UNIVERSITY OF EDUCATION, WINNEBA

PERCEPTIONS OF JUNIOR HIGH SCHOOL STUDENTS ON INTEGRATED SCIENCE TEACHERS' ATTITUDES AND COMPETENCIES IN USING LABORATORY RESOURCES: THE CASE OF GA EAST MUNICIPALITY

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A thesis in the Department of Integrated Science Education, Faculty of Science Education, submitted to the School of Graduate Studies, in partial fulfilment of the requirement for the award of the degree of Master of Philosophy (Science Education) in the University of Education, Winneba.

JANUARY, 2024

DECLARATION

STUDENT'S DECLARATION

I, Susanna Nuomeeno Amuh, declare that this thesis, except for quotations and references contained in published works that have all been identified and duly acknowledged, is entirely my original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE…………………………………………….

DATE…………………………………………………….

SUPERVISORS' DECLARATION

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

SUPERVISORS" NAME: DR. JAMES AZURE AWUNI

SIGNATURE…………………………………………….

DATE……………………………………………………

DEDICATION

This master thesis is dedicated to my religious family, the Handmaids of the Holy Child Jesus Province, and the dedicated staff of Ancilla Primary & J.H.S. Your endless sacrifices, unwavering support, and encouragement have been instrumental throughout my life and entire education journey. I am profoundly grateful for your guidance and inspiration.

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GLOSSARY/ABBREVIATION

COVID 19	Coronavirus Disease of 2019
MOE	Ministry of Education
JHS	Junior High School
SHS	Senior High School
SRC	Science Resource Centre
PMT	Performance Monitoring Test
SPAM	School Performance Appraisal Meeting
NACCA	National Council for Curriculum and Assessment
BECE	Basic Education Certificate Examination
CLT	Cognitive Load Theory
H_2O	Hydrogen Di-oxide
SSSCE	Senior Secondary School Certificate Examination
GCE "O"	General Certificate of Education – Ordinary Level
SPS	Science Process Skills
FGD	Focus Group Discussions
UEW	University of Education, Winneba
SPSS	Statistical Package for Social Sciences
TLM	Teaching and Learning Materials
NAFTI	National Films and Television Institute
L1	First Language/ Mother Tongue

ABSTRACT

This study, adopting a descriptive survey design, explores Junior High School students' perceptions of integrated science teachers' attitudes and competencies in utilizing laboratory resources for teaching. The study population encompasses three public basic schools in the Ga East District, randomly selected for data collection. Utilizing a proportional random sampling approach, 180 students were selected from all three schools to complete the structured questionnaire. Additionally, six focus groups were formed, with two sets in each school, each comprising eight students. The objectives include investigating students' perceptions of teachers' attitudes and competencies, as well as examining the effect of these factors on the use of laboratory resources in the teaching of integrated science and students' academic performance. Data analysis involved quantitative methods, using descriptive statistics, and qualitative methods, including verbatim analysis. The findings highlight generally positive student perceptions while identifying specific areas for improvement, such as teacher attendance during practical works and optimizing laboratory material usage. Recommendations involve enhancing resources, providing teacher training, and integrating technology into teaching practices. Future research could explore the development and implementation of targeted professional development programs for science teachers to enhance competencies in utilizing laboratory resources effectively.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This section of the research discusses the background to the study, statement of the problem, purpose of the study, objectives of the study, research question, and hypothesis, significance of the study, limitation and delimitation of the study.

1.1 Background to the Study

Education is the most salient foundations that form the social structure of every society (Stinchcombe, 2000). It is in this educational system that the younger ones are socialized in becoming better versions of themselves. Education is viewed as the manner through which people gain information, skills, and attitudes that allow them to fully develop their mental capacities (Baidoo-Anu & Mensah, 2018). Perception may be defined as a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment (Zhang, 2019). Perception is man's primary form of cognitive contact with the world around him. As all conceptual knowledge is based upon or derived from this primary form of awareness, the study of perception has always had a unique significance for philosophy and science. Among the merits of a good education is that it allows people to participate in the improvement of their own, their communities, and the nation's quality of life. Along with Kosgei et al., (2013), education is a fundamental human right that leads to understanding, riches, and power. It ought to be noted that in order for a person to attain this, the function of instructors cannot be discarded.

In recent times, science has become a vital contribution to determining a country's social and economic well-being. Science is extensively recognized as an essential component of every student's education. Science education heavily concentrates on the identification, growth, and application of abilities, procedures, and prowess for societal advancement. Science literacy helps pupils become scientifically informed and oriented. One of the impressive successes of science in recent times is seen in how the deadly diseases called Ebola and COVID-19, which nearly brought about human extinctions, have been managed and controlled, particularly in the endemic countries throughout the world. According to Onasanya and Mosewo (2011), science is the foundation upon which the bulk of present-day technological break-through is built. The assertion is undisputable because countries that are now considered superpowers, such as China, Russia, Germany, Japan, and the United States of America, owe their status to the substantial investments they have made in the sciences. Abbey et al., (2008); Davis (2010) and Adeyemo et al., (2014) opined that nations that want to advance in science and technology development for their societal growth needs to invest on resources that can enhance its effective teaching and learning in the various schools. That is why Ghana subscribes to the goal “science for all” (MoE, 2010). As a result, the Ministry of Education, Science and Sports (2007) and Ministry of Education, Science and Sports (2012) have introduced the integrated science as a compulsory subject to all Junior High Schools (JHS) and Senior High Schools (SHS) throughout Ghana. The Ministry of Education, Youth and Sports, (2004) aimed at equipping Ghanaian students with the necessary scientific skills. These educational reforms have resulted in the integration of some subjects, as well as the removal and addition of new subjects. Notable among them was the integrated science which was formally called General Science.

The subject Integrated Science refers to the approach or pedagogy that unveil the principles and concepts of science to convey the fundamental unity of scientific thought and processes in order to avoid undue stress on the distinctions between the various scientific fields. Integrated science is the combination of all the sciences such as physics, chemistry, biology, agriculture and geology that has to be learned as a single discipline (Leliveld 2002; Abbey et al., 2008). Studying all the various branches of science as a single discipline is unquestionable because it exposes the student to variety of skills and principles, which could be adopted in solving societal problems that could lead to growth and development (Abbey et al., 2008).

The present Ghanaian Junior High School integrated science curriculum is built on the conception of science as both product and process. As a process, science has to do with the skills that are called into play by scientists in carrying out scientific investigation. This implies adopting an enquiry method in the teaching of science at the JHS level. As a product, science is viewed as consisting of scientific facts, principles, laws and generalizations derived from scientific investigations. The new curriculum of integrated science in Ghana adopts a child-centred approach (Asano et al., 2021), that is, the teacher is supposed to provide guidance to the students who should participate actively in the teaching-learning process (Sholeh, 2020). The teacher is expected to provide conducive atmosphere for the children to observe, ask questions and be involved in problem-solving activities and open-ended field or laboratory exercises.

The goal of integrated science education in Ghana is to prepare students to acquire scientific skills and scientific principles and used what they have acquired in a logical and coherent manner to the benefit of their society (Ministry of Education, Science and Sports, 2007, Ministry of Education, Science and Sports, 2012). Critical analysis of the goals of integrated science suggests that students‟ poor performance in the subject would make the achievement of the goals difficult, which would eventually retard Ghana‟s growth and development.

The integrated science syllabus for the Junior High School and Senior High School was designed as a compulsory subject with the following aims: developing understanding of scientific concepts and principles, developing an appreciation for the application of science to life, thinking and acting scientifically and developing scientific attitudes towards life.

That is, integrated science teaching and learning at the basic and secondary school levels expose and equip students with vital knowledge. As students" progress through their educational journey, they move toward their areas of specialty, whether in science or humanities. To achieve the objectives of the integrated science curriculum, Leliveld (2002) said the Ministry of Education has set up 110 Science Resource Centres in all the districts in Ghana which are equipped with modern laboratory facilities. The centres serve as teaching centres and promote practical work among teachers and students. Other schools in the neighbourhood can access the facilities via the use of the SRC (Science Resource Centre) buses. This was done by the Education Ministry with the aim of equipping students with scientific skills and principles at their formative years of schooling so that as they branch towards non- science subject, they can make informed decisions and also solve their daily problems scientifically. Therefore, any obstacle that would impede the successful implementation of integrated science syllabus through its teaching and learning must be rooted out with all the seriousness that it deserves since that is the only way Ghana can derive her scientist (agronomists, chemists, doctors and astronaut) to mount the various sectors of the economy.

As Ghana continues to seek development, it pursues educational reforms aimed at empowering its citizens scientifically. Domestically, the Ministry of Education, Science, and Sports, along with the Ghana Education Service, has not relented in its efforts to provide textbooks to schools and strengthen the monitoring and supervision of teaching and learning in basic schools. Some of such measures are the provision of free exercise books and recommended textbooks for students and the introduction of Performance Monitoring Test (PMT) and School Performance Appraisal Meeting (SPAM) by the various communities and educational authorities (Mensah & Somuah, 2013).

The ability of teachers to teach fundamental science is a helpful factor in assessing the effectiveness of their classroom sessions. Their competence and expertise in handling the subject has an impact on the academic accomplishment of their students. As a result, enhancing teachers' competencies, including attempts to cultivate favourable attitudes, is an absolutely vital policy priority for strengthening the teachers and ensuring significant advancements in scientific educational quality. This explains why the teaching of integrated science and performance of students at the JHS level have been the concern of government and parents. Teachers are the instructors as well as controllers of learning experience; hence their attitudes and competencies can affect the students‟ interest and performance positively or negatively.

Many researchers have identified that the quality of science teaching and learning could be affected by many factors including content knowledge and pedagogical skills of the teacher due to poor teacher preparation, inadequate, and inappropriate instructional materials, medium of instruction, lack of effective supervision and monitoring at school, lack of motivation for teachers, and inadequate number of qualified teachers to fill empty classrooms, poor attitude, and interest of pupils among others (Anamuah-Mensah et al., 2009; Fredua-Kwarteng & Ahia, 2005; Ngman-wara, 2015; Parker, 2004; Hill et al., 2005).

According to Apelgren and Olsson (2010) having the best attitude for students' learning also involves the requirement for the instructor to maintain excellent interaction with all pupils. To be competent, teachers need to be efficient in designing, planning and implementing both practical as well as theory aspect. The teachers‟ ability and wisdom in handling learning activities will have a direct impact on students‟ active involvement in the teaching and learning activities. Again, the teachers‟ competency involving the efforts of fostering positive attitudes was a major agenda to strengthen the teaching profession and to ensure great development of the educational quality in integrated science (Jusuf et al., 2019).

According to Sambo et al*.,* (2014) and Sadikovna et al., (2020), positive attitudes towards science and scientific activities will exist through constant monitoring of experiments and continuous assessment of practical activities. The Ghana Association of Science Teachers (GAST) has also been holding annual and biennial conferences with her members in order to introduced and sensitized members to the rudiments in the teaching and learning of science, for societal transformation.

It is in line with these challenges that the study seeks to investigate junior high school students‟ perceptions on teachers‟ attitudes and competencies in teaching integrated science.

1.2 Statement of the Problem

Several studies (Dukmak 2015; Killen 1994; Suhaini et al., 2020 & Smithikrai et al., 2018) have been conducted to investigate factors influencing students‟ academic success. There is no doubt that one of the factors that determine students‟ successfulness in learning is influenced by the teacher. Research indicates that the teacher is a dominant key factor that optimizes educational progress and success of students (Hakim, 2015). It means that teacher‟s quality plays decisive roles in determining whether education succeed or not. Teacher‟s quality depends on teacher‟s knowledge about his field and its implementation in the classroom and how to transfer knowledge to students. The teacher not only transfers the knowledge to students but also becomes the educator that guides students to be competent, active, creative and independent by giving them good instruction.

In Ghana, NACCA regulates that, a teacher should have four competencies: professional, personality, pedagogical, and social competence. By having those competencies, it is hoped that it will lead to an increase in the quality of education. Among those competencies, pedagogical competency is important component to run teachers‟ work effectively. Fania (2022) found that by having pedagogical competence, it greatly influences students‟ interest in learning and culminate with increasing students‟ achievement. Pedagogical competence means teaching and learning management competency.

Zimmerman, Khoury, Vega, Gil, and Warheit (1995 in Thamrin, 2020) observed that students‟ learning motivation, endeavour, and performance depend much on students‟ belief on teacher‟s support, interest, and teacher‟s respect. Previous studies indicate that if the students have positive perception toward teachers‟ competence, they will have enthusiasm and focus in learning activities.

On the other hand, if the students have negative perception toward teachers‟ competence, they will not study seriously because they do not have interest, no motivation and losses teacher‟s role as role model. The worrying condition is that students will not respect their teacher. If this condition happens, it is impossible improving education quality and most of the students will fail in their study. There is a dearth of literature in Ghana concerning students‟ perception of their teachers‟

attitude towards teaching science and the pedagogical competence of their teachers in the classroom (Owusu-Fordjour, 2021).

Junior High school students‟ performance has been on the low ebb for quite the past four or five years in their BECE Chief Examiners‟ reports for 2018-2022. Studies on students‟ perceptions of their teachers‟ competencies and attitude towards teaching integrated science in Ghana is scarce. Hence there is need for this study to fill this gap.

1.3 Purpose of the Study

The purpose of the study was to investigate the perceptions of Junior High School students on integrated science teachers‟ attitudes and competencies in the use of laboratory resources for teaching of integrated science.

1.4 Objectives of the Study

The objectives of the study are to:

1. Find out the perceptions of junior high school students about teachers‟ attitudes towards the use of laboratory resources in the teaching of integrated science.
2. Examine the perceptions of junior high school students about teachers‟ competencies in the use of laboratory resources for teaching integrated science.
3. Examine the effects of teachers‟ attitudes and competencies on the use of laboratory resources for the teaching of integrated science on students‟ academic performance.

1.5 Research Questions

The research questions of the study include:

1. What is the perception of junior secondary school students about teachers‟ attitudes towards the use of laboratory resources for the teaching of integrated science?
2. What is the perception of junior secondary school students about teachers‟ competencies in the use of laboratory resources in teaching integrated science?
3. What are the effects of teachers‟ attitudes towards and competencies in the use of laboratory resources for teaching of integrated science on students‟ academic performance?

1.6 Significance of the Study

The study will contribute to the formation of knowledge of the perceptions of Junior High School students of their teachers' attitudes and competencies in basic science instruction. The research will offer data to teachers so that they may understand their students' perception regarding their attitudes and competencies in using laboratory resources and repair any bad impressions that have been produced. The study's findings will be useful to policymakers, particularly the Ministry of Education, in enacting creative policies that will promote scientific learning and teaching in junior high schools, as well as training teachers to increase their expertise and skills. The findings of the study are also expected to be useful to the Government of Ghana as they may support to implement the training programs to empower teaching and learning at various schools in the country.

1.7 Delimitation of the Study

This study was focused on JHS students" perception of their teachers" attitudes towards and competencies in using laboratory resources for teaching integrated science.

1.8 Limitations

The researcher had financial and time constrain which was a challenge that has potential to degrade the study's quality. The small sample size used also limits the application of the results to schools.

1.9 Organisation of the Study

This study is organized into five chapters. The introductory chapter presents the background, statement of the problem, and research questions as well as the objectives of the study. The chapter also outlines the significance of the study. The concluding part of the first chapter indicates how the entire study is organized. The second chapter is the review of relevant literature. It includes a review of the literature on the various topics and concepts related to the study. Chapter three explains the methodology taking into account the study profile, research design, sampling and research techniques, and data analysis. Chapter four covers data presentation and analysis consistent with the specific objectives of the study. Chapter five considers the summary, conclusions, and targeted recommendations of the study and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter focuses on the perceptions of Junior High School students on integrated science teachers" attitudes and competencies in using laboratory resources. It also discusses the theoretical and conceptual frameworks of the study.

2.1 Theoretical Framework

The theoretical framework is discussed under cognitive load theory and constructivist theory.

2.1.1 Cognitive load theory

Science curriculum is organized through scope and sequencing. Scope refers to the level and the arrangement of the curriculum elements that occur across subjects, while, sequence refers to the breaking down of the content and learning experiences into manageable steps to facilitate learning over a period of time. Scope and Sequence provides information for teachers about the literacy genres, numeracy opportunities and scientific knowledge. It is a major theory providing a framework for investigations into the kind and the amount of information that a student accommodates at a go.

To improve student performance, teachers need to understand the evidence base that informs and helps their practice. By using the scope and sequence organization it allows teachers to focus primarily on the intended curriculum, providing support for teachers on what to teach, how to teach it and how to assess it hence, allowing teachers to make the most of learning in the class. However, teachers are the key players in the education sector and it is critical that they play a central role in the curriculum reforming. Cognitive load theory (CLT) centralizes the characteristics of human cognitive architecture, and especially the limitations of working memory in time and capacity (Baddeley, 2002), as a prerequisite for the optimization of learning. Cognitive-load researchers focus on instructional methods that can be used to manage working memory load (i.e., cognitive load). Cognitive load has been conceptualized as a multidimensional construct consisting of three types of cognitive load (Takır, 2011) namely (1) intrinsic load that is imposed by the learning task itself, (2) extraneous load that is imposed by the design of the instruction, and (3) germane load that is related to the amount of cognitive resources that learners have available for learning. All three types of load have been proposed to be influenced by element interactivity (Takır, 2011); thus, the many separate parts of information needed to be integrated for learning to occur.

During learning, initially separate information elements are categorized, organized and chunked into schemata in long-term memory, which after construction can be treated as one information element in working memory (Winne, 2013). This process of learning is called schematization. It is a core mechanism underlying successful learning in cognitive load theory. When trying to successfully learn materials with high element interactivity, it is proposed that more mental effort needs to be invested by the learner than for materials with low element interactivity. Therefore, having a valid indication of cognitive load experienced/spent during a specific task or activity could provide crucial information on the development of a learning process and quality of an instruction.

Cognitive load theory is built upon two commonly accepted ideas. The first is that there is a limit period to how much new information the human brain can process at one time. The second is that there are no known limits to how much stored information can be processed at one time. The aim of cognitive load research is therefore to develop instructional techniques and recommendations that fit within the characteristics of working memory, in order to maximise learning. Cognitive load theory supports explicit models of instruction, because such models tend to accord with how human brains learn most effectively (Sweller, 2011). Explicit instruction involves teachers clearly showing students what to do and how to do it, rather than having students discover or construct information for them.

The question of how people learn best has been the subject of significant debate, which can be broadly divided into two approaches to teaching practice. On one side are those who believe that all people learn best when allowed to discover or construct some or all of the information themselves? On the other side are those who believe that learners do best when they are provided with explicit instructional guidance in which teachers clearly show students what to do and how to do it. There is some research to suggest that managing the cognitive load of learners through explicit instruction may also contribute to higher levels of motivation and engagement although further research is required in this field (Martin, 2014). In addition to supporting explicit modes of instruction, cognitive load theory also asserts that teaching domain-specific skills is more effective than teaching generic skills (Takır, 2011).

Cognitive load research demonstrates that the basic school science curriculum is the most effective when designed to fit within the known limits of working memory, and therefore strongly supports guided models of instruction. Cognitive load theory offers a range of evidence-backed recommendations for educational practice, especially for teaching novice learners in „technical" subjects such as mathematics, science and technology.

2.1.2 Constructivist theory

Constructivist theory describes learning as an active, continuous process in that leaners take information from the environment and construct personal interpretation and meaning based on the prior knowledge and experience (Amineh, 2015). According to constructivist theory, effective learning takes place when the learner makes meaning out of the required knowledge. For new knowledge to be understood and remembered, it must be meaningful to the leaner (Scott, 1998). That is meaningfulness of learning depends on the learners" success in finding or creating connection between the new information and the pre-existing knowledge (Amineh, 2015). Ranging from the individual-centred radical constructivist position (Sakpaku, 2016) to the group-centred social constructivist position. However, these theories share a common feature that is the learner occupying the central position in the sense making and in building meaningful knowledge schemata.

Taber (2012) has revealed that vital distinction exists between a constructivist theory of learning, adopted for teaching purposes in the education community, and the philosophically constructivist theory of scientific knowledge. The former relates to students" learning process, whilst the latter posits to „the laws of nature which was referred to as the social constructs–essentially the laws that scientists have agreed between themselves and do not have any fundamental significance" (Scerri, 2003). It is clear that one can believe that the learning process involves knowledge construction whilst simultaneously believing that scientifically accepted laws do have physical significance.

The ability to manage information and to reason analytically, both deductively and inductively are essential requirements for a successful learning of integrated science. Students are expected to absorb, assimilate and apply the knowledge they have acquired in the integrated science concept in problem solving (Davis, 2010). The teacher believed that if one learns fundamental principles and theories, one would be able to make applications as needed.

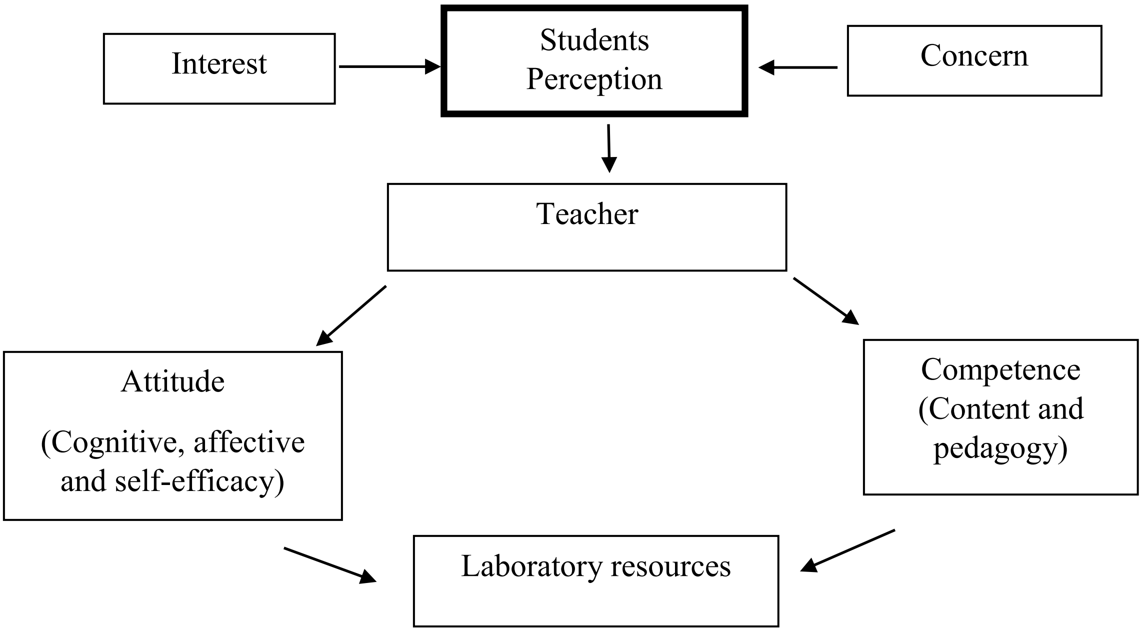
One approach used by science educators to address the challenges in science teaching and learning is co-operative learning cycle. The learning cycle teach science in phases that is (a) exploration, (b) term introduction and (c) concept application that are based on the way people spontaneously learn about the world (Sikkes, 2006). According to Doyle (2012), exploration allows students to investigate new materials and or ideas so that patterns of regularity can be discovered and questions are raised that students then attempt to answer. Term introduction allows the teacher to introduce terms, to label the patterns and explain the newly invented concepts. Concept application provokes students to seek the patterns elsewhere and to apply the new concepts to additional examples, often employing abstraction or generalization techniques.

Learning cycle is an effective means in teaching and learning processes that is, it encourages students to think creatively and critically, which facilitates better understanding of scientific concepts, developed positive attitude towards science, improved science process skills and cultivate advance-reasoning skills (Doyle, 2012). Science books are traditionally written contrary to the learning cycle approach that is term introduction precedes exploration of learning (Deliberto, 2014). Sakpaku (2016) is of the view that science textbooks are generally of low personal interest to students and have been shown to be used mainly as dictionary, to look up definitions that must be memorized for test. Research has shown that textbook content is organized in such a way that the task of reading and integrating the information are made unduly difficult, particularly for students with low reading skills (Lewis, 2008). Despite these problems, many teachers erroneously believe that textbooks are accurate and up to date, present interesting information, and facilitate learning.

Teachers who lack pedagogical content knowledge commonly paraphrases information in learners‟ textbooks or provide abstract explanations that are not meaningful to their students (Abdu-Raheem, 2015). Students with negative self-concept have poor academic performance (Ford, 1985). These are likely to result in the student having negative perception about the topic under consideration. This necessitated the current study since one cannot isolate teaching from learning. Nkpolu-Oroworukwo (2011) was of the view that traditional method of teaching science was dull, unimaginative and lacking in vigour. The integrated science teachers were believed to dispensed knowledge, while their learners also learnt mostly by rote memorization. In this view, students were regarded as passive learners. These phenomena in science teaching cannot stimulate the imaginative minds of students because they discourage and demotivate interest in science learning, which is crucial for scientific literacy that contributes to a country's economic development.

Furthermore, research conducted in Turkey High School, revealed that students' responses to open-ended questions and teachers' interviews in biology topics highlighted terminology, textbooks, teaching methods, curriculum, abstract and interdisciplinary nature of concepts among others were the sources of their difficulties (Metlí & Akıs, 2022). Owoyomi (2015) also said that many new terms and symbols used in physics and chemistry as compared to biology were some sources of the perceived difficulty in the integrated science. Again, Agyei and Agyei (2021) also said that students should not be forced to memorize these terms and symbols, but rather, the terms and symbols should be used in the students‟ everyday lives and even studied in other subject areas. In addition, Agyei and Agyei (2021) were of the view that this may be a source of misconceptions for students adding to the difficulty of the subject. Furthermore, the difficulty of the integrated science syllabus topics according to Adjei (2019) was the lack of appropriate and adequate teaching and learning resources such as science equipment and science workshops. These are the main challenges making the understanding of the integrated science syllabus topics very difficult for the students. Ikawati (2020) suggested that teaching and learning difficulties could be reduced by scaffolding. Scaffolding is a communication process where presentation and demonstration by the teacher is contextualized for the learner. The performance of the study is coached, articulated and elucidated by the learner as the teachers‟ support is gradually being removed. Ikawati (2020) observed that Scaffolding is therefore a temporary support made available for students‟ learning until the students can perform independently without the teachers‟ support. It is therefore temporary frameworks that enable learners to achieve higher learning skills (Swail, 2003). The integrated science teacher serves as the scaffolds in supporting the student during teaching and learning activities and simultaneously retreat their support while student continuous to work independently to achieve mastery.

2.2 Conceptual Framework



The conceptual framework suggests that the teacher‟s use of laboratory resources plays a pivotal role in shaping students' perceptions. The teacher's attitude and competence are key factors influencing how students perceive their ability to teach science effectively.

The inclusion of cognitive, affective, and self-efficacy components in the teacher's attitude suggests a recognition of the multifaceted nature of a teacher's approach to teaching. How a teacher thinks, feels, and believes about their teaching impact students‟ classroom behaviour.

The inclusion of both content and pedagogical competence emphasizes the significance of a teacher being knowledgeable in the subject matter and effectiveness in delivering that knowledge.

The focus on students' interest and perception indicates an awareness of the importance of student engagement and how their experiences in the classroom, influenced by the teacher and resources, shape their attitudes towards Integrated Science.

The presence of laboratory resources in the conceptual framework underscores their role in the teaching and learning process. The quality and availability of these resources can impact both teacher effectiveness and student perception.

The inclusion of "concern" as an outcome suggests that students may have worries or uncertainties related to the teacher's attitude, competence, or the adequacy of laboratory resources. This opens up avenues for exploring specific concerns students may have.

2.3 Teaching and Learning of Integrated Science

Modern life requires general scientific literacy for every Ghanaian citizen, a requirement that will result in the creation of a scientific culture in line with the country‟s strategic programme of achieving scientific and technological literacy in the shortest possible time. Scientific culture should therefore become the common property of every citizen of this country because it is the antithesis to superstition and the catalyst that will help us towards faster development. The fast advances in science and technology have influenced the rate of economic development of nations, improved the quality of life in most parts of the world, and provided solutions to some major problems and needs of society.

The most important aspects of the educational processes are the students and what they learn. Learning is about a change: the change brought about by developing a new skill, understanding scientific laws, and positive change in attitude. Learning is a relatively permanent change, usually brought about intentionally (Benitti, 2012). Other learning can take place without planning, for example by experience. Generally, with all learning there is an element within us of wishing to remember and understand why something happens.

So, for meaningful scientific education, it is important for pupils to be trained in the investigative process of seeking answers to problems, a requirement that enables pupils to physically explore and discover knowledge within their environment and in the laboratory to be able to contribute to new scientific principles and ideas to the body of knowledge already existing in their culture. To guarantee that the needed goals are achieved, the 2007 revised pre-tertiary curriculum puts greater emphasis on critical and scientific thinking as pre-conditions for developing the new type of Ghanaian who will become a problem solver and be able to function effectively in a society. The integrated science syllabus for JHS creates a conscious effort to raise the level of scientific literacy of all students and equip them with the relevant basic integrated scientific knowledge needed for their own survival and for the development of the country. It is also expected that scientific experiences in junior high school will cultivate in pupils an interest and love for science and its related courses. The study of science also provides excellent opportunities for the development of positive attitudes and values which comprise:

1. Curiosity to explore their environment and question what they find
2. Keenness to identify and answer questions through investigations
3. Creativity in suggesting new and relevant ways to solve problems
4. Open mindedness to accept all knowledge as tentative and to change their view if the evidence is convincing
5. Perseverance and patience in pursuing a problem until a satisfying solution is found

6. Concern for living things and awareness of the responsibility they have for the quality of the environment
7. Honesty, truthfulness and accuracy in recording, and reporting scientific information, love, respect and appreciation for nature and desire to conserve natural balance.

These are also the general aims of the JHS science syllabus and so, one must possess the required knowledge, skills, and attitude enshrined in the syllabus after learning in order to fit well in the technological society to solve societal problems and be self-reliant.

The course has been designed to offer a body of knowledge and skills to meet the requirement of everyday living, and provide adequate foundation for those who want to pursue further education and training in science and science related vocations. Specific issues covered are: Science for all students, science as an active inquiry process, science and the satisfaction of individual needs, science as a profession and science as a culture. As a result, at the end of the JHS education the pupils are expected to acquire the basic skills and attitudes needed, and hold right perception about science and technology. The acquisition of appropriate skills for self-reliant nation/self-reliance is an expression which has become conceptually and practically attractive, particularly in developing countries, wrestling with the economic forces of meeting numerous needs with limited resources (Matazu, 2010).

Research has shown that laboratory-based method, where processes of science were used, was an effective means of improving the achievement of students in science (Ampiah, 2004). It has been observed that when students engaged in the processes of science during teaching and learning, their level of achievement in it becomes higher.

The processes of science provide students with unique opportunities to study abstract concepts and generalisations through the medium of 'real' materials. This is because as students interact with learning materials, in addition with their teachers, classmates, and practice what scientists do, they gradually developed skills needed for future work in the sciences. Sakpaku (2016) revealed that in Barbados" lower secondary schools where concepts are presented in abstract with very little efforts made to present them to the students in a concrete way, learning became difficult. They said the use of models, can increased an easier understanding of abstract concepts. They further pointed out such concepts where models could be used are commonly found in physics and chemistry as compared to biology areas. In addition, they also said that the teaching strategies used in the science classes is also another area of concern to the perceived topics difficulty for students. According to them students refers to teachers" teaching strategies as „boring" because students are of the view that their teachers do very little to present the materials or topics to them in an interesting and relevant way. Further, Johnstone (1993) theorized that difficulties may be caused by complexity due to ideas and concepts existing at the three levels of learning. That is micro, macro and symbolic levels in the integrated science. He opined that these multi-level conceptual frameworks are more common in physics and chemistry topics than in biology. That is concepts at the micro and symbolic levels are very abstract, hence making it difficult for teachers to provide concrete experiences for the students to facilitate effective learning. The effectiveness of learning can be achieved if the teacher imparts the learner with the rightful knowledge or concept. Theories and concepts in teaching and learning of science such as constructivist theory; problem-based learning and contextual learning approaches in science (Davis, 2010) among others are useful in the teaching-learning process in junior high school.

2.4 Concept of Perception

According to Kagan (2011), perception is the process of interpreting the messages of our senses to provide order and meaning to the environment. Kumar (2010) explains the concept of perception from the perspective of philosophy, psychology, and the cognitive sciences that perception is the process of attaining awareness or understanding of sensory information. In this study, perception is the process of selection, organization, and interpretation of stimuli by someone to be the coherent and meaningful picture of the world.

2.4.1 The process of perception can build on the concern and interest about selection

Selection is the first stage in the process of perception, during which a person converts the environment stimuli into a meaningful experience. In daily life, people are constantly bombarded with such a large variety of information that, in a blink of a moment, they may encounter stimuli such as the words people are hearing, the selection, organization, and interpretation of information, the witness of an accident, the ticking of a clock, to name but a few. Since our world embraces everything, there are countless stimuli arriving at our sensory organs simultaneously and waiting to be processed. However, we cannot perceive all the information available to us, because in doing so we would experience information overload and disorder. Therefore, we perceive only part of the information from the environment through a selective process. In other words, when being surrounded by many competing stimuli, we only pay attention to those stimuli which we are familiar with or interested in through the selective process of perception (Qiong, 2017).

2.4.2 Organization

The second stage in the perception process is organization. After selecting information from the outside world, a person needs to organize it in some way by finding certain meaningful patterns. This organization stage is accomplished by putting things or people into categories. In this stage of perception, the social and physical events or objects we encounter will immediately have shape, colour, texture, and size (Qiong, 2017). The organization allows us to structure and give coherence to our general knowledge about people and the social world, providing typical patterns of behaviour and the range of likely variation between types of people and their characteristic actions and attributes. Perception at this stage enjoys two characteristics. First, the organizing process gives the human perception structure. People always put raw stimuli from the outside world into structured meaningful experiences. Second, the process shows that human perception possesses stability. So, after a person selects stimuli and put them into categories, the selected stimuli become durable (Qiong, 2017)

2.4.3 Interpretation

The third stage in perception is interpretation, which refers to the process of attaching meaning to the selected stimuli. Once the selected stimuli have been categorized into structured and stable patterns, people try to make sense of these patterns by assigning meanings to them. But different people may give different interpretations of the same stimulus. Such interpretation differences arise because "Culture provides us with a perceptual lens that greatly influences how we interpret and evaluate what we receive from the outside world" (Frantz, 2021). When confronting a physical object or event, almost everybody agrees on its objective part of the meaning, but what it means to any unique individual varies according to that individual"s past experiences and cultural background. Different experiences and backgrounds will result in people"s attributing different meanings to the same stimulus, so perception diversity appears. In the meaning-attribution process, people from close cultures will have similar stores of past experiences and knowledge, so they will probably attribute similar meanings to the same stimulus, thus similar perceptions. Then with these similar perceptions, it is easier for communicators to understand the accurate meaning of each other"s verbal and nonverbal behaviours, so communication goes smoothly (Qiong, 2017). Based on the perceptual process and all the factors that influence it, it appears that most attitudes, behaviours, and adjustments are determined by one"s perceptions. Perception itself is influenced by several factors both internal and external that make each individual perceives differently.

2.5 Students' Perception on Science Teachers and Teaching

Learners" views about the teacher"s skill will enlighten the teacher about the best ways students learn and will want to be taught. On this note, teachers" adherence to this demand could contribute substantially to effective teaching as well as make students disassociate themselves from negative attitude towards science. This shows that students" perception is one of the major integral phases in teaching and learning plans. It therefore calls for the science teachers to acquire an adequate knowledge of students" perceptions for teaching. The science teachers" knowledge of students" thoughts about their use of the various pedagogical skills during teaching may perhaps direct them to reflect on and adjust their skills in teaching (Benson et al., 2020). In recognition of the above statement, emphasis is now on how the students perceive the skills their teachers use in teaching science subjects (Biology, Agriculture, Chemistry and Physics) in junior high schools and how these skills influence attitude towards science.

Perception is a way an individual evaluates people with whom they are familiar with (Adediwura & Tayo, 2007). Perception is an experience that involves the organization of objects, events or relationship leading to the process by which we interpret our sensory input (Eka, 2014). Students" perception is thus described as students" thoughts, beliefs and feelings about persons, situation or events (Malik, 2021).

Adeyemo et al., (2014) also viewed learning environment and the availability of infrastructural facilities as a contributing factor to a positive learning outcome. He said students" perception of physics classroom environment affects the quality or learning effectiveness. He further argued that academic achievements of physics students depend on both the teachers and students" perception of physics classroom environment. Ogunkola and Samual (2011) opined that the only significant relationship observed is that of gender and study habits where it was observed that 45% of females had a high interest in science compared to 24.5 % males.

Johnstone (1993), commenting on the perceived difficulty of the subject indicated that this difficulty may be due to problems in perception and thinking of students. His analysis of the nature of perceived difficult topics led him to propose that this difficulty may be caused by complexity due to ideas and concepts existing at three different levels: macro and tangible, micro, and representational or symbolic. He uses the concept „water" to explain these levels. He said the concept could be taught at the macro level where students are able to observe the properties of water. It can also be taught at the micro level where, for example, students are taught that water consists of molecules of hydrogen and oxygen. At the representational level, these molecules can be represented as a symbol H_2O. These multiple ways of representing the same concept is common in secondary level science courses, especially chemistry and physics. Johnstone and Tan (2015) proposed that the interaction of these three levels may cause overworking memory hence causing difficulty in conceptualizing various areas in science. Although the spiral nature of the curriculum has allowed the gradual progress of learning concepts from concrete (macro level) to abstract (micro and representational), very often in science he suggested that teachers have to use all three levels in a single lesson.

Ogunkola and Samuel (2011) also point to misconceptions about science phenomena possessed by students as contributing to the difficulty of certain science topics. According to Taber (2012), misconceptions or alternative conceptions are ideas about a phenomenon that students bring to the classroom, which do not align with the scientific knowledge intended to be taught and learned. Such conceptions are often described as tenacious and resistant to change through conventional teaching strategies. Therefore, these misconceptions may, according to Siaw and Yeboah (2019) causes misunderstandings in certain science topics. This may especially be the case if the teaching strategies used by teachers are not adequate to allow for conceptual change. A related argument put forward by Siaw and Yeboah (2019) concerned the many terms and symbols used in the teaching of various science concepts. Many such terms are new to the students and so cannot be linked to their cognitive structures, which according to Siaw and Yeboah (2019) also causes information overload in the working memory. In addition, some terms are known by students, but in a different context and with a different meaning to that used in science. An example is the concept of „work". Confusion may result which adds to the perception of difficulty of the area of content. Key factors in facilitating an effective learning environment in the science class are the teaching strategies used by teachers. As early as 1910, John Dewey criticized science teaching of the day as giving too much emphasis to the accumulation of information rather than to an effective method of inquiry (Mensah, 2017). Unfortunately, this argument appears to be as relevant today as it was then. Many times, teachers use the excuse of overloaded science curricula to explain their reliance on strictly didactic methods of teaching. Though these claims may have some merit, the teaching strategies may in effect, portray the subject as difficult to many students. Siaw and Yeboah (2019) alluded to this when they identified the passive roles of students in the classroom and their perception of the teacher as the only source of knowledge, as contributing to the perceived difficulty of integrated science topics.

Maharaj-Sharma (2012) said there has been growing concern in Trinidad and Tobago about the declining number of students who opt to pursue science in secondary school. He said even though there is limited literature on the topic in the local context, several international researchers such as Jenkins; Murphy and Beggs, (as cited in Maharaj-Sharma, 2012) have pointed out that part of the reason for this is that children are "turned-off" by science at school when they are quite young. Hadden and Johnstone; Murphy, Ambusaidi, and Beggs; Schibeci (as cited in Maharaj-Sharma, 2012) agree that the waning of students‟ interest in science occurs between the ages of 9 and 14. During the last decade or so, the role of the primary school teacher in the delivery of science in the classroom has come into focus, Studies by Murphy, Beggs, Hickey, Meara, and Sweeney; Murphy, Neil, and Beggs (as cited in Maharaj-Sharma 2012) have criticized the level of the content covered in some areas of primary science, suggesting that it may be above the appropriate level of cognitive development for the students and therefore overly challenging. Ogunkola and Samuel (2011) studied about lower secondary school teachers‟ and students‟ perceptions of integrated science topics has revealed that, almost all the topics in chemistry were found to be difficult. Wood (cited in Davis, 2010) also studied students‟ and teachers‟

perceptions of SSS chemistry topics and found out that, students had difficulty in learning organic chemistry generally. Tajudeen (2005), in his study on students" perception of difficult topics in chemistry curriculum in Nigerian secondary schools found that students perceived 13 topics out of 20 major topics in the secondary school chemistry curriculum as difficult topics of which organic chemistry was part. Findings from his study revealed that chemistry students perceived more than half (65%) of the senior secondary chemistry topics as difficult to learn. Perhaps the low performance of chemistry students at the SSSCE level may not be surprising since they found most of the topic in the curriculum difficult to comprehend (Tajudeen, 2005).

Adebayo and Dorcas (2015) conducted research into the comparative analysis of students' scores in social studies and integrated science at the Junior Secondary School Certificate Examination in Edu Local Government Area of Kwara State, Nigeria. It was revealed that students" performance in Social Studies was slightly better than that of integrated science. The multiple comparisons showed that the scores of the students in social studies were significantly different between these years 2011, 2012 and 2013. However, there was no significant difference in the performance of students in integrated science between years 2012 and 2013.There existed significant differences in the performances of male and female students in both Social Studies and Integrated Science in 2011 with female students out performing their male counterparts. However, there are no significant differences in male and female students" performance in the two subjects during 2012 and 2013 academic years. In view of the students" performance in both social studies and integrated science which were credits (average), it was recommended that the teaching of both subjects which serves as basis for any career be improved, this could be achieved through the use of teachers who are specialists in the subjects (Adebayo

& Dorcas, 2015). Andor (2017)) explored students' perception of integrated science teaching in Nigeria and summarized students" perception under the following:

1. Students do not carry out suggested science activities in Integrated Science lessons.
2. The teacher teaches Integrated Science lesson without performing experiments.
3. Project work is not done in Integrated Science
4. Observing or measuring things, reporting activities, predicting the result of activities are not carried out in Integrated Science lesson.

This suggests that teachers do not vary their teaching methods from time to time. It may also be suggested that activities carried out are not stimulating enough. The key concepts in the process of science, i.e., observing things, reporting activities, measuring things were not adequately carried out.

2.6 Studies on the Influence of Students' Perception of Their Teachers' Attitudes and Competencies on the Use of Laboratory Resources

During the past decades, various researchers have been making the effort to look into learners" understanding of scientific concepts. "Much of this research concerns about learners" inability to understand scientific concepts or to develop conceptual understanding about mental models that are in accord with scientific or model of teaching.

Davis (2010) have shown that certain topics were perceived to be difficult by students in Nigeria and their perception of the topics showed a reasonable correlation with their performance in their examinations.

There are varieties of reasons why students, especially at the JHS level, may perceive integrated science as difficult in comparison to other subject areas. Findings by Davis (2010) have suggested that students" perceptions of the topics in the syllabus strongly reflected their actual performance on those topics as indicated by the grades obtained at the GCE „O" level examinations. This According to Ogunkola and Samual (2011) may be due to how the students perceive the subject based on their experiences or even from information about the subject from other persons.

They also suggested that most students generally found difficulty in physics and chemistry concepts such as components of the air, energy, physical and chemical changes. Whiles in the biology concepts such as healthy lifestyles, light, the eye, sound and air were found to be comparably easier. In their opinion, the focus group they interview supported their findings because the students generally thought that biology concepts were more interesting and easier to study than physics and chemistry concepts. They said students further pointed out those biology concepts were more realistic and relevant to them compared to many concepts in physics and chemistry, which tended to be very abstract. Ogunkola and Samuel (2011) studied that science teachers" and students perceived difficult topics in the integrated science curriculum. Their purpose was to identify integrated science concepts or topics that lower secondary school students and teachers perceived to be difficult. To find out if there is a significant difference between the teachers and students" perception; significant difference in students" perceptions of difficult topics based on their gender, interest in science, study habits and school location and to make suggestions that are potentially viable for improving the teaching and learning of integrated science.

2.7 Concept of Students' Attitudes in Learning Science

Attitude means the way an individual thinks or acts towards a given subject or issue (Ezeudu, Ezeudu & Sampson, 2016). According to Adediwura and Tayo (2007), attitude could be defined as a consistent tendency to react in a particular style often positively or negatively toward any matter. Attitude possesses both cognitive and emotional components. Based on these definitions, attitude could be described as an individual‟s reaction as a result of an evaluated behaviour, action or experience. It is a mental habit that explains how you perceive the world around you and spurs the action and behaviour you take in response. Attitude towards science is therefore a feeling, belief and values held about science. The feeling, belief and value one holds for an object will therefore either make one favour or disfavour the object. In other words, favouring or disfavouring an object is a step into an action and these actions are observable (Davis, 2010). Attitudes are important to educational psychology because they strongly influence social thought, the way an individual thinks about and process social information.

Ampofo and Fynn (2020) opined that positive teachers‟ attitudes are fundamental to effective teaching. The teacher must work students into such a state of interest about what the teacher is going to teach the students so that every other object of interest is banished from the student‟s mind. The teacher should also fill the students with devouring curiosity to know what the next steps in connection with the topic are.

Ampofo and Fynn (2020) identified a number of teachers‟ attitudes that will facilitate a caring and supportive classroom environment. They summarized them as enthusiasm, caring, being firm, democratic practices to promote students‟ responsibility, use of time for lesson effectively, free interaction with students and providing motivation for them.

Many researchers, psychologists and educators alike, have identified the variables that have effects on students‟ academic performances, which is an individual‟s inherent potentials in terms of intelligence combined with other sociological factors, Ojerinde (as cited in Davis, 2010). Anxiety, achievement, motivation and level of interest are some that affect academic performance. Wright (2009), claimed that student with high self-efficacy received higher grades than those with low self-efficacy and that student with negative self-concept have poor academic performance.

2.8 Attitudes of Students towards Using Laboratory Resources

According to Muhammad (2017) science educators have believed that the laboratory instruction is an important means of instruction in science since late 19th century. They further emphasized that laboratory instruction was considered essential because it provided training in observation, supplied detailed information, and arouse pupils‟ interest. To align with their summation, laboratory instruction can be considered as an essential tool to arouse young mind into the doing of science subjects. Adebisi (2015) commented that if science is to be learned effectively, it must be experienced and close to the students through practical activities.

Developing favourable attitudes towards science has often been listed as one of the importance goals of science teaching. Hofstein and Lunetta (2004) have suggested that the laboratory, as a unique social setting, has (when activities are organized effectively) great potential in enhancing social interactions that can contribute positively to developing attitudes and cognitive growth.

Attitude is an important concept in human behaviour and according to Ukenna and Ayodele (2019) the concept attitude has had more definitions than many other concepts in social psychology. It can be regarded as the description of how people think about other people, places, events, things or ideas (Wallace, 2004).

Psychologists view attitudes as having cognitive, behavioural and affective components. Your attitude toward something depends on what you think and feel about the thing as well as on how you act toward the thing based on your thoughts and feelings (Reed, 2002). Attitude according to Donadieu (2000) is one of the basic outlooks on how something is. He emphasized that there are two general distinctions for attitude; positive and negative. People with positive attitudes turn to be enthusiastic, cheerful, outgoing, exciting, worthwhile and enjoyable. Negative attitudes on the other hand deal with complains, often in angry manner, withdrawal, unhappy most of the time and do not seem to like other people. The implication is that teacher"s attitude towards the teaching of integrated science may be positive or negative (Wagler, 2010).

Glynn (2007) from their study have indicated that field experience is good to arouse and sustain students" interest in science lessons. Also Reed (2002) found out in the study conducted that teacher variable in the utilization of instruction is motivated and warmth is positively related with pupils" interest in science. Indirect teacher influence encourages students" participation in the classroom activities and increases freedom of action. One of the first and perhaps one of the most long-lasting impacts from international science education has been the child cantered approach resulting from a reaction to the mainly didactic, chalk to chalk approach previously accepted as the sole method of teaching science.

Child cantered approaches are operationalized as discovery learning. The activity method of teaching science at the basic levels seeks to forge linkage between existing ideas and new experiences, testing the formal against the evidence of these new experiences and situations (Anderson & Olsen, 2006). The central theme of this mode of learning according to Oppong and Tabi (2020) is that when a learner investigates with structured materials at his/her pace with no pre-defined goals, then the content learned becomes more meaningful. Bruner (1961) claims that, such learning procedure generate self-motivation and satisfaction, fosters deeper understanding of the content learned and aids children to develop their own strategies for the selection of the organization of information.

Teaching learning materials (resources) are the materials and equipment as well as the personnel that facilitate effective teaching and learning in the classroom. According to Donadieu (2000) the success of teaching and learning depends to a large extent on judicious use of resources. The limited use of resources in schools, particularly the scarcity of suitable teaching materials and inadequate accommodation, is a factor that can reduce the effectiveness of teaching in classrooms.

For Cotton (2000), teachers and students should make use of the science library which should be in the laboratory or at a convenient point of easy access from the laboratories. This enhances the teacher to have easy access to integrated science books and syllabus for reading, reference and preparation of lesson notes. Books that should be selected for science library should have good background information in science. Current instructional materials including textbooks, journals and supplementary readers need to be provided for effective science education. The integrated science textbooks should be made available in all basic schools for effective teaching and learning to help build a strong foundation for higher levels.

Laboratory work has been able to promote students‟ positive attitudes and enhance motivation for effective learning in science as described by Brobbey et al., (2022). Consequently, a positive attitude toward the importance of practical work meaningfully affects students‟ achievement in science (Shana & Abulibdeh, 2020).

Laboratory work has also been shown in some studies to help improve the communication skills of students in order to solve problems in science and thus become more motivated in science (Hodson, 2003). In addition to this, practical work encourages and increases students‟ interest in science and promotes it as an engaging subject. As an example, when students practice chemical reactions, they see that chemistry/science is an applied science and not just theories and rules. Laboratory work plays a significant role in science education (Hofstein & Lunetta, 2004).

In the educational process, laboratories can be used to develop scientific notations and create models to test hypotheses. Laboratory work also helps in understanding the difference between observation and presentation of data (Shana & Abulibdeh, 2020). In support of this fact, it is documented that "Laboratory activities appeal as a way of allowing students to learn with understanding and, at the same time, engage in a process of constructing knowledge by studying science" (Gordon, 2011). Laboratory experiments have vital importance in the study of all scientific subjects (chemistry, physics, and biology).

2.9 Attitudes of Teachers toward Basic School Syllabus

According to Rivkin, Hanushek and Kain‟s (2005) study on the professional experiences of teachers have a significant effect on the achievement of students. On student achievement, attitudes and behaviours of teachers are other criteria to think over. The values, attitudes and experiences of teachers affect the way they source or choose relevant techniques and instructional element of the teaching and learning process for a meaningful realization of specific educational objectives. Science education is concerned in producing a scientifically literate society by acquainting the students with certain basic knowledge, skills and attitudes. It has been said by one who has the gift of words that having the right attitude is far more important than knowing the right things. There is no novelty nowadays in suggesting that the study of science is largely an attitude of mind. Teaching is most likely to be successful when the subject is brought into the close contact with realities (Oppong & Tabi, 2020). Teachers should encourage and direct in their pupil"s sound attitude of enquiry and critical appraisal. Science as a discipline has been part of the educational system in Ghana since the introduction of formal education in the country. Attitude is a complex mental state involving beliefs, feelings, values and dispositions to act in certain ways. Ajzen (2005) states that attitude is the result of several beliefs a person holds that makes him or her respond in a preferential way towards an object or situation. Science is a process for producing knowledge. The process depends both on making careful observations of phenomena and on inventing theories for making sense out of those observations. The essence of science is validation by observation. But it is not enough for scientific theories to fit only the observation that are already known.

The aim of any educational institution is to produce students with the necessary skills, prerequisite knowledge and the relevant technology to understand and become useful to the community and contribute to the development of the community and the nation as a whole. It implies that quality education greatly depends on the kind of quality interaction the teacher has with each child in the class.

According to Edward (2013) the goal of all science education is to develop scientifically literate and personally concerned citizens who are able to think and act nationally. Thomas (2019) explains that, one of the prime objectives of science education is to help children develop concept and conceptional schemes that will help them understand and interpret their environment.

2.10 Attitudes of Teachers towards Students Learning In the Laboratory

It has been suggested that engaging learners in science laboratory activities or practical work promotes students‟ understanding of scientific concepts, problem solving abilities and attitudes towards science (Mandina, 2018). Laboratory work has the potential to engage students in authentic investigation in which they can identify the problem to be investigated, design procedures and draw conclusions. These activities can give students a sense as to how scientists go about their work, which in turn may influence their attitudes about scientific enterprise (Heap, 2014). For teachers who do conduct science laboratory activities with their students, similar to Tan (2008) arguments and observations, the laboratory activities are normally used to clarify and verify theories learned in classrooms. Students would follow instructions-like recipe cook books-to perform the experiments so that students are able to practice the standard laboratory procedures as well as complete their „experiments‟ as part of fulfilling the requirements of examinations. Lack of opportunities is given to students to do authentic scientific investigations. One of the possible reasons for such an implementation of a school science laboratory is based on teachers‟ epistemological views of science (Halim, Ahmad, Abdullah, & Meerah, 2012) in which their view on the purpose of laboratory work will shape and influence teachers‟ implementation of their laboratory lessons. Little research has focused on physical characteristics of the laboratory that might affect the science learning environment experienced by the students. As argued by Mark (2015) improvements in science teacher job satisfaction might lead to more effective science education. One of the sources of job satisfaction is infrastructure.

2.11 Competencies of Teachers towards Using Laboratory Resources

Teachers are the agents off curriculum implementation; hence their quality is crucial. However, the procedures put in place in the country to empower basic science education failed. According to Deakin (2008), competence is best described as a complex combination of knowledge, skills, understanding, values, attitudes and desire, which lead to effective embodied human action in the world, in a particular domain. According to Ofori-Appiah, (2015), the ability to plan, organise and conduct various investigations involving students is certainly one of the most important competencies.

Stoffelsma and Spooren (2019), explain that there is a high correlation between students" achievement in integrated science and factors such as teachers, students and the school environment. This raises a serious question about the quality of teaching of science especially in the Basic Schools which forms the foundation for the study of science in both Secondary and Tertiary Levels of Education. Research reveals that teachers have minimal participation with students, particularly JHS students, in their instructional hours (Boateng, 2014). This has, in many respects, decreased students" enthusiasm and dedication to study well, resulting in bad performance over time (Gafa & Asante, 2021). Taylor (2021) asserted that teachers are being inept at managing laboratory equipment and are incapable of conducting successful experiment. This is because of teachers" unpreparedness, along with their failure to arrange lessons and notes, affects their delivery and not allowing pupils to flourish. Science is taught in the laboratory by observation and a series of experiments without activities being carried out with students. Science teachers at the JHS level currently lack the competencies to teach using student-cantered approaches, which has a detrimental impact on students‟ passion for the subject. According to Antwi (2020), Ghana‟s science performance remains among the worst in Africa and the globe, notably in the Basic Education Certificate Examination.

Teachers‟ and students are perplexed when it came to practical aspect, this is because most primary and JHS lack laboratory facilities and also teachers‟ poor innovative skills for simple demonstrations to be carried out practically, thereby, making the lesson useless and not have any impact on students' behavioural change

Teachers‟ inability to handling practical work will have a direct impact on students‟ active involvement in practical work. Adequate and appropriate use of instructional material ensures effective teaching and learning of science and also, give students the chance to use their senses of hearing, smelling, tasting, seeing, and feeling (Quansah, Sakyi-Hagan & Essiam, 2019). If instructional materials are inadequate, students are made to read textbooks while the teachers explain the concepts to them instead of the students carrying out activities as suggested by the integrated science curriculum (Owusu-Fordjour, 2021). This deprives pupils of taking responsibility for their learning through active construction and reconstruction of their meanings for concepts and phenomena (Quansah, Sakyi-Hagan & Essiam, 2019) hence their performance as compared to pupils with adequate facilities. The benefits of the use of instructional materials in teaching and learning of science cannot be overemphasized. This is because as pupils become involved in science activities with the materials, they understand scientific concepts better and ultimately improve their performance.

Teacher competencies have an important effect on learning outcomes. Competent teachers will be able to create an effective and fun learning environment better and are better at managing their classes so that student learning outcomes can be optimized. In science learning, teachers have an important role in conveying the concepts which often require a complicated depiction process. Teacher professionalism described elements of knowledge involving subject matter content, teachers‟ ways of thinking on a discipline (Subandi et al., 2020). Teacher socialization skills describing its‟ practical knowledge, in which they find themselves (their class and subject domain) and the way they form theories about specific situations (Beijaard, Meijer, & Verloop, 2004), while other study revealed that it describes the kind of teacher behaviour that contribute on the performance of learning (Good & Nichols, 2001). In another study, Loughran (2014) presented a perspective on teaching pedagogy, emphasizing that the teacher's role should garner much more attention. According to Loughran, it is a crucial factor in the development of self-study movements, contributing to the substantial growth of studies. In Indonesia, teacher competence is regulated by the Teacher and Lecturer Law of 2005, which stipulates that teachers and lecturers must possess specific competency qualifications. These competencies encompass pedagogic, professional, social, and personal aspects. Teacher qualification is considered a requisite skill for effectively carrying out teaching duties, relying on specialized educational expertise.

However, results from researches on the teaching and learning of Integrated Science revealed that teachers lecture and give notes when teaching Integrated Science lesson (Andor, 2017), also, according to Somuoh (2013), teachers perceived some integrated science topics to be difficult.

Topics in integrated science that teachers perceived as difficult to teach include the following: basic electronics, chemical compound, electrical energy, acids, base and salt, respiratory system, technology and development, metals and non-metals, carbon cycle, fish culture, machinery and magnetism.

Meanwhile the Integrated Science Chief Examiners for Basic Education Certificate Examination (BECE) of West African Examination Council (Asare, 2019) revealed that emphasis should be laid on the teaching of items in Physics and Chemistry of the integrated science syllabus because students performed poorly in these areas. This clearly shows that students" poor performance in the subject was as a result of teachers perceived difficulty with physics and chemistry concepts of which basic electronics, chemical compound and electrical energy falls within according to the themes of the JHS (1-3) integrated science syllabus of the Ministry of Education, Science and Sports (Park, & Oliver, 2008). Therefore, teachers" perceptions of topic difficulty would have a negative effect on the student performance, because teachers would teach topics that they could effectively handle for students to understand and ignore the difficult ones.

Despite the various interventions from those concerned in education, the situation remains the same. It is indeed a tragedy that, the number of students (young people) who select science and science related subjects keep on decreasing day in day out (Turner, 2013). This is due to candidates" poor performance at the Basic Education Certificate Examination (BECE) which Dadzie and Annan-Brew (2023) attributed to poor teaching and learning in our High Schools. Jenkins and Pell; Osborne et al; and Schmidt (as cited in Ogunkola & Samuel, 2011) stated that studies worldwide have revealed that interest and attitudes in science has declined during students" secondary years. Kalolo (2014) also alluded to the fact that there has been a significant decline in interest in physics, chemistry and mathematics as student progress through secondary school. This highlights severe concerns regarding the standard of science education, particularly in junior high schools, which serve as the basis for science studies at the senior high school.

Teachers‟ competency level and attitudes in organising practical work are essential factors to be considered as they both influence the success of the implementation of practical work. However, as attitudes are generally considered within the scope of competency (Ofori-Appiah, Safo-Adu, Quansah, & Ngman-Wara, 2008), it is necessary to examine the competency level of science teachers and their attitudes towards practical work. Science teachers develop their own attitudes towards practical work, which reflect in their discourse with their students during practical work. The teacher‟s attitude towards practical work will also reflect in his or her use of equipment and materials, and the criteria to use in assessing practical work output of students (Abrahams, 2011). A study carried out by Bello (2015) on teachers‟ attitudes toward practical work indicated that Biology teachers had poor attitudes toward practical work.

2.12 Perception of Students towards Basic Science Teachers' Attitude and Competence in Teaching

Teachers‟ competence and attitudes toward organising practical work contribute significantly to students‟ academic performance. Teachers who have the requisite process skills and knowledge and have the right attitudes toward practical work are competent in organising practical lessons (Johns-Smith, 2023). This suggests that Biology teachers‟ competence and attitudes toward organising practical work cannot be undermined. Research also points to the inseparable and mutual supporting relation between knowledge and competence.

Teachers are the controllers of learning experience that goes on in the classroom. The teachers are the instructors of the students in the course of carrying out their duties. This depends on the professional training he or she acquired during his pre-service years. No adequate training at whatever level of education can take place without positive attitude and competence of the teacher that handles the programme. There have been low performances in integrated science all over the country (Akale & Mohammed, 2020). The major factor responsible for this could be incompetence of integrated science teachers, teachers‟ attitude to the subject and students‟ attitude to the subject.

According to Martin (2017), there are three dimensions under which a teacher‟s knowledge of subject matter can be assessed; namely content knowledge, pedagogical knowledge of content, and general knowledge. Subject knowledge of a teacher has a very important role to play because high quality teaching rests on teachers understanding of the subject they are teaching. The study did not find a significant correlation between the student‟s academic performance and teacher subject knowledge. However, it is suggested that there may be more that impacts students‟ performance than just teacher‟s subject knowledge. The teaching-learning process is always initiated by the teacher. In order words, teaching cannot exist in the absence of the teacher. Smith (2006) conducted a study on this and found that teacher absenteeism has a direct impact on student achievement. Franklin (2020) also conducted a study on absenteeism and found that students who recorded the lowest performances had teachers who recorded the highest levels of absenteeism. In consonance, Moloko and Mdhlalose (2021) also conducted a study that highlighted teachers‟ perception of the impact of class attendance on students‟ academic performance and reported that significant differences exist between class attendance and student performance.

2.13 Qualification and Leadership Style of Teachers

Leadership style is part of a person's characteristics to influence other people or organizations so that others are willing and able to move and emulate their attitudes and personal disposition towards achieving certain goals (Ali et al., 2021). In an experiment, democratic leadership was found to be the most effective styles of the three styles concerning the feeling of involvement, motivation, cooperation, and creativity. However, members in authoritarian groups are perceived as little creative, lots displeased and detached. Likewise, members of the laissez-faire group were found to be less productive by showing small cooperation and satisfaction (Rustin & Armstrong, 2012). It is clear that democratic leadership facilitates the growth of leaders and another personal potential, while discovered on the experiment. A sense of cultivation for the common interest and individual freedom to act according to one's direction is the essence of democratic leadership for what becomes human, (McClain, Ylimaki & Ford, 2010). Then, democratic leadership creates an atmosphere where persons are encouraged and supported in aspiration of fact by hearts open. Study from educational administration on democratic leadership school type often focus on how principals exhibit behaviour democratic; apply cooperative relationships, and collective decision-making within schools to increase school effectiveness while some studies emphasize the relationship between several administrative variables (Woods, 2004).

2.13.1 What are the qualities of a good science teacher?

Science teacher‟s qualities have the capability to boost students‟ interest, motivate them to learn, and magistrate all students with a fair judgement, with the use of holistic or analytic rubrics in their activities and outputs. They use numerous teaching procedures to meet learner"s learning objectives, and most importantly, apply constructivist philosophy where students are the centre of the instructional endeavour. Inspirational science teaching occurs when a teacher is not only enthusiastic about the science topic being taught, but also understands the topic fully in order to present it in a comprehensible and meaningful way to each learner. In this study, sciences teachers" qualities are categorised into three sub aspects include;

2.13.2 Professional knowledge

The professional knowledge is a level of confidence in teaching science and explores participants" confidence. As mentioned, professional knowledge of science teachers, discussed as an essential pre-condition for successful teaching, is therefore linked to the discussion about teachers" competencies in general and standards for teacher education in particular. Models of professional knowledge have been more or less explicitly included in all attempts to describe the quality of instruction. Therefore, the professional knowledge of teachers is more than fixed taxonomy of well-defined elements of knowledge clearly distinguishable and applicable to all possible situations in the classroom. But, not all knowledge of a teacher is unrestrictedly relevant for action because only some parts are applicable to regulating classroom teaching activities (Fischer & Tepner, 2012).

2.13.3 Professional practice

Teachers play an important role in shaping the future of individuals as well as of entire generations. Professional practice outlines the teachers" achievement for quality learning objective of science education. In order to attend to recognition of faculty members" teaching practice improvement needs, we must first problematize good teaching. They can also influence the economic dynamism of the country by imparting skills that translate into innovation and productivity in the workplace (Annan-Brew, & Arhin, 2022). Because of the current changing and challenging world, teachers should be provided with a range of skills, knowledge, attitudes and relevant educational experience that enable them to cope with the challenge.

2.13.4 Professional attribute

Teachers are seen as essential pillars of education. No matter how grandiose a school system and its curricula may be, the implementation of its programmes will be fruitless unless competent and effective teachers handle them. The professional attributes are those characteristics that enable teachers to embrace change to develop and improve teaching practice as well as sustain professional growth. According to Fehintola (2014), in a typical classroom setting, a professional teacher must demonstrate excellence attitudes in his teaching. It shows that teachers must put forth an attitude that will help to transform the learners' positively in the three domains of learning i.e., cognitive, affective and psychomotor areas. A professional teacher must demonstrate sound attitudes such as intelligence, neatness and desirable traits. Teacher professional development has influence on a lot of variables such as student motivation, teaching methodologies, communication skills, and organization of content and planning of lessons, students‟ participation during lessons, teacher confidence and knowledge of subject matter (Maende, 2012). Attitude is the way people reason or acts and most of the times can either make or mar an individual performance while carrying out their tasks and responsibilities.

In order to receive information from the environment we are equipped with sense organs e.g., eye, ear, and nose. Each sense organ is part of a sensory system, which receives sensory inputs and transmits sensory information to the brain. A particular problem that confronts psychologists is how to explain the process by which the physical energy received by sense organs forms the basis of perceptual experience. Sensory inputs are somehow converted into perceptions of desks and computers, flowers and buildings, cars and planes; into sights, sounds, smells, taste and touch experiences (Karanika, 2015). Student perception is an accepted means of reviewing teaching methods and developing effective teaching methodologies around the world. Therefore, student perception is used to identify which teaching strategies students perceive to be the most effective means to facilitate the learning in the classroom (Ampofo, 2020). They said students" feedback has been considered an effective methodology for modification of undergraduate curriculum and making pharmacology more interesting and practicable. They also revealed that several studies on students" perceptions regarding learning of pharmacology, documented students" improvements in performance through improved teaching and learning processes. Student feedback is thus considered an invaluable tool for improving students" performances when suggestions obtained from students are implemented. They further suggested that students" feedback help to provide several useful inputs for educational improvements. To which they said provide valuable inputs into the curriculum review processes, help in forming a learner-centred knowledge building process, improve on the implementation of recent teaching methods in pharmacology as well as enhance the quality of learning environment (Ampofo, 2020).

A person perception"s is their ability to notice and understand things that are not obvious to other people. Perception may be defined from physical, psychological and physiological perspectives. However, for the purpose of this study, it would be limited within the scope postulated by Ricciardi (2008), which is the way we judge or evaluate others. Meaning individuals evaluate people with whom they are familiar in everyday life. Khotimah (2021) gave cognitive dimension of perception; they see perception as the process by which people attach meaning to experiences. They explained that after people attend certain stimuli in their sensory memories, processing continues with perception. According to Davis (2010), perception is valuable because it influences the information that enters a working memory. Background knowledge in the form of schemas affects perception and subsequent learning. Aulls (2002) supported the idea that research findings corroborate the claim that background knowledge derived from experience significantly influences perception. Baron (2007) referred to this phenomenon as 'social perception,' which is the process through which we seek to understand other people.

Thus, perception in humans describes the process whereby sensory stimulation is translated into organized experience. That experience, or percept, is the joint product of the stimulation and of the process itself. Relations found between various types of stimulation (e.g., light waves and sound waves) and their associated percept suggests inferences that can be made about the properties of the perceptual process (Davis, 2010).

2.14 Studies on the Relationship between Teachers' and Students' Perception

The essence of science education is to have students construct a deep conceptual understanding of any scientific topic studied. This cannot be achieved if students do not acquire the skills that make possible the instruction especially cognitive, affective and psychomotor oriented learning. Science curriculum that emphasizes science process skills (SPS) would help students acquire and understand information, as well as improve skills in critical thinking and decision-making. Consequently, the SPS should be systematically taught to the students from as early as at primary school. To produce students who acquire the science process skills, the teacher should be competent in science process skills theoretically and practically (Hafizan, Halim &

Meerah, 2012). Based on this fact, teachers and students" orientation has to be changed to make the best use of skills embedded in any given scientific activities since they are closely associated with habit formation. These skills are related to a logical sequence and any omission of performance skills in a chain can be catastrophic to the development of essential abilities in real life situation (Akintola, & Adeyemo, 2022). Adarkwah, Zeyuan, Kwabena and Mensah-Abludo (2022) opined that teacher-student relationship in kindergarten predicted a number of academic and behavioural outcomes through the 8th grade, particularly for students with high level of behavioural problems.

However, teachers" perception on their level of understanding of the integrated SPS was found to be inconsistent with the actual level of understanding (conceptual knowledge). Teachers did not have sufficient conceptual knowledge of integrated SPS to teach their students to understand it in a meaningful way. Primary teachers" competency in the integrated SPS is good at the practical stage but not theoretically. Therefore, they suggested that emphasis should be given to integrate SPS both conceptual and operational knowledge in-service training to ensure the teachers understand, acquire and are able to implement the skills meaningfully for students understanding.

According to Adediwura and Tayo (2007), students" perception of teachers" knowledge of subject matter, attitudes to work and teaching skills is dependent on the fact that they have been taught by the teachers under evaluation and are familiar with them. They therefore, have minds already preoccupied with memories and reactions that inventory for data collection would measure. Perception may be energized by both the present and past experience, individual attitude at a particular moment, the physical state of the sense organ, the interest of the person, the level of attention, and the interpretation given to the perception.

Davis (2010) investigated the chemistry laboratory classroom environment, teacher–student interactions and student attitudes towards chemistry among gifted and non-gifted secondary-school students in Singapore. Lang et al., said this was the first study conducted in Singapore"s gifted chemistry classrooms, the findings of the study could provide useful information for the teaching of the gifted and about the psychosocial aspects of the chemistry laboratory learning environment for the gifted (Davis, 2010). Based on the students" perceptions, the findings related to the chemistry laboratory-learning environment and to teacher–student interactions are particularly useful to the administrators, teachers and other stakeholders. Similarly, it was theorized that teachers" perspective could help chemistry teachers to reflect on the various aspects of the chemistry laboratory, their interactions with students and their teaching approaches in the environment. For the students, it provided them with a better understanding of the students" perceptions and the ideal chemistry laboratory classroom learning environment and the teacher–student interactions that could help the gifted, as well as the non-gifted, to learn better in the future.

They also found out that associations between student attitudes and open-endedness suggested that it could be desirable for educators to consider creating a more open-ended learning environment for the teaching and learning of chemistry in secondary schools. A further implication would be that we might restructure our integrated science curriculum by adapting instruction to meet the learning needs of learners, incorporating more lively and practical approaches and infusing scientific inquiry, creative and critical thinking skills into both the theoretical and the laboratory work (Davis, 2010).

Davis (2010) opined that open-endedness and material environment were significant predictors of gifted students" attitudes to chemistry. Open-endedness could be beneficial in establishing a unique and an enjoyable learning environment for the gifted. The first practical implication of this finding is that teachers might attempt to adopt more open-ended approaches in their teaching and improve the quality of the material environment in the chemistry laboratory in order to meet the learning needs of gifted students. The teachers concerned ideally would establish an intellectually-stimulating environment and design an appropriate chemistry curriculum for the gifted. Students could be asked to and expected to be thinking critically and creatively across all curriculum areas. Further, teachers might use a variety of resources and materials to create divergent learning tasks or situations. Since the findings revealed that the open-endedness positively correlated with students integrated science-related attitudes, the use of such divergent approaches to teach the gifted is likely to help them do better in the future. It also showed that the interpersonal behaviour of teachers had an impact on the students" attitudes towards integrated science.

This highlights severe concerns regarding the standard of science education, particularly in junior high schools, which serve as the basis for science studies at senior high school.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

This chapter of the study involve the research design, population, accessible population, and sample and sampling technique; the research instruments that were used to collect data are also discussed. The chapter again provides information about the validity and reliability of the instruments, data collection procedure, data analysis techniques and ethical issues.

3.1 Research Design

Research design is a scheme, outline, or plan that is used to generate answers to research problems (Essel, 2015). It constitutes the blue print of a detailed documentation of the plan for the collection, measurement, and analysis of data (Saunders, Lewis & Thornhill, 2003).

A descriptive survey research design was employed in the study. Descriptive research is a study to determine the nature of a situation as it exists at the time of the study (Abdulai & Owusu-Ansah, 2014). According to Mason, (2010), a descriptive survey research attempts to determine the incident, distribution and interpretation among sociological and psychological variables. In this study, the descriptive survey method (using structured questionnaires and Focus Group Discussions) was considered appropriate to determine J.H.S Students" perceptions on integrated science teachers" attitudes and competencies in using laboratory resources in the Ga-East Municipality of Greater Accra Region.

By incorporating both quantitative data from structured questionnaires and qualitative insights from FGDs with thematic exploration, the research design aimed to provide a holistic understanding of students' perceptions and experiences regarding their Integrated Science education.

3.2 Population

In survey design research, where information is collected from a large and dispersed group of people, the concepts of the population and the sample are very important. By population is meant the target group or the group which is of interest to the researcher (Creswell, 2011).

3.2.1 Target Population

The target population defines those units for which the findings of the study are meant to generalize (Lavrakas et al., 2022). The target population of the study was Junior High School (J.H.S) students in the Ga-East Municipality of Greater Accra Region.

3.2.2 Accessible population

The accessible population defines the portion of the population to which the researcher has reasonable access (Lavrakas et al., 2r4022). Therefore, the accessible population of the study was all third-year J.H.S students of the Ga-East Municipality in the Greater Accra region for 2023/2024 academic year.

3.3 Sample and Sampling Technique

A sample is the group of individuals, who are selected from within a larger population by means of a sampling procedure. The sample represents the subjects the researcher would want to deal with because they bear the same characteristics as the target population. The sample size allocation for each school was determined based on a proportional random sampling approach. This method was chosen to ensure that the selected sample of Junior High School (J.H.S) students accurately represented the distribution of students across the three selected schools within the Ga East Municipality.

To determine the sample size allocation for each school, the following steps were undertaken:

1. Total Student Population: The study obtained the actual number of third-year students in each of the selected schools.

- School A: 154 students
- School B: 194 students
- School C: 186 students

The total population of the three schools was 534 students.

2. Proportional Sample Size Calculation: The sample size for each school was calculated proportionately to its total population, ensuring that each school had an equal opportunity to contribute to the study. This approach maintains fairness and representation across all schools within the municipality.

Table 1 Selection of Students Sample According to Proportions

Name of school	Population	Sample size formula	Sample size
A	154	(154 / 534) * 180	52
B	194	(194 / 534) * 180	65
C	186	(186 / 534) * 180	63
Total	534		180

This calculation resulted in a total sample size of 180 students across the three schools. By employing a proportional sampling technique, the study aimed to mitigate bias and ensure that the sample accurately reflected the diversity and distribution of students within the target population. This approach enhances the validity and generalizability of the study findings

3.3.1 Random selection

To ensure unbiased selection of participants, a random selection process was implemented within each school, guaranteeing that each student had an equal opportunity to be included in the study.

Within each school, a simple random technique using "YES" and "NO" was employed. For instance, in School A, which has a total of 154 students, 52 "YES" and 102 "NO" pieces of paper were prepared. Similarly, in School B, 65 "YES" and 129 "NO" pieces of paper were used out of the total 194 students, and in School C, 63 "YES" and 123 "NO" pieces of paper were prepared from a total of 186 students.

Subsequently, the "YES" and "NO" papers were placed in a box, thoroughly shuffled, and students were asked to draw one piece of paper each. Students who drew "YES" papers were selected to participate in the study. This process ensured randomness and eliminated potential biases in participant selection.

The total sample size of 180 students, as indicated in Table 1, was achieved through this random selection process across the three schools.

In conclusion, the utilization of a proportional random sampling technique facilitated the selection of a representative sample of 180 students from the three selected schools in the Ga East Municipality. This methodological approach allowed for the collection of diverse perspectives, thereby enabling a comprehensive exploration of

Junior High School students' perceptions regarding their Integrated Science teachers' attitudes and competencies in using laboratory resources for teaching.

3.4 Research Instruments

The research instruments employed in this study included a structured questionnaire and focus group discussions (FGDs) schedule.

3.4.1 Structured questionnaire

A structured questionnaire served as one of the primary instruments for data collection. This questionnaire was administered to a total of one hundred and eighty (180) Junior High School (J.H.S 3) students selected through proportional sampling. The use of a structured questionnaire offered several advantages in this research context.

Questionnaire Structure

The questionnaire consisted of three distinct parts:

Part A: Personal Data - This section collected demographic information about the participants, such as age and gender.

Part B: Attitudes and Perceptions - Part B comprised seventeen (17) items designed to assess J.H.S students' perceptions regarding Integrated Science teachers' attitudes and competencies in using laboratory resources for teaching.

Part C: Competencies Assessment - Part C consisted of seventeen (17) items aimed at evaluating the competencies of Integrated Science teachers in utilizing laboratory resources for teaching.

3.4.2 Focus Group Discussions Schedule

In addition to the structured questionnaire, qualitative insights were gathered through focus group discussions (FGDs). The FGDs were conducted on three themes;

a. Teachers and the usage of TLM"s during lessons.

b. Laboratory experiment conduction to complement theoretical lessons.

c. Educational Field Trips

A selected group of participants within those who were picked for the questionnaire were engaged. There were six focused groups in all, two sets in each school comprising eight students in a group. The same 'YES and NO' sample random technique was employed to delve deeper into their perspectives and experiences related to the research topic. In the first school, the two focus groups were labelled A and B. In the second school, the focus groups were labelled C and D. And in the third school, the focus groups were labelled E and F resulting in six focused groups in total.

The inclusion of both structured questionnaires and FGDs allowed for a comprehensive exploration of J.H.S students' perceptions and experiences concerning Integrated Science education, encompassing both quantitative and qualitative dimensions.

3.5 Validity of the Instruments

Prior to using the instruments, their validity was accessed to determine their accuracy and consistency. Validity is concerned with whether the findings are really about what they appear to be (Winter, 2000). According to Treagust, Won and Duit (2014), validity is based on the view that a particular instrument measures what it purports. The instrument were face and content validated by my supervisor and some colleagues. The questionnaires consisted of thirty-four (34) items which was taken to the researcher‟s supervisors at the university to vet them, so as to determine how effective it is to in measuring what it is designed for.

3.6 Pilot Test

Prior to administering the questionnaires to the participants in the main study, a pilot test was conducted to assess the reliability of the instrument. The pilot test aimed to identify and address any potential issues with the questionnaire design, clarity of instructions, and response format, ensuring that the instrument was valid and reliable for use in the study.

The pilot test was conducted at a school that was not part of the main study, using a sample of third-year students as participants. A total of 18 participants took part in the pilot test. Following the distribution of the questionnaires, the data collected was analyzed using statistical software, specifically SPSS version 25, to calculate the reliability coefficient.

The results of the pilot test provided valuable insights into the internal consistency of the questionnaire items, enabling adjustments to be made to improve the reliability of the instrument. Based on the findings of the pilot test, modifications were made to clarify ambiguous questions, refine response options, and ensure the overall coherence of the questionnaire.

By conducting a pilot test, the study ensured that the questionnaire used in the main study was robust and reliable, enhancing the validity of the data collected and ultimately contributing to the overall quality of the research findings.

3.7 Reliability of the Instrument

Reliability, as defined by Carmines and Zeller (1979), is the extent to which a measurement of a phenomenon yields stable and consistent results, emphasizing the importance of consistent outcomes. Testing for reliability is a critical step in research, ensuring consistency across different parts of a measuring instrument (Huck, 2007). Creswell (2014) asserts that the goal of good research is to have measures that are reliable.

For the assessment of reliability in this study, the Cronbach Alpha coefficient, widely recognized as the most appropriate measure of internal consistency (Whitley, 2002; Robinson, 2009), was employed. This coefficient gauges the consistency of responses across items within the questionnaire, providing a robust measure of the reliability of the instruments used.

The reliability of the instrument measuring students' perception of teachers' attitude in using laboratory resources was evaluated using the Cronbach's Alpha coefficient. The obtained coefficient, 0.70, aligns with the range of acceptable internal consistency as suggested by Bhandari et al., (2020). This indicates a satisfactory level of internal consistency, suggesting that the items within the questionnaire consistently measure the intended construct, ensuring stability and reliability in capturing students' perspectives on their teachers' attitudes in utilizing laboratory resources.

Similarly, the reliability of the instrument assessing students' perception of their teachers' competencies in using laboratory resources for teaching was determined using the Cronbach's Alpha coefficient. The resulting coefficient, 0.74, also falls within the range of acceptable internal consistency as recommended by Bhandari (2020). This reinforces the reliability of the questionnaire, affirming that the items consistently measure the intended construct. These reliability assessments underscore the dependability of the instruments in gathering accurate and stable data for the study.

3.8 Data Collection Procedure

The researcher visited the sampled schools with an introductory letter from the Head of Department of UEW to seek permission of the school"s administration to carry out the collection of data on the research work. After a brief consultation with the various school administrators, dates were agreed upon and students were informed. On the said dates, the administration and collection of the questionnaire were carried out by the researcher with the assistance of some assigned teachers. Respondents were educated on how to respond to the questions. This procedure resulted in a return rate of 100%. After sorting out the scores, the data were analyzed based on the objectives of the study using Statistical Package for the Social Sciences (SPSS) version 25.

Also, a focus group discussion was held with students on the day of the questionnaire administration. Permission was obtained from students to record what was discussed. During the focused group discussion, a set of questions were asked, not in any order, also anyone could respond and at the end, all agreed to an answer. The researcher also paid close attention to respondents" body clues and facial expressions.

3.9 Data Analysis

The data was analyzed using the research questions as a guide. The data were organized and then coded with various numbers assigned to each distinctive variable. After coding, imputes were made to the coded data using Statistical Package for Social Sciences (SPSS) version 25 for analysis. Qualitative data (focus groups data) was analyzed verbatim as was recorded and further discussed.

3.10 Ethical Consideration

In order to gain access to both teachers in the selected schools, permission was obtained from various schools" heads. In this regard, a letter was written explaining the purpose of the study and why the data was needed for the research. Permission was subsequently granted for data to be collected. Before the questionnaires were administered, the researcher further explained the purpose of the study to the respondents, and assured them of anonymity and confidentiality of information that was given. This gave respondents the confidence to freely and honestly respond to the instruments.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

This chapter presents the findings of this study based on the data collected from the pupils in relation to the objectives of the study. The chapter is in two parts. The first part presents the results on the demographic characteristics of the respondents followed by its discussion. The second aspect of the chapter focuses on the discussion of the main data to address the research questions. The discussions are presented with headings reflecting the research questions being addressed. Thus, the second part considers students attitudes and competencies towards the use of laboratory resources for teaching of integrated science.

4.1 Demographic Characteristics of Respondents

The demographic variables of the participants were collected and analyzed, as presented below. The study involved three Junior High Schools (JHS) in the Ga East Municipal area of the Greater Accra region in Ghana. The sample included 52 students from the first school, with 33 girls and 19 boys. In the second school, 65 students were sampled, comprising 29 girls and 36 boys. For the last school, 63 students were sampled, with 33 girls and 30 boys. The total number of students sampled for the study was 180 participants, with 95 girls and 85 boys.

The ages of the participants ranged from 15 to 17 years.

4.2 Research Question One

What is the perception of junior secondary school students about teachers' attitudes towards the use of laboratory resources for the teaching of integrated science?

This question sought to find out the perception of students about teachers‟ attitude towards the use of laboratory resources for integrated science teaching in some selected schools in Ga East municipal in greater Accra region of Ghana. The information regarding students' responses is provided in Table 2.

Table 2: Attitudes of Teachers towards the use of Laboratory Resources

s/n	Attitude questions	Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Mean	Standard deviation
1	Integrated science teachers allow active participation of students in their laboratory lessons.	5 (2.80%)	7 (3.90%)	4 (2.20%)	47 (26.10%)	117 (65.00%)	4.47	0.929
2	Integrated science teachers are friendly to us in the laboratory.	11 (6.10%)	9 (5.00%)	4 (2.20%)	91 (50.60%)	65 (36.10%)	4.06	1.066
3	Integrated science teachers allow us to ask questions in the laboratory.	4 (2.20%)	1 (0.60%)	4 (2.20%)	48 (26.70%)	123 (68.30%)	4.58	0.767
4	Integrated science teachers encourage us in experiments during their practical work.	5 (2.80%)	6 (3.30%)	12 (6.70%)	62 (34.40%)	95 (52.80%)	4.31	0.941
5	Integrated science teachers attend their laboratory lessons regularly and promptly.	9 (5.00%)	13 (7.20%)	27 (15.00%)	68 (37.80%)	63 (35.00%)	3.91	1.112
6	Integrated science teachers missed their lessons often when they are to engage us in practical works.	49 (27.20%)	53 (29.40%)	20 (11.10%)	37 (20.60%)	21 (11.70%)	2.60	1.381
7	Integrated science teachers give us assignment to do using laboratory materials.	37 (20.60%)	53 (29.40%)	12 (6.70%)	42 (23.30%)	36 (20.00%)	2.93	1.469

8	Integrated science teachers assist us in the classroom to use laboratory equipment.	20 (11.10%)	40 (22.20%)	13 (7.20%)	60 (33.30%)	47 (26.10%)	3.41	1.373
9	Integrated science teachers are generally harsh when students fail to use a particular laboratory material.	23 (12.80%)	23 (12.80%)	20 (11.00%)	66 (36.70%)	48 (26.70%)	2.74	1.317
10	Integrated science teachers usually help us to solve our problems in the laboratory.	8 (4.40%)	18 (10.00%)	27 (15.00%)	75 (41.70%)	52 (28.90%)	3.77	1.206
11	Integrated science teachers usually come late to the class when they have practical work with us.	2 (1.10%)	2 (1.10%)	9 (5.00%)	46 (25.60%)	121 (67.20%)	2.32	1.290
12	Integrated science teachers interact with us in helping us to use particular laboratory materials.	56 (31.10%)	29 (16.10%)	24 (13.30%)	46 (25.60%)	25 (13.90%)	3.81	1.417
13	Integrated science teachers are friendly towards us during laboratory sessions.	25 (13.90%)	34 (18.90%)	28 (15.50%)	52 (28.90%)	41 (22.80%)	4.06	1.045
14	Integrated science teachers do not allow us interact freely during their laboratory lessons.	14 (7.80%)	9 (5.00%)	23 (12.80%)	84 (46.60%)	50 (27.80%)	4.41	1.023
15	Integrated science teachers usually mark the students‟ exercise books during the lesson.	7 (3.90%)	16 (8.90%)	22 (12.60%)	53 (29.40%)	82 (45.20%)	2.92	1.460
16	Integrated science teachers usually check the students‟ practical notebooks during their lesson.	18 (10.00%)	32 (17.80%)	31 (17.20%)	61 (33.90%)	38 (21.10%)	4.18	0.910
17	Integrated science teachers usually discipline students for making mistakes with laboratory tools.	6 (3.30%)	14 (7.80%)	6 (3.30%)	40 (22.20%)	114 (63.30%)	3.44	1.338

From Table 2, a significant majority (91.10%) of students have strongly indicated agreement that integrated science teachers allow them active participation in activities, with a mean of 4.47 and a standard deviation of 0.929. The mean score indicates a generally positive perception, suggesting that students' active participation during science lessons aligns with their learning preferences. This claim may be valid given how students willingly participated in class activities without being compelled to do so.

Students' positive attitudes towards the use of laboratory resources might be facilitated by the friendly approach of integrated science teachers in utilizing laboratory instruments. Approximately 87.00% of students, with a mean score of 4.06, suggest a positive perception that their teachers are friendly towards them in the laboratory; although it shows a relatively lower agreement compared to the first question. Students indicated that laboratory work makes the learning experience easier. Learning, by its nature, becomes uncomfortable when students find it challenging. However, students are more willing to engage in practical activities when the difficulty in learning is reduced. Therefore, it is not surprising that there was the high congruence in the response, indicating that laboratory activities make the learning experience easier.

Again, majority (95.00%) of students had the perception that integrated science teachers allows them to clarify their views about questions that were unclear to them. This implies that the product or outcome of classroom activities is achieved without much stress on students as each student can find out anything he/she deemed difficult to understand in the learning situation. Also, the mean score of 4.583 suggests a positive perception about their teacher-student interaction in the laboratory.

The majority of students (52.80%) perceive that integrated science teachers actively encourage them in experimental work during laboratory lessons. This observation aligns with the principles of positive teacher-student engagement emphasized (Felder & Brent, 2006). According to their research, students often find complex topics challenging and may need support and encouragement from teachers and peers to comprehend these subjects and progress effectively.

Breaking down the responses (item 4), 34.40% of students agreed, 52.80% strongly agreed, 6.70% remained neutral, and only 2.80% and 3.30% disagreed or strongly disagreed, respectively, with the statement regarding encouragement in experimental work. The high percentage of students expressing agreement highlights the positive learning environment fostered by integrated science teachers. Despite the inherent difficulty in learning complex topics, the mean score (4.31) obtained in the study reflects a positive perception among students. This suggests that students are resilient in their learning efforts, particularly when they perceive that they can receive help and encouragement from their teachers. The positive environment created by integrated science teachers contributes to a mindset where students are less likely to give up easily on learning when faced with challenging concepts.

Felder and Brent's work highlights the significance of teacher support and positive reinforcement in overcoming learning challenges. In this context, the encouragement provided by integrated science teachers in experiments during practical work not only aligns with these principles but also contributes to a more favorable learning environment. This positive interaction can play a pivotal role in students' willingness to persist in their learning endeavors, even when faced with complex subject matter.

It was realized that, approximately 73.00% of students agree that their teachers attend laboratory lessons regularly and promptly. The mean score of 3.91 and a standard deviation of 1.112 suggests a positive attitude, but there is a relatively lower level of agreement compared to some other items.

A considerable proportion of students (32.30%) perceive that their teacher often missed lessons during practical works. The mean score of 2.60 indicates undecided, highlighting a potential area of concern. It is noteworthy that the respondents show a high level of agreement on the homogeneity of their responses, as reflected in the very low standard deviation of 1.381. However, a majority (56.60%) of students perceived that their science teachers do not miss practical lessons suggesting a consistent perspective among the respondents.

In light of the findings thus far (item 7), a proportionate number (50.00%) of students expressed disagreement with the notion that integrated science teachers gives assignment involving laboratory materials. An appreciable percentage of 43.30% of students held the view that their teachers gave them assignments. This creates a conflict in deciding the attitude of teachers towards practical work since some students were undecided on the matter (6.70).

A majority of students (59.40%) agree that their teachers assist them in using laboratory equipment.

Furthermore, a considerable majority of students (63.40%) express agreement with the perception that their teachers tend to be strict when students fail to utilize specific laboratory materials. Conversely, only a minority of students disagree with the statement.

Moreover, a substantial majority of students (70.60%) affirmed that integrated science teachers consistently assist them in resolving issues encountered in the laboratory.

This assertion finds support in the calculated mean of 3.77, suggesting that collaborative group work fosters a positive working relationship.

Again, a significant majority of students (92.80%) strongly agree that their integrated science teachers tend to arrive late for practical work sessions. However, a minority (2.20%) disagrees with this assertion. Consistent lateness to practical sessions indicates a negative attitude on the part of teachers.

Regarding the interaction between students and integrated science teachers in assisting with the use of specific laboratory materials (item 12), 47.20% express disagreement with the statement, while 39.50% agree. Despite the varying opinions, the mean score of 3.81 confirms agreement to the assertion. Those who remain silent also constitute a significant number. This suggests that students may be expected to achieve higher levels of knowledge after engaging with integrated science teachers during science lessons.

Students exhibit positive attitudes towards group work, citing intellectual growth in such learning situations. This perspective is endorsed by 51.70% of students, accompanied by a high mean of 4.06. This high mean suggests that integrated science teachers are perceived as friendly during laboratory sessions. Consequently, the collaborative approach to assigned tasks is implied to contribute to increased learning outcomes.

Additionally, a substantial majority (74.40%) affirmed that integrated science teachers do not allow free interactions during laboratory lessons. Based on this question, students conveyed a consistent response, indicating that integrated science teachers establish an environment where making noise in class, which could disrupt the proper delivery of lessons, is not allowed. The mean score of 4.41 suggests a positive perception among students regarding this aspect.

The majority of students (74.60%) express agreement regarding their teachers marking exercise books during lessons. Only a minority disagrees with the statement.

Notably, a substantial proportion (55.00%) of students, reporting a mean of 4.18, affirm that integrated science teachers consistently review their practical notebooks during lessons. This assertion is consistent with students' responses, indicating that teachers ensure correct procedural adherence through book inspections. Furthermore, teachers are recognized for maintaining discipline by addressing mistakes made with laboratory tools.

Finally, a significant majority (85.50%) of students agree that their teachers usually discipline them for making mistakes with laboratory tools. This belief in the positive impact of discipline on learning is supported by the mean score of 3.44, with a standard deviation of 1.338, indicating a notable level of agreement. Students perceive the presence of discipline as contributing to a conducive learning environment, where clear expectations and corrective actions foster an atmosphere of focused and undisturbed learning.

4.3 Research Question Two

What is the perception of junior secondary school students about teachers' competencies in the use of laboratory resources in teaching integrated science?

This question sought to find out the perception of junior secondary school students about teachers‟ competencies in the use of laboratory resources in teaching integrated science. Their responses are contained in Table 3.

Table 3: Competencies of Teachers towards the use of Laboratory Resources

s/n	Competency questions	Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Mean	Standard deviation
1	Integrated science teachers usually improvise local materials during their lesson.	8 (4.40%)	4 (2.20%)	30 (16.70%)	76 (42.20%)	62 (31.70%)	4.00	1.002
2	My teacher does not conduct experiments with us in the laboratory.	19 (10.70%)	39 (21.60%)	22 (12.20%)	43 (23.80%)	57 (31.70%)	3.44	1.399
3	Integrated science teachers use problem solving method in their teaching.	7 (3.90%)	19 (10.60%)	15 (8.30%)	77 (42.80%)	62 (34.40%)	3.93	1.096
4	Integrated science teachers use instructional materials in their teaching.	11 (6.10%)	15 (8.30%)	20 (11.10%)	71 (39.40%)	63 (35.00%)	3.89	1.157
5	Integrated science teachers take students out for educational trip.	93 (51.60%)	31 (17.20%)	12 (6.70%)	25 (13.90%)	19 (10.60%)	2.14	1.442
6	Integrated science teachers motivate students in class.	1 (0.60%)	13 (7.20%)	12 (6.70%)	80 (44.40%)	74 (41.10%)	4.18	0.887
7	Integrated science teachers do not create active learning environment in the laboratory.	18 (10.00%)	18 (10.00%)	16 (8.90%)	71 (39.40%)	57 (31.70%)	3.73	1.281
8	Integrated science teachers use varied methods to deliver their lesson.	9 (5.00%)	13 (7.20%)	27 (15.00%)	71 (39.40%)	60 (33.30%)	3.89	1.103
9	Integrated science teachers involve students in the use of laboratory experiment.	23 (12.80%)	23 (12.80%)	20 (11.10%)	66 (36.70%)	48 (26.60%)	3.52	1.347
10	Integrated science teachers usually carry out experiment during the lesson with enthusiasm.	8 (4.40%)	18 (10%)	27 (15.00%)	75 (41.70%)	52 (28.90%)	3.81	1.099
11	Integrated science teachers explain topics treated clearly to us.	2 (1.10%)	2 (1.10%)	9 (5.00%)	46 (25.60%)	121 (67.20%)	4.57	0.741
12	Integrated science teachers occasionally engage specialists to treat some topics.	56 (31.10%)	29 (16.10%)	24 (13.30%)	46 (25.60%)	25 (13.90%)	2.75	1.472
13	Integrated science teachers carry out experiment in the laboratory.	25 (13.80%)	34 (18.90%)	28 (15.60%)	52 (28.90%)	41 (22.80%)	3.28	1.370
14	Integrated science teachers usually use captivating approach to introduce every lesson.	14 (7.80%)	9 (5.00%)	23 (12.80%)	84 (46.60%)	50 (27.80%)	3.82	1.131
15	When necessary, integrated science teachers use their "mother tongue" to explain difficult concept.	7 (3.90%)	16 (8.90%)	22 (12.20%)	53 (29.40%)	82 (45.60%)	4.04	1.135
16	Integrated science teachers use only lecture method during their lesson.	18 (10.00%)	32 (17.80%)	31 (17.20%)	61 (33.90%)	38 (21.10%)	3.38	1.274
17	Integrated science teachers are dedicated to their work.	6 (3.30%)	14 (7.80%)	6 (3.30%)	40 (22.20%)	114 (63.30%)	4.34	1.079

The findings from the students' responses to various items in Table 3 shed light on their perceptions of integrated science teachers' competencies in using laboratory resources for teaching integrated science.

Firstly, a substantial majority of students (73.90%) agree that their teachers usually improvise local materials during lessons, revealing a positive attitude towards teachers' resourcefulness (mean = 4.00, standard deviation = 1.002). This demonstrates a commendable level of competence in utilizing locally available materials to enhance the learning experience.

However, in relation to the use of the lecture method versus practical experiments (Item 2), a significant majority (55.50%) agrees that their teacher does not conduct experiments with them in the laboratory. The disagreement from 32.40% raises concerns, indicating a potential area for improvement in balancing teaching methods for a more comprehensive understanding.

Moreover, the study indicates that 77.20% of students, with a mean of 3.93, agree with the idea that integrated science teachers use problem-solving methods in their teaching (Item 3). With only 14.60% in disagreement, this highlights a positive aspect in the application of interactive teaching approaches, showcasing a strength in the current teaching methods.

Similarly, there is an agreement among 74.40% of students regarding the use of instructional materials by integrated science teachers (Item 4). The mean score of 3.89 suggests that students perceive a high level of competence of their teachers in the integration of instructional materials into the teaching process, even though 14.40% of students disagree.

Furthermore, a significant number (68.80%) of students, with a mean of 2.14, express disagreement with the assertion that integrated science teachers take students out for educational trips. Hence students perceived that their teachers do not take them out on field trips. This finding highlights a potential area for improvement in providing real-world exposure to students.

On the contrary, the study reveals a positive perception of teachers' motivational skills (Item 6), with a high mean of 4.18 and a standard deviation of 0.887. This reflects the agreement of 85.50% of students, highlighting a commendable aspect of teacher-student engagement.

In relation to the establishment of an active learning environment in the laboratory (Item 7), 71.10% of students agree, with a mean of 3.73, indicating that integrated science teachers are perceived not to create an active learning environment in the laboratory.

Moreover, the results indicate positive perceptions (mean = 3.89, standard deviation = 1.103) regarding the utilization of diverse methods by integrated science teachers in delivering their lessons (Item 8). The majority (72.70%) of students expressed agreement, highlighting a commendable level of flexibility in instructional delivery of lessons by their teachers.

Additionally, there is an agreement among students (63.30%, mean = 3.52) that their teachers involve them in laboratory experiments (Item 9). This indicates a positive perception of teachers' competencies in facilitating hands-on activities for students.

When it comes to conducting experiments with enthusiasm (Item 10), the results reveal a positive perception (mean = 3.81, standard deviation = 1.099). This reflects the agreement of 70.60% of students with the statement, indicating an appreciation for their teachers' dedication to practical activities.

Importantly, a remarkably positive perception emerges from students' responses regarding teachers' clarity in explaining topics (Item 11), evidenced by a mean of 4.57 and an overwhelming affirmation from 92.80% of students. This underscores the effectiveness of teachers' communication skills.

Moreover, 47.20% of students disagrees with the claim that integrated science teachers occasionally bring in specialists to cover certain topics (Item 12). The mean score of 2.75 suggests that students are undecided, neither agreeing nor disagreeing with the occasional engagement of specialists. This indicates a lack of a strong consensus among students on this matter. However, a considerate majority (51.70%) of students agreed that their teachers carry out experiments in the laboratory (Item 13).

Additionally, the study reveals a positive perception (mean = 3.82, standard deviation = 1.131) of teachers using captivating approaches to introduce every lesson (Item 14). This finding is reflected in the agreement of 74.40% students, suggesting that teachers successfully engage students from the beginning of each lesson.

Moreover, a strong majority of students (75.00%) express robust support for the idea that integrated science teachers effectively employ their 'mother tongue' when necessary (Item 15). The mean score of 4.04 emphasizes the significance of using the 'L1' (first language) in enhancing students' comprehension of challenging concepts.

Contrary to diverse instructional methods, a substantial portion (55.00%) of students believe that integrated science teachers predominantly rely on the lecture method for instruction (Item 16). While 27.80% express disagreement, 17.20% remain neutral on this aspect, resulting in a mean of 3.38. This mean suggests a notable lack of strong consensus among students regarding their teachers' predominant instructional approach.

Finally, there is an overwhelming support for the dedication of integrated science teachers to their work (Item 17), as evidenced by a mean of 4.34 and a standard deviation of 1.079. This highly positive perception is reflected in the agreement of 85.50% of students with the assertion, signifying the recognition of teachers' commitment to their profession of teaching.

4.4 Research Question Three

What are the effects of teachers' attitudes and competencies in the use of laboratory resources for teaching of integrated science on students' performance?

This question seeks to find out the possible effect of teachers" attitude and competencies in the use of laboratory resources in integrated science teaching on students" perfomance.

In the first school, Focus Group A and Focus Group B, comprising students sampled for the study, unanimously expressed the view that their school has no laboratory and integrated science teachers hardly taught them using TLM"s nor taking them to science resources centres or science trips. Both focus groups expressed discontent with the limited exposure to practical experiments, a sentiment supported by the quantitative finding that 55.60% of students agree that their teachers do not conduct experiments in the laboratory (Table 3, Item 2).

Again, students of the aforementioned focus group added that, they dislike the subject due to the mode of lesson delivery. From the body language of students, some do not even want to talk so that they may be laughed at for wrong pronunciation of words etc. This is evidently seen in Table 2, Item 9, where (63.40%) of students perceive that their integrated science teachers are generally harsh when they fail to use a particular laboratory material. This quantitative finding aligns with the qualitative insights gathered from the focus group discussion. Participants expressed their dislike for the subject, attributing it to the mode of lesson delivery.

Additionally, the hesitation to speak, as observed from students' body language, was linked to a fear of being laughed at for incorrect pronunciation of words. Though a few students in Focus Group B acknowledged they like the subject and are hoping to further in science, they were however quick to add that, there are some words that the teacher pronounces and since some of them do not have the text books, they think that the teacher is adding his own and the truth also is that some struggle to read well coupled with the big words in science puts them off. The qualitative feedback affirms and provides depth to the quantitative result by illustrating how this lack of practical engagement impacts students' perceptions and interest in the subject. The students' reluctance to speak and their dislike of the subject due to the mode of lesson delivery further emphasize the potential consequences of a deficient practical component in integrated science teaching. This challenge could have been mitigated if the teacher had invited specialists to address specific topics, as confirmed in Table 3, Item 12.

Interestingly, in the second school, the two focus groups (C and D) shared similar ideas of having a science resource centre nearby that their teacher takes them to for observations and practicals. In fact, here majority showed high interest in integrated science. Some students confidently described some experiments that they were taken through at these centres and also mentioned some apparatus that they saw at these centres. Also, they have confidence in their teacher because all what the teacher said in class was the same, they heard at the resource centre. They shared with me all the positive experiences they had with their science teacher, they added that, integrated science teacher always brings Teaching Learning Materials (TLM"s) to class during some lesson to ease their understanding in some area in science practical. Students from both focus groups (the second school) support the idea that integrated science teacher take them to science trip but not often, some of the science trip that they have ever been to were; water processing plant, National Films and Television Institute (NAFTI), and Ghana Atomic Energy, all these were possible through the support of parents who have links to these places. A student from Focus Group D added that when you have such experiences and it comes in exams you can write well because you know it and all laughed.

The positive feedback from Focus Group C and Focus Group D aligns with specific quantitative data from Table 3. According to the quantitative results, 85.50% of students agreed that their integrated science teachers motivate them in class, with a mean score of 4.18 (Table 3, Item 6). Additionally, a significant majority of them (92.80%) agreed that their teachers explain topics clearly and use Teaching Learning Materials (TLMs) effectively (Table 3, Item 11). Notably, majority (91.10%) of students" express agreement with the active participation encouraged during laboratory lessons (Table 2, Item 1), highlighting a positive and engaging classroom dynamic. This sentiment is further reinforced by Table 2 Item 2, where a robust consensus (86.70% agreement and a mean score of 4.06) affirms a perceived friendliness of integrated science teachers in the laboratory. The overwhelmingly high agreement (95.00%) in Table 2 Item 3 indicates an open and supportive learning environment, where students feel at ease asking questions in class. Also, in Table 2 Item 4, majority of students (87.20%) expressed agreement that their teachers encourage them during practical works. However, the lack of educational trips organized by their teachers, as indicated in Table 3, Item 5, is viewed as a contributing factor to poor performance among the students. These insights emphasize the positive impact of practical experiences, science resource centers, and teacher support on students' engagement with integrated science.

In the third school, Focus Group E and Focus Group F were giving different views about teachers" attitude and competencies in using laboratory resources. According to Focus Group E, students expressed dislike for the subject because they felt that the science teacher is not well-versed in the science content, does not use TLMs, or take them on science trips. They showed a negative experience they had with their science teacher. This qualitative feedback is supported by quantitative data from Table 3, Item 16, where 55.00% of students, with a mean score of 3.38 indicating an undecided stance, agreed that their teachers predominantly use the lecture method. Only two out of eight students in Group F showed a little positive liking about the subject and had an average pass in the last end of year examination, but their body posture and facial expressions tell the researcher they show no interest at all in the subject. The affirmation is apparent when considering the quantitative data from Table 2, particularly in Items 6 and 14. In Item 6, 32.30% of students agreed that their teachers often miss class during practical work sessions, resulting in a mean score of 2.60, indicating an undecided stance. Additionally, in Item 14, 71.50% of students agreed that their integrated science teachers restrict their freedom to interact freely in the laboratory. This aligns with the concerns raised by the focus groups E and F in the third school, where students expressed dissatisfaction with their teachers' limitations on interaction during practical lessons. The combined data from both items in Table 2 reinforces the qualitative feedback and affirms students' perceptions of their teachers' inconsistent attendance and restrictive practices in the laboratory. With the second group in the last school, half of the students showed a positive and the other half show a negative perception about science teachers‟ attitudes and competences towards the use of science laboratory resources. It was very clear to the researcher that though the school do not have some of the basic TLMs like beakers, beam balance, thermometers, conical flask and others, the teacher is not also making any effort on his own to get these things so that the students can learn. One of them said “seeing is believing” and they all laughed.

4.5 Summary of chapter

The findings from the study, as presented in Tables 2 and 3, reveal the perceptions of junior secondary school students regarding teachers' attitudes and competencies in using laboratory resources for the teaching of integrated science.

The study indicates a high perception among junior high school students of their teachers‟ attitudes and competencies in using laboratory resources in teaching integrated science. This positive response aligns with the research of Nelson (2003), Calderón-Garrido et al., (2022), and Golumbic et al., (2013), which collectively highlight the significant impact of positive teacher-student relationships on learning outcomes. Students in the study recognized the importance of teachers fostering a conducive and engaging learning environment in science learning.

Moreover, the absence of assignments given by Basic Science teachers raises concerns. While this finding could be attributed to potential time constraints faced by teachers, it emphasizes the need for a balanced approach to ensure that students receive constructive feedback, fostering motivation and academic improvement (Panadero & Lipnevich, 2022).

The quantitative data presented in Table 3 suggests a high level of perceived competence among students regarding teachers' use of laboratory resources in junior high school integrated science. Students' responses indicate confidence in teachers' proficiency in content and pedagogy. These findings resonate with the works of Afe (2001) and Ajao (2001), emphasizing the pivotal role of teachers in shaping students' academic performance.

However, when examining the qualitative insights, a nuanced perspective emerges. Despite the positive perception, there are indications that teachers lack some degree of competence, particularly in using different teaching methods. This resonates with previous research by Adu and Okeke (2014), Anthony (2000), and Pell (2001), which highlighted deficiencies in teacher training and competence in instructional delivery.

The current study underscores the challenges faced by Basic Science teachers in terms of resource limitations, contributing to their perceived lack of competence. These findings align with the works of Rabiu (2014) and Fischer et al., (2012), emphasizing the importance of adequately preparing teachers for the challenges of junior secondary school education.

The study delves into the effects of teachers' attitudes and competencies on students' performance. Schools with teachers making effective use of laboratory resources demonstrate positive impacts on student learning and practical application. However, the absence of dedicated laboratories in any of the schools poses a significant challenge. Teachers' frustrations regarding the lack of resources and proper storage facilities are highlighted, shedding light on the difficulties they face in delivering practical aspects of science education.

Moreover, the study reveals that some schools without integrated science laboratories make commendable efforts by improvising local materials and organizing educational trips. Teachers also leverage technology by guiding students to find information online. These efforts reflect the resilience of educators in overcoming resource constraints and adapting to the evolving educational landscape.

In conclusion, the findings emphasize the importance of teachers' attitudes and competencies in integrated science education. While quantitative data suggest a positive perception among students of their teachers, qualitative insights highlight nuanced challenges faced by teachers, particularly in resource-constrained environments. The study underscores the need for comprehensive teacher training programmes, addressing both content and pedagogy, to enhance the quality of science education at the junior secondary school level. Additionally, efforts should be made to provide adequate resources and facilities to support effective teaching and learning in the field of integrated science.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Overview

This chapter comprises five sections. The initial section provides an overview of the study. The findings of the study, as discussed in the preceding Chapter Four, are recapitulated in the second section. The third section encompasses the conclusion, followed by recommendations. These recommendations are directly linked to the significant research results, major research questions, and the primary goal of the study. The fifth section encompasses all proposed avenues for further research.

5.1 Summary of the Study

This research delved into the perceptions and experiences of junior high school students of their teachers" concerning the utilization of laboratory resources in integrated science teaching. It presented a background on the pivotal role of science education in contributing to the socio-economic development of nations and underscored the performance of science at both basic and secondary school levels within the country.

The study was guided by three objectives and corresponding research questions. Its significance lies in offering insights to all stakeholders in education, enabling them to comprehend students' perceptions of teaching techniques and address any negative impressions. For instance, basic school managers could use the data to implement effective induction programs aimed at enhancing teaching and learning across various educational domains.

The literature review focused on students' perceptions of their teachers' attitudes and competencies in teaching integrated science. It covered the cognitive load theory, constructivist theory, conceptual framework, teaching and learning of integrated science, the concept of perception, studies on students' perceptions of science teacher"s competencies in using laboratory resources, and professional code of ethics.

A total of 180 students were proportionately sampled as participants from three public basic schools in the Ga East Municipality. The study employed both primary and secondary data. Student input was gathered through questionnaires and Focus Group Discussions. Quantitative data were analyzed using SPSS version 25, while qualitative data were summarized verbatim.

5.2 Discussion of the Findings

The findings of this study shed light on students' perceptions of their teachers' attitudes and competencies in utilizing laboratory resources for teaching integrated science. Overall, the results indicate a positive perception among students towards their integrated science teachers and the use of laboratory resources. However, several areas for improvement have been identified, including enhancing teacher attendance during practical works and assigning tasks that utilize laboratory materials more effectively.

One key aspect highlighted by the research is the commendable resourcefulness, motivation, and clarity in explanations demonstrated by integrated science teachers. These positive attributes contribute significantly to the overall learning experience of students. However, there is room for improvement in balancing teaching methods, increasing the frequency of educational trips, and further integrating instructional materials into teaching practices. Addressing these areas could enhance the effectiveness of science education in junior secondary schools.

The study also explored the potential effects of teachers' attitudes and competencies in using laboratory resources on students' performance. The findings reveal varying impacts across different school settings. In schools with adequate resources and effective use of teaching and learning materials, there is a positive correlation between teachers' competencies and students' performance. Conversely, schools facing challenges such as the absence of a laboratory and limited use of teaching materials experience a negative impact on students' interest in the subject and the mode of lesson delivery.

The qualitative insights obtained from focus group discussions complement the quantitative results, emphasizing the importance of effective teaching strategies in influencing student outcomes. These insights underscore the need for targeted interventions to address resource limitations and enhance teacher competencies in utilizing laboratory resources for teaching integrated science.

In conclusion, the findings of this study highlight the importance of continuous improvement in teacher training, resource provision, and instructional practices to enhance the quality of science education in junior secondary schools. By leveraging existing strengths and addressing identified areas for improvement, educators can create a more conducive learning environment that fosters students' interest and achievement in integrated science.

5.3 Conclusions

The study established a generally positive perception of students about their teachers using laboratory resources in teaching integrated science. However, variations were observed among different schools, highlighting the influence of the availability of resources and teachers' competencies. Some schools lacked proper laboratory facilities, impacting students' engagement and interest in the subject. Teachers who utilized teaching and learning materials, conducted experiments, and organized educational trips were associated with positive student experiences.

On the other hand, there were indications of challenges, such as the inadequacy of laboratory resources, limited improvisation, and inconsistencies in teachers' competencies. Notably, some teachers faced difficulties in effectively integrating practical elements into their teaching, potentially affecting students' understanding and performance.

5.4 Recommendations

In order to enhance the overall quality of science education, the following key recommendations are proposed. First and foremost, there is a critical need for resource enhancement, particularly in schools lacking laboratory facilities. Prioritizing the creation of accessible and well-equipped science laboratories can significantly improve students' practical learning experiences.

Additionally, an emphasis on teacher training and professional development is crucial. Implementing programmes that enhance teachers' competencies in utilizing laboratory resources effectively, through workshops, seminars, and ongoing professional development, is essential to keeping educators informed about innovative teaching methods.

Encouraging improvisation with local materials, even in the face of resource constraints, is another valuable strategy, fostering creativity and ensuring practical elements are incorporated into lessons.

The integration of technology can compensate for resource limitations, as teachers guide students to online resources, providing access to additional information and interactive learning experiences. Collaborative efforts between schools, with the sharing of resources and best practices, are recommended, along with seeking support from educational institutions, government bodies, and community stakeholders to enhance the overall learning environment.

By implementing these comprehensive recommendations, schools can work towards creating an environment that fosters positive attitudes, enhances teacher competencies, and ultimately improves students' performance in integrated science.

5.5 Suggestions for Future Research

Building upon the conclusions drawn from this study, a promising avenue for future research could focus on the development and implementation of targeted professional development programmes for integrated science teachers. This research could investigate the impact of such programmes on enhancing teacher competencies, particularly in utilizing laboratory resources effectively. Key areas of emphasis might include strategies to improve teacher attendance during practical works, methods for assigning and assessing tasks involving laboratory materials, and interventions to foster a balanced use of teaching methods.

Additionally, exploring the influence of specific interventions, such as workshops, mentoring programmes, or access to advanced teaching technologies, on teacher competencies and student outcomes could provide valuable insights. This research could delve into the long-term effects of sustained professional development initiatives on teachers' practices and students' perceptions, thereby contributing to the continuous improvement of integrated science education in junior secondary schools.

By addressing the identified areas for improvement and closely examining the effectiveness of targeted interventions, future research can contribute to the refinement of teaching practices, ultimately enhancing the overall quality of integrated science education and positively impacting students' academic performance and engagement in the subject.

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APPENDICES

APPENDIX A

Introductory Letter for Research Study

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Our Ref: *ISED/PG/VOL.1/47*

26th September, 2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION:

I write to introduce to you the bearer of this letter Sister Susanna Nuomeeno Amuh with index number **220031535,** a student of Science Education in the University of Education, Winneba who is reading a Master of Philosophy programme in Science Education.

As part of the requirements of the programme he is undertaking a research topic; Perceptions of Junior High School Students on Integrated Science Teacher's Attitudes and Competencies' in using Laboratory Resources. She needs to gather information to analyse the said research topic.

I would be grateful if she would be given the needed assistance to carry out this exercise.

Thank you.

Yours faithfully,

DR. CHARLES K. KOOMSON
Ag. Head of Department

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APPENDIX B

Survey Questionnaire

PERCEPTIONS OF JUNIOR HIGH SCHOOL STUDENTS ON INTEGRATED SCIENCE TEACHERS' ATTITUDES AND COMPETENCIES IN USING LABORATORY RESOURCES FOR TEACHING.

The questions used to assess students‟ knowledge are applied to both the experiment and control groups. The following questionnaire is part of a study being conducted for a Master of Philosophy degree. You are required to respond to the items as sincerely as possible. The information you provide will only be used for research purposes and will be ***kept confidential.*** Therefore, ***please do not write your name or index number on this questionnaire.***

Please note that there are no right or wrong responses to these items, but rather what is appropriate for you. Choose the option that best describes your opinion by indicating a tick (√) in the appropriate box.

SEX: Male [ ] Female [ ]

AGE: 15 – 17 years [ ] 18 – 20 [ ] 19+ [ ]

QUESTIONS ABOUT ATTITUDE

S/N	Perceptions of Students of teachers' attitude in using lab resources for teaching.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	Integrated Science Teachers allow active participation of students in their lesson.					
2	Integrated Science Teachers are friendly to us in the laboratory.					
3	Integrated Science Teachers allow us to ask questions in the classroom/laboratory.					
4	Integrated Science Teachers encourage us in experiments during their practical work.					
5	Integrated Science Teachers attend their lessons regularly and promptly.					
6	Integrated Science Teachers missed their lesson often when they are to engage us in practical work.					
7	Integrated Science Teachers give us assignment to do using laboratory materials.					
8	Integrated Science Teachers assist us in the classroom to use laboratory equipment.					
9	Integrated Science Teachers are generally harsh when students fail to use a particular laboratory material.					

10	Integrated Science Teachers usually helps us to solve our problems in laboratory work.					
11	Integrated Science Teachers usually come late to the class when they have practical work with us.					
12	Integrated Science Teachers interact well with us in helping us to use particular laboratory material.					
13	Integrated Science Teachers are friendly towards us during laboratory sessions.					
14	Integrated Science Teachers do not allow us to make noise during their lesson.					
15	Integrated Science Teachers usually mark the student‟s exercise book during the lesson.					
16	Integrated Science Teachers usually check the student‟s practical notebooks during their lesson.					
17	Integrated Science Teachers usually discipline students for making mistakes with laboratory tools.					

QUESTIONS ABOUT COMPETENCIES

S/N	Perception of students towards teachers' competencies in teaching Integrated Science	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	Integrated Science Teachers usually improvise local material during their lesson.					
2	My teacher does not conduct experiments with us in the laboratory.					
3	Integrated Science Teachers use problem solving method in their teaching.					
4	Integrated Science Teachers use instructional materials in their teaching.					
5	Integrated Science Teachers take students out for educational trips.					
6	Integrated Science Teachers motivate students in class.					
7	Integrated Science Teachers do not create active learning environment.					
8	Integrated Science Teachers use varied methods to deliver their lessons.					
9	Integrated Science Teachers involve students in laboratory experiment.					

10	Integrated Science Teachers usually carry out experiment during the lesson with enthusiasm.					
11	Integrated Science Teachers explain topics treated clearly to us.					
12	Integrated Science Teachers occasionally engage specialist to treat some topics.					
13	Integrated Science Teachers carry out experiment in the laboratory.					
14	Integrated Science Teachers usually use captivating approach to introduce every lesson.					
15	When necessary, Integrated Science Teachers use their “mother tongue” to explain difficult concept.					
16	Integrated Science Teachers use only lecture method during their lesson.					
17	Integrated Science Teachers are dedicated to their work.					