Cumulative Percent
2017 BECE	High	60	11.9	11.9	11.9
	Average	285	56.3	56.3	68.2
	Low	161	31.8	31.8	100.0
	Total	506	100.0	100.0	
2018 BECE	High	38	7.5	7.5	7.5
	Average	250	49.4	49.4	56.9
	Low	218	43.1	43.1	100.0
	Total	506	100.0	100.0	
2019 BECE	High	44	8.7	8.7	8.7
	Average	243	48.0	48.0	56.7
	Low	219	43.3	43.3	100.0
	Total	506	100.0	100.0	

Source: Field Data, 2020

The findings in Table 8 showed that, the proportion of pupils who attained average scores in the 2017 BECE was highest (n=285, 56.3%) as compared to those who attained low scores (n=161, 31.8%) and high scores (n=60, 11.9%) respectively. The findings further showed that in 2018 BECE, almost half of the pupils obtained average scores (n=250, 49.4%), followed by low scores (n=218, 43.1%) and high scores (n=38, 7.5%) respectively. Similar trend was noticed in the 2019 BECE where the greatest proportion of the pupils scored average in the examination (n=243, 48%) as compared to those who scored low (n=219, 43.3%) and high (n=44, 8.7%) respectively. It was therefore evident in the analysis that, the lowest proportion of pupils scored high grades in the BECE over the three-year period as compared to the proportion of those who scored lowest in the examination.

The research question 3 seeks to find out the strength of relationship between the learning strategies and academic achievement in Integrated Science within Abura Asebu Kwamankese District. An inferential statistics using the Pearson product matrix correlation was used to analyse the data based on the recommendation of Cohen (1988). Details from the findings are presented in table 9.

Research Question 3 - What is the relationship between Integrated Science learning strategies and pupils' academic achievement in public basic schools in Abura Asebu Kwamankese District?

This research question aimed to investigate the relationship between the various strategies for learning Integrated Science and pupils' academic achievement. The variables involved in the analysis were effective use of teaching and learning resources, teachers varying their teaching strategies, learning activities carried out as outlined in the syllabus, specialization of teachers in science, and regular supervision of science lessons. The correlation coefficients were assessed based on the recommendation of Cohen (1988) that ±0.10 to ±0.29 is weak, ±0.30 to ±0.49 is moderate, and ±0.50 to ±1.0 is strong. The Pearson product moment correlation was used to analyse the data, and the findings are presented in Table 9.

Table 9: Inferential statistics using Pearson Correlation Matrix for Integrated Science Learning Strategies and Academic achievement

			1	2	3	4	5	6	7	8	9
1	Regular supervision	Pearson Correlation	1								
2	Effective use of TLRs	Pearson Correlation	0.937*	1							
		Sig. (2-tailed)	0.000								
3	Teachers varying teaching strategies	Pearson Correlation	0.946*	0.921*	1						
		Sig. (2-tailed)	0.000	0.000							
4	Learning activities as in syllabus	Pearson Correlation	0.922*	0.865*	0.939*	1					
		Sig. (2-tailed)	0.000	0.000	0.000						
5	Specialisation in teaching science	Pearson Correlation	0.789*	0.861*	0.801*	0.796*	1				
		Sig. (2-tailed)	0.000	0.000	0.000	0.000					
6	2017 BECE	Pearson Correlation	0.108	0.124	0.090	0.115	0.298*	1			
		Sig. (2-tailed)	0.414	0.347	0.496	0.380	0.021				
7	2018 BECE	Pearson Correlation	0.366*	0.485*	0.373*	0.323*	0.480*	0.050	1		
		Sig. (2-tailed)	0.004	0.000	0.003	0.012	0.000	0.705			
8	2019 BECE	Pearson Correlation	0.126	0.185	0.087	0.108	0.289*	-0.039	0.137	1	
		Sig. (2-tailed)	0.336	0.157	0.508	0.414	0.025	0.767	0.296		
9	Overall Academic Performance	Pearson Correlation	0.350*	0.466*	0.325*	0.314*	0.589*	0.390*	0.744*	0.647*	
		Sig. (2-tailed)	0.006	0.000	0.011	0.014	0.000	0.002	0.000	0.000	

Source: Field Data, 2020

The findings in Table 9 showed that, there was a moderate and statistically significant positive relationship between regular supervision of science lessons and academic achievement ($r=0.350$, $p<0.05$, two-tailed). The findings also established that, there was a moderate and statistically significant positive relationship between effective use of teaching and learning resources and academic achievement ($r=0.466$, $p<0.05$, two-tailed). Furthermore, the findings revealed that there was moderate and statistically significant positive relationship between teachers varying their teaching strategies and academic achievement ($r=0.325$, $p<0.05$, two-tailed). Additionally, the findings pointed out that there was a moderate and statistically significant positive relationship between teachers' conducting learning activities as specified in the syllabus and pupils' academic achievement ($r=0.314$, $p<0.05$, two-tailed). Finally, the relationship between teacher specialization in teaching science and pupils' academic achievement was positive, strong, and statistically significant ($r=0.589$, $p<0.05$, two-tailed).

Discussion on finding

The findings showed that the teachers rated highest on activities that were used in teaching science as found in the syllabus, followed by the teachers varying their teaching strategies, regular supervision of science lessons, effective use of teaching and learning resources, and teachers' specialisation in teaching science.

The findings established a solution to the first research objectives of the study that aims to identify the strategies that are used in presenting science lessons. As indicated earlier the findings revealed that teachers are more fond of using activities during teaching and learning than the use of teaching and learning resources. This confirms the study of (Adejoh, 2006, Tshiredo, 2013 & Azure, 2015) that the majority of Integrated Science teachers adopt a theoretical approach to teaching due to inadequate resources.

Meanwhile, studies conducted by Effiong *et al.* (2015) on the effectiveness of instructional materials in science revealed that there is a positive achievement in students when exposed to instructional materials during lessons. Studies from (Ifeoma, 2013; Arisa *et al*., 2015) on the effectiveness of instructional materials in Integrated Science lessons at Junior High Schools in Nigeria consistently revealed that the use of instructional materials has favourable effects on students' academic achievement in Integrated Science to the extent of helping females to score higher mean than males. Asrizala *et al*. (2018) study conducted in Indonesia, further confirms that the integration of instructional materials in an Integrated Science curriculum encourages students to connect learning material to real-world contexts to make learning more meaningful.

The study findings from Yeboah *et al.* (2019) further affirm that instructional materials play a significant role in effective teaching and learning. This is not surprising because when lived experiences of learners are brought to bear on any teaching and learning context, it enhances and promotes the learner's understanding of a concept which intern makes it possible for the learner to apply what has been learned to address real-life issues. This finding is embodied in the constructivist theory which stipulates that learners construct knowledge through active participation and manipulation of teaching and learning resources.

This claim further corroborates the assertion by researchers (Ifeoma 2013, Arisa *et al*, 2015, Effiong, *et al*, 2015, Asrizala *et al.*, 2018; Yeboah *et al.*, 2019) that instructional materials enhance and promote students' understanding of the concept taught in class in effect the lack of will likely harm quality teaching and learning.

The findings further revealed that, despite the evidence that the majority of the pupils scored average scores in the BECE, the findings pointed out that the lowest proportion of pupils scored high grades in the BECE over the three-year period as compared to the proportion of those who scored low in the examination. The findings of this study were confirmed in previous studies carried out in Ghana (Mensah & Somuah, 2013; Hofstein, Eilks, & Bybee, 2011) which indicated that academic achievement among learners in Integrated Science is low. This implies that learners do not gain enough from their learning experiences in relation to Integrated Science. This finding provides a solution to the second objective of the study to identify the current performance of students within the area of study which revealed a marginal improvement from low performance to average status.

The finding on the third research question showed that there was a positive and statistically significant relationship between the individual strategies for promoting science teaching such as regular supervision of science lessons, effective use of teaching and learning resources, teachers varying their teaching strategies, teachers' conducting learning activities as specified in the syllabus, and teacher specialization in teaching science on one hand and academic achievement on the other hand. This implies that when these strategies are effectively implemented in learning science, they would inure to the benefit of the learners in terms of improved academic achievement. This finding provides a solution to the third objective of the study to identify that, there is a moderate and strong correlation between strategies used in teaching and learning science and academic achievement.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the study

Introduction

This section of the study highlights the summary of the entire study, conclusions made based on the study findings, suggested recommendations by the researcher to curtail the problem under investigation, and finally suggestions for future research circling around the topic under investigation.

The study aimed to evaluate the teaching and learning of the Integrated Science curriculum to ascertain its effectiveness in academic achievement within the Abura Asebu Kwamankese District in the Central Region of Ghana. The evaluation was carried out through the following research protocols, the background of the study, statement of the problem, the purpose of the study, the significance of the study, literature review, data analysis, findings, and discussions.

The study was guided by the positivist philosophy; therefore, the quantitative research approach was adopted for the study. A descriptive survey design was used for the study. The census sampling technique was used to select 85 teachers while the stratified sampling technique was employed to select 506 pupils. The data collection instrument was a 5-point Likert scale questionnaire constructed by the researcher. The data were analysed through descriptive and inferential statistics with the aid of the SPSS version 26. Ethical issues such as informed consent, confidentiality, and anonymity were ensured.

The study's contribution to knowledge was demonstrated in the results which revealed that when teachers implemented the activities stipulated in the syllabus academic performance in science raised from outright poor performance to average status. This implies that when teachers are able to implement activities in the syllabus it promotes understanding of the concept taught which will eventually improve academic performance. This contribution could be linked to Vygotsky's social-cultural theory which operates on the notion that learners construct knowledge through the activities they perform with their colleagues and materials in the classroom.

Summary of Key Findings

The major findings of the study included the following:

1. The findings showed that the teachers rated highest on activities that were used in teaching science as found in the syllabus, followed by the teachers varying their teaching strategies, regular supervision of science lessons, effective use of teaching and learning resources, and teachers' specialisation in teaching science. The findings provided a solution to the first research objective of the study which aims to examine the strategies used in learning Science. The results revealed that teachers used a lot of activities in teaching Integrated Science lessons. The results further indicated the relevance of using activities in teaching could improve academic performance from low to average. This finding is intended with the constructivist theory which operates on the concept that students construct knowledge through hands-on activities, that are performed during the teaching and learning process. This could also be linked to the Vygotsky social-cultural theory which operates on the notion that learners acquire knowledge through interactions with colleagues and materials.

2. The findings further revealed that, despite the evidence that the majority of the pupils scored average scores in the BECE, the findings pointed out that the lowest proportion of pupils scored high grades in the BECE over the three-year period as compared to the high proportion of pupils who scored low in the examination. The findings here provided a solution to the second objective of the study, which aims to ascertain the current performance of pupils in Integrated Science. The findings revealed that the performance of students has moved from low to average status. This indicated a marginal improvement in teaching and learning of Integrated Science, which forms the central focus of the study.
3. The findings also showed that there was a positive and statistically significant relationship between the individual strategies for promoting science teaching such as regular supervision of science lessons, effective use of teaching and learning resources, teachers varying their teaching strategies, teachers' conducting learning activities as specified in the syllabus, and teacher specialization in teaching science on one hand and academic achievement on the other hand. The findings enabled the researcher to prove that individual strategies that are used in implementing the curriculum have an influence on academic performance. This is based on the findings that there was a positive significant relationship between individual strategies used in teaching Integrated Science and academic performance.

Conclusions

Based on the findings that the academic performance of pupils has elevated from low performance to average level require the need to put measures in place that will maintain the current level and improve performance in the subsequent years ahead. This is because science plays a major role in the development of every nation that is based on the knowledge acquired through the educational system. Which begins from the basic level to make room for learners to acquire the requisite scientific knowledge that is required for the development of every nation. The improvement in academic performance will also equip learners with the requisite scientific literacy needed to apply in solving real-life challenges that confront society on daily basis.

Therefore, it is pertinent that science teachers adopt effective strategies in teaching to maintain the level attained and help to improve upon it. It is also prudent that the strategies adopted by teachers are derived from the curriculum. Even though there was a little improvement, however, the BECE results from 2017 to 2019 showed that students were not performing as expected. This is problematic and likely to affect national development because science is at the heart of the development of every nation.

From the findings discussed so far, it can be concluded that the teaching and learning of the Integrated Science curriculum in basic schools have been evaluated thoroughly. This revealed that teachers perform activities as well as academic performance has elevated from low to average status. Therefore, it is evident that the effective use of activities improves academic performance.

Recommendations

The following recommendations are suggested based on the findings.

1. Based on the findings that science teachers rated highest on the activities used in promoting the teaching and learning of Integrated Science in the classroom, it is recommended that the Ghana Education Service in collaboration with Non-Governmental Organisations (NGOs) should partner with each other and supply basic schools the required teaching and learning resources that will support teaching through hands-on activities to promote easy transfer of knowledge in the classroom.
2. In line with the finding that the academic achievement of the pupils in science was average, with the highest proportion getting low scores. It is recommended that education stakeholders should put in place measures to support the schools and pupils in the learning of science through the provision of resources, posting of qualified teachers, and boosting the pupils' confidence in the learning of Science. To turn the table around from the majority getting low scores to the majority getting high scores
3. Consistent with the finding that there was a positive and statistically significant relationship between the strategies for promoting science learning and academic achievement, it is recommended that science symposiums should be organised for teachers on regular bases to train them on the need to integrate teaching strategies in teaching for ultimate academic achievement.

Suggestions for Further Research

It is suggested that this study is replicated in all districts in the Central Region of Ghana so as to design a region-wide programme to enhance the learning of Science in the region.

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APPENDIX A

Introductory Letter

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
FACULTY OF EDUCATIONAL FOUNDATIONS
DEPARTMENT OF BASIC EDUCATION

Telephone: +233-(0)3321 33379
Cables: University, Cape Coast
Email: [illegible]

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

Our Ref: DBE/32/V.3/73

Your Ref:

18th September, 2020

Dear Sir/Madam,

LETTER OF INTRODUCTION

The bearer of this letter Solomon Asare Bediako, is an M.Phil student at the Department of Basic Education, University of Cape Coast.

He is undertaking a study on **"Evaluating the (2012) integrated science curriculum of basic Schools in Abura Asebu Kwamankese District".**

In connection with this, he needs to collect data. The study is academic in purpose and data collected will be treated as confidential.

We would therefore be grateful if you could give him the necessary assistance.

Thank you.

Yours faithfully,

Dr. Mumuni Thompson
for: HEAD OF DEPARTMENT

DEPARTMENT OF BASIC EDUCATION
UNIVERSITY OF CAPE COAST
CAPE COAST

APPE NDIX B

QUESTIONNAIRE FOR TEACHERS

Item	Strongly Agree	Disagree	Neutral	Agree	Strongly Agree
Regular supervision of science lessons					
My supervisors such as the headteacher and the school improvement support officer regularly visit my classroom to supervise my science lessons.					
My supervisors discuss my performance in teaching science after carrying supervision in the classroom.					
My supervisors and I agree on what could be done to enhance the learning of science after post-lesson observations.					
Effective use of TLRs					
I prepare and use TLRs in relation to the concepts I teach in science.					
I use TLRs to explain concepts in science in my teaching activities.					
I use TLRs to make my science lessons practical.					
Teachers varying teaching strategies					
I use different strategies in teaching my science lessons.					
I use various strategies to help both slow and fast learners to understand science concepts.					
I adopt different teaching strategies to suit both males and females in my science lessons.					
Activities are carried out as in the syllabus					
My classroom activities are in line with those in the syllabus.					
Activities in my lessons are carefully selected from the syllabus activities.					
The syllabus determines my science activities in the classroom.					
Specialisation in teaching science					
I studied science as a major subject.					
Science falls within my major area of study.					
I studied science from pre-tertiary to the tertiary level of education.					

APPENDIX C

Ethical Clearance

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 0558093143 / 0508878309/ 0244207814
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OUR REF: UCC/IRB/A/2016/806
YOUR REF:
OMB NO: 0990-0279
IORG #: IORG0009096

17TH SEPTEMBER, 2020

Mr. Solomon Asare Bediako
Department of Business and Social Sciences Education
University of Cape Coast

Dear Mr. Bediako,

ETHICAL CLEARANCE – ID (UCCIRB/CES/2020/36)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Provisional Approval** for the implementation of your research protocol **Evaluating the (2012) Integrated Science Curriculum of Basic Schools in Abura Asebu Kwamankese District**. This approval is valid from 17th September, 2020 to 16th September, 2021. You may apply for a renewal subject to submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

Samuel Asiedu Owusu, PhD
UCCIRB Administrator

APPENDIX D

Letter of Confirmation on Proposal

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
FACULTY OF HUMANITIES & SOCIAL SCIENCES EDUCATION
DEPARTMENT OF BUSINESS & SOCIAL SCIENCES EDUCATION

Telephone: +233 03321 35411/ +233 03321 32480/3,
EXT. (268), Direct: 35411.
Telegrams & Cables: University, Cape Coast.
Email: dbase@ucc.edu.gh
Our Ref: DoBSSE/37/V.2/61
Your Ref:

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

DATE: 25th February, 2020

The Chairperson
Institutional Review Board
University of Cape Coast
Cape Coast

Dear Sir,

LETTER OF CONFIRMATION ON PROPOSAL

We write to you to formally bring to your notice that the Department is satisfied with the research proposal of Mr. Solomon Asare Bediako and has consequently given the said candidate the permission to apply for ethical clearance from IRB in order to enable him to undertake data collection.

We count on your usual cooperation.

Thank you.

Yours faithfully,

DR. JOSEPH TUFUOR KWARTENG
HEAD

APPENDIX E

UNIVERSITY OF CAPE COAST, INSTITUTIONAL REVIEW BOARD (UCC-IRB)

PART II: VOLUNTEER'S AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***(EVALUATING THE (2012) INTEGRATED SCIENCE CURRICULUM OF BASIC SCHOOLS IN ABURA ASEBU KWAMANKES DISTRICT)*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

Volunteer's Name: JOHN CALVERT ANDOH **Volunteer's Mark/Thumbprint............**

Date: 18/5/20

If volunteer cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

Witness's Name:................................... **Witness's Mark/Thumbprint: ....**

Date: ....

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

Researcher's Name: SOLOMON ASARE BEDIAKO **Researcher's Signature: ....**

Date: **18/5/20**

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UCC-IRB
VERSION: 2020

APPENDIX F

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Solomon Asare Bediako
Assignment title:	Sam Jonah Library (Research Commons)
Submission title:	EVALUATING THE TEACHING AND LEARNING OF INTEGRATED...
File name:	work.docx
File size:	1.6M
Page count:	114
Word count:	22,926
Character count:	132,876
Submission date:	01-Sep-2023 08:56AM (UTC+0000)
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UNIVERSITY OF CAPE COAST

EVALUATING THE TEACHING AND LEARNING OF INTEGRATED SCIENCE CURRICULUM IN BASIC SCHOOLS WITHIN THE ABURA ASEBU KWAMANKESE DISTRICT

SOLOMON ASARE BEDIAKO

2021

UNIVERSITY OF CAPE COAST

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EVALUATING THE TEACHING AND LEARNING OF INTEGRATED SCIENCE CURRICULUM IN BASIC SCHOOLS WITHIN THE ABURA ASEBU KWAMANKESE DISTRICT

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