UNIVERSITY OF EDUCATION, WINNEBA

INTEGRATED SCIENCE TEACHERS' KNOWLEDGE AND PRACTICE OF LEARNER – CENTRED INSTRUCTIONAL STRATEGIES IN THE SEFWI – WIAWSO MUNICIPALITY

OPHELIA ODURO

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OPHELIA ODURO (8180030022)

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DECLARATION

Student`s Declaration

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

Signature:…….

Date:……..

Supervisors` Declaration

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

Name: Ernest I. D. Ngman-Wara (PhD) (Principal Supervisor**)**

Signature:…….

Date:……..

Name: James Azure Awuni (PhD) (**Co-Supervisor)**

Signature:…….

Date:……..

DEDICATION

This thesis is dedicated to, my husband; Dr. Emmamuel Carsamer, and my children, Kwadwo Sampeney Kumah Carsamer and Kwaku Yeboah Kumah Carsamer

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ABBREVIATIONS

BECE	:	Basic Education Certificate Examination
JHS	:	Junior High School
ICT	:	Information and Communication Technology
APA	:	American Psychological Association
LCE	:	Learner Centerd Education
LCIS	:	Learner Centerd Instructional Strategies
CCE	:	Child-Centerd Education
NRC	:	National Research Council
SPSS	:	Statistical Package for Social Sciences
B.Ed.	:	Bachelor of Education
SSCE	:	Senior Secondary Certificate Examination
LCP	:	Learner Centred Practice
GES	:	Ghana education service
MoE	:	Ministry of Education
TLMs	:	Teaching and Learning Materials
NaCCA	:	National Council for Curriculum and Assessment

ABSTRACT

The purpose of the study was to explore Junior High School Integrated Science teachers' knowledge and practice of learner-centred instructional strategies. The sequential explanatory mixed method research design was used for the study. Census sampling technique with a sample size of one hundred and twenty-eight (128) swas used for the quantitative and purposive sampling was used to select ten teachers for

the qualitative phase of the study. The instruments for data collection were questionnaire, interview guide and observation check list. The instruments were selfadministered. It was revealed that, JHS Integrated Science teachers have substantial knowledge of the learner centred instructional strategies. JHS Integrated Science teachers' background factors (Years of teaching experience and in-service training) contribute significantly to teachers' knowledge level on learner centred instructional strategy. JHS Integrated Science teachers hardly apply it during lesson delivery. It was recommended that Municipal Directorate of Education should laisse with the municipal assembly to supply the needed resources to JHS Integrated Science teachers apply it and practice learner-centred instructional strategies.

CHAPTER ONE INTRODUCTION

1.0 Overview

This chapter presents the introduction to the study. It comprises of the background to the study, statement of the problem, purpose of the study and objectives of the study. it also presents the research questions, research hypotheses, significance of the study, delimitation, limitations, and definition of terms. The chapter ends with organization of the study.

1.1 Background to the Study

According to Arhin and Asimah cited in Abedi (2016), science is a process of learning which involves firsthand experience, inquiry, problem solving, and interpretation of data and communication of findings. Science is a subject that investigates nature, analyses societal problems and also provides some technological needs of the society. Science has become part of our lives because we apply science in everything that we do. Science helps us to understand nature. For example, natural phenomenon like atmospheres, environments and earthquake are explained through scientific knowledge. Science plays an important role in this technological revolution. Technology has advanced the production of potent drugs and improved agricultural mechanization which has led to high yield of crops and quality foodstuff for the everincreasing population. In fact, Telecommunication development has reduced time of production and scientific methods of waste management have improved greatly due to the application of scientific ideas. Technological and computer knowledge development has led to the revision of the science curriculum of most countries (Boakye, 2019).

The 2019 science education reforms in Ghana, aimed at preparing individuals to meet the challenges of the rapidly technological development and demands of industrialization all over the world. The new syllabus for Junior High School (JHS) in Ghana, believes that an effective science education needed for sustainable development should be inquiry-based (National Council for Curriculum and Assessment, 2019). Thus, the teaching philosophy places emphasis on opportunities to expand, change, enhance and modify the ways in which we view the world. It should be pivoted on learner-centred teaching and learning approaches that engage learners physically and cognitively in the knowledge-acquiring process in a rich and rigorous inquiry driven environment. The curriculum is aimed at developing individuals to become scientifically literate, good problem solvers, have the ability to think creatively and have both the confidence and competence to participate fully in Ghanaian society as responsible local and global citizens. (National Council for Curriculum and Assessment, 2019).

The prescribed method for implementing the new school curriculum for science places emphasis on field study, guided discovery, laboratory techniques and skills and conceptual thinking. Other methods include models, demonstration, field trip, discussion, group work, project work and resource persons (National Council for Curriculum and Assessment, 2019). The methods were prescribed in pursuance of the stated objectives, the contents and context of the curriculum. Encouraging students for learning, developing interest, conceptual teaching, imparting realistic knowledge and practical experience about the world are elements of teaching practices that create a great influence of teachers on their students (Wang, 2020). Non-availability of teaching materials, unequipped and in some cases non-existence of science

laboratories, unrealistic teacher to student ratio in large class sizes are some of the factors that discourage teachers to adopt discovery and inquiry-based teaching approaches in their classrooms and may make impossible face to face teaching (Chui, 2020). Tufail and Mahmood (2020) observe that science teachers are less interested in using the inquiry method and project- based learning in their classrooms because content of syllabus is too big. Mostly, teachers have no option but to adopt teaching method according to available resources, as result, the lecturing method is the most commonly adopted teaching strategy by science teachers (Iqbal, Azam & Rana, 2009)

The recommended method aim is to equip children with scientific literacy, positive attitudes and knowledge of basic science concepts that would provide a strong foundation for further study in science at Senior High School level and beyond. It is also to develop the young person interest, spirit of curiosity, creativity and critical thinking and inclination toward the pursuit of scientific works (National Council for Curriculum and Assessment, 2019). This is because students use critical thinking, self-assessment, reasoning, problem-solving, collaboration, research, and investigation to make connections in innovative ways as they progress through Integrated Science education (National Council for Curriculum Assessment, 2012).

Miller (2012) states that in learner centred instructional strategies, “learners are treated as co-creators in the learning process, as individuals with ideas and issues that deserve attention and consideration”. Underlying the process of science teaching is the fundamental assumptions about the uniqueness of learners. The uniqueness of learners requires teachers to use variety of techniques to meet individual’s patterns of development and the active nature of student learning. These assumptions influence instructional procedure and outcomes, selection of instructional materials and methods

of assessment. Effective teaching of science requires a sound teacher pedagogical skill, knowledge of the subject matter and classroom practices to support the learning process among all categories of students. Some of the ways by which a teacher can induce quality learning in the science classroom is to make science learning active and student-centred.

The use of learner-centred approach for teaching makes learners contribute to the lesson by sharing ideas on what is being learnt or taught. Students are not considered to be empty vessels; they come with their own perceptual frameworks. Focus is not just on what is taught but how effective learning should be promoted. Student learning becomes the main preoccupation of the teacher (not his/her performance as a teacher or a new number of facts to be transmitted to the students). It is recognized that students learn in different ways and have different learning styles. Most people learn best with hands-on activities, but some gain a lot more than others. Students really increase their learning potential when they are given the opportunity to do something by themselves especially in a science classroom, there should be plenty of opportunities to learn by doing. This calls for teachers' adequate knowledge in recommended instructional strategies because teachers' adequate knowledge in recommended instructional strategies does not only play an important role in classroom practices but also improves pupils' performance. Therefore, to make Integrated Science learning meaningful, teachers should use learner-centred approach in which students are responsible for the learning process by making use of the available teaching learning materials. This suggests that the mastery of science concepts cannot be fully achieved without the use of learner centred instructional practices.

According to Ajaja (2013), 'talk and chalk' method of teaching and learning science' is one of the factors contributing to low interest in science and hence there is the need for alternative instructional strategies that could stimulate students' interest and enhance their achievement The teaching of Integrated Science without teaching and learning materials will certainly lead to students' poor performance. Appiah (2014) and Mensah (2014) separate studies on Science teachers' instructional and assessment practices showed that the low level of teachers' knowledge on recommended instructional strategies and adoption of inappropriate instructional practices hinder effective science instruction in their classroom.

Jegede, Okota and Eniayeju (2010) stressed that as a professionally qualified Science teacher no matter how well the teacher is trained, he/ she would be unable to put his /her ideas into practice if the needed equipment and materials necessary for him or her to translate his competence into reality is absent. Therefore, professional teachers ought to be creative and innovative in selecting and using instructional technique(s) and materials that motivate students to learn, expose them to variety of learning styles within the context of the learning environment (Erinosho, 2008). The integrated science syllabus embodies a wide range of activities such as projects, experiment, demonstrations and scientific inquiry skill (NaCCA, 2019). All these activities are achieved by the teacher through innovative and appropriate usage of instructional techniques. The science teacher is therefore required to design teaching activities with appropriate teaching pedagogies that have the potential to develop students' interest in the subject and properly respond to situations they may encounter in their world of life that their knowledge in science may be of benefit. According to Showers cited in Boakye (2019), for science to be effectively and properly taught, the practical

approach to teaching must be viewed as an essential component of teaching integrated science. The "hands- on" approach has the potential to stimulate students' (pupils) interest in the subject matter. Example, laboratory skills enhance the learning of knowledge and give insight into scientific attitudes and objectives. Thus, before this is achieved the integrated science teacher needs to have pre requisite knowledge of the recommended instructional approach in the curriculum.

However, evidence from the researcher's school shows that an appreciable proportion of JHS pupils have inadequate conceptual understanding of the integrated science topics. An available record at Sefwi-Wiawso Municipal Education Office also indicates that the performance of JHS pupils in integrated science over the years has not improved as expected. It is not known whether it is as a result of instructional approaches utilized by the teachers during integrated science lessons. According to Mensah (2014), inappropriate instructional practices used by some teachers contribute to the poor performance of pupils in integrated science at JHS level. In addition, issues related to teachers' knowledge about what to teach, how to teach it, how students learn and what to assess may contribute to poor performance (Mensah, 2014). The need of this study is to find out Junior High school integrated science teachers' knowledge and practices of learner–centred instructional strategies in the Sefwi-Wiawso municipality.

1.2 Statement of the Problem

Traditionally, teacher centred instructional strategy has dominated science lessons delivery which do not stimulate pupils' interest in science (Fredua-Kwateng & Ahia, 2005). Over the years, the performance of some junior high schools' (JHS) pupils in the subject at the Basic Education Certificate Examination (BECE) has been poor

(WAEC,2016/2017). The national concern is not different from the study area. Whiles other factors could account for the low interest in integrated science, instructional strategies cannot be left out. Government and the Ministry of Education, Ghana (2012) have adopted the learner centred approach as a teaching method to improve pupil's interest and performance in integrated science at basic education level (Mensah, 2014). Though government has recommended learner centred instructional strategies as the only teaching philosophy at the basic level in order to stimulate pupils' interest in science, steachers hardly apply it in their lesson delivery rather they use teacher-centred (Ngman-Wara, 2011). Therefore, the study s examined Integrated Science Teachers knowledge and practice of learner centred instructional strategies in their science lessons delivery.

1.3 Purpose of the Study

The purpose of the study was to examine Junior High School integrated science teachers' knowledge and practice of learner–centred instructional strategies in the Sefwi-Wiawso Municipality.

1.4 Objectives of the Study

The research was designed to:

1. Determine JHS integrated science teacher's knowledge on learner centred instructional strategies in Sefwi-Wiawso Municipality.
2. Determine the relationship that exists between JHS integrated science teachers' background factors and their knowledge level of learner centred strategies
3. Determine the extent to which JHS integrated science teachers' background factors relate to their practices of learner- centered instructional strategies.

4. Examine Junior High School integrated science teachers' learner centred instructional practices in the science classroom

1.5 Research Questions

The following research questions were formulated to guide the study:

1. What are JHS integrated science teachers' knowledge level of learner centred instructional strategies in the Sefwi-Wiawso Municipality?
2. What relationship exists between JHS integrated science teachers' background factors and their knowledge level of learner centred instructional strategies?
3. To what extent do JHS integrated science teachers' background factors relate to their practices of learner- centered instructional strategies.
4. What learner centered instructional practices do Junior High School integrated science teachers' use in their science classroom?

1.6 Research Hypothesis

H0: There is no statically significant relationship between JHS integrated science teachers' background factors and their knowledge level of learner centred instructional strategies

H1: There is statically significant relationship between JHS integrated science science teachers' background factors and their knowledge level of learner centred instructional strategies

H0: JHS integrated science teachers background factors significantly relate to their practice of learner centred instructional strategies

H1: JHS integrated science teachers background factors do not relate to their practice of learner centred instructional strategies

1.7 Significance of the Study

For any research to be useful it must contribute to the volume of existing knowledge of the field under investigation. In the view of this, it is my conviction that the information obtained from this study will provide additional information on some of the challenges that confront in selection of suitable instructional approaches in teaching and learning of integrated science at the JHS level of education. It will also suggest remedies that will make students learning of science enjoyable.

It will also inform the Sefwi-Wiawso Municipal Directorate of education and stakeholder in education on JHS science teachers' knowledge and practice of learner–centred instructional strategies. This will also provide necessary information to Municipal Education Directorate that could be used to organize in-service training and workshop to address the challenges

1.8 Delimitations of the Study

Marilyn (2011) explained delimitations as those characteristics that limit the scope and define the boundaries of a study. According to him delimitations are in the control of the researcher. Delimiting factors may include the choice of objectives, the research questions, variables of interest, theoretical perspectives that the researcher adopted (as opposed to what could have been adopted), and the population he/she chooses to investigate. Although the study area included the Primary and JHS, the researcher restricted himself to only JHS. The study focused on JHS Integrated Science teachers' knowledge on learner centred and instructional strategies in science classroom in the Junior High Schools in the Sefwi-Wiawso Municipality.

1.9 Organization of the Study

The study was organized into six chapters. Chapter one looked at the introduction of the study. It comprised the background to the study, statement of the problem, purpose of the study, research objectives and research questions. It also looked at the significance of the study, delimitation, and organization of the study. Chapter two involved review of literature relevant to the study while chapter three focused on the methodology which comprised the research design, population, sampling and sample size, instrument for data collection and the procedure used in data analysis. Chapter four dealt with results while chapter five dealt with discussion of findings. The final chapter involved the summary, conclusion and recommendations as well as suggested areas for further research.

CHAPTER TWO LITERATURE REVIEW

2.0 Overview

The chapter reviewed related theories and empirical literature on learner centered approach. These include philosophical and psychological perspectives, theories and concepts of the learner centred approach. Empirical literature on the teachers' background factors, knowledge and practice of learner centred approach of integrated science teachers are reviewed.

2.1 Historical Perspective of Learner-Centered Teaching Approach

Rousseau believes that meaningful education should make the learner to reason and to be creative. Mark (2005) quotes Rousseau philosophy that 'If children understand how to reason they would not need to be taught.". The philosophy which was conception of the evolution of culture was to develop the learner's character and moral sense, reasoning and creativity, self-mastery. Rousseau's stages of child development include

1. First stage age 12, when children are guided by emotions and impulses.
2. Second stage 12-16 years, reason starts to develop.
3. Third stage 16 years onwards, when the child develops into an adult.

The education described was unknown, natural, learner centered, and protect children from a corrupting society (Vincent, 2009). Emile Durkheim said children should be given the freedom to explore and interact with nature was in line with behaviourism perspective because children continue with the behaviour that results in positive consequences, or otherwise Thorndike's cage and Skinner's box studies of stimulus

response. Froebel, a Germany philosopher, Kindergarten Philosophy populace learner centred approach where children ought to be free, creative and express themselves as God intended. Lilley (1967) said Frobel's Kindergarten Philosophy was that humans are creative beings and that separates humans from other living things. Human beings can change their environment, because their brains allow them to visualize, therefore true education must help children to understand nature as creative beings. The second tenet is that play is the engine that drives true learning. Thus, play is not idle behavior, it is biologically imperative to discover how things work. It is happy work, but definitely purposeful.

Learner centred approach in American was pioneered by Colonel Francis Parker when he gave demonstrated lectures on learner centred approach after receiving a degree on it from Germany. After completion of his studies he returned to Quincy, Massachusetts, he marketed learner centred pedagogy through district wide teachers' meetings because memorization of facts is not good. Parker's work made learnercentred approach more popular in American schools (Henson,2003).

John Dewey (1859-1952) idea that children need to be alone in classroom was influenced by Locke's tabula rasa, Bacon's scientific method, and Immanuel Kant's pragmatism, and William James' (1842-1910) because truth is inseparable from experience. The joint enterprises expand the learner's horizons by linking his immediate activities with the larger life of the community. The above and the Chinese adage that teach me how to fish instead of catching fish for me is in line with Sparrow's (2000) assertion that learning by doing, not only facilitates the acquisition and retention of knowledge, but it fosters the right traits, critical intelligence, as well as individual initiative.

2.2 Theoretical Framework

The study is situated within the constructivism learning theory. The theory is very much associated with psychological perspectives theories (Jadallah, 2000; Weimer, 2002). Any study on the learner centred approach to teaching and learning should also examine Psychologists' views about the learner centred approach. Jadallah (2000) and Weimer (2002) argue that psychological perspectives are very important when it comes to the practicing of the learner centred approach, because psychologists prescribe and suggest what ought to be done in order to successfully implement the learner centred approach to teaching and learning. The fact is that psychological perspectives influence the development of the learner centred approach to teaching and learning (Jadallah, 2000). According to Jadallah (2000), pedagogically, the learner centred approach has emerged from dynamic nature of learning, and from learning theory known as constructivism.

Constructivist learning theory states that learners construct knowledge for themselves because the learner is not a blank slate, but brings past experiences and cultural factors to the classroom (Hein, 1991; Duffy & Jonassen, 1998). Hence, constructivist teacher provides tools such as problem solving and inquiry-based learning activities which learners use to formulate and test their ideas, draw conclusions, inferences, and convey their knowledge in a collaborative learning environment. Thus, constructivism transforms the learner from a passive recipient of information in class to an active participant in class during the learning process. The learners construct their knowledge actively rather than mechanically ingesting knowledge from the teacher or the text book.

Hein (1991) opines that constructivist theories are array of Philosophical, Psychological, and epistemological orientations but Jadallah (2000) asserts that cognitive constructivism is based on Piaget's model which emphasizes the interaction between the individual and their environment in constructing meaningful knowledge, while on the other hand social constructivism is attributed to the work of Vygotsky, and it emphasizes the importance of student learning through interaction with the teacher and other students.

Weimer (2002) contends that, the principal implication of constructivist theory is that learners are the key initiators and architects of their own learning and knowledge making, rather than passive vessels who receive the transmission of knowledge from expert teachers. This approach ultimately holds learners responsible for their own learning. Weimer (2002) maintains that learner centered teaching encompassing five changes in practice:

- Shifting the balance of classroom power from teachers to students.
- Designing content as a means to building knowledge rather than a knowledge end in itself.
- Positioning the teacher as the facilitator and contributor, rather than director and source of knowledge
- Shifting responsibility of learning from teacher to learner.
- Promoting learning through effective assessment.

Thus, moving towards a learner centred approach entails changing the learning environment responsibilities and assessment of teachers and learners, to learning.

Constructivism is divided into two groups (Sparrow, 2000). One group focuses on the interaction amongst learners while the other focuses on each learner's perceptions.

Jadallah (2000) reported Vygotsky study on learners' interaction, and he realized that when learners solved problems by discussing them as a group they managed to discuss until they come up with solutions to those types of problems. This means that learners effectively come up with proper solutions to problems if they work as a group than when they work as individuals. For example, in integrated science lessons when learners are asked to collect living and non-living organisms during the field tour, they can manage to come up with meaningful collections if they work as a team, rather than when working as individuals. Learners can also manage to conduct experiments successfully in the laboratory if they use the collaborative approach that enables them to assist and complement each other's efforts.

Henson (2003) is of the opinion that Vygotsky teaching method which is now known as cooperative learning encourages co-operation with each learning group. Members of the group have to help each other if they are to achieve intended goals.

Learners in a group have to work as a team and succeed as a team. The teacher can only guide learners as they work through the tasks in their groups. Henson (2003) says that the teacher must not interfere too much in group activities, rather he must only give them guidance and allow learners to learn from each other. According to Donald (2008) if learners work collaboratively as a group, unproductive competition that is usually rife in classrooms is automatically replaced by productive co-operation among learners in the classroom.

Jean Piaget is leading Psychologist associated with constructivism through his four stages cognitive development theory (Weimer, 2002). Piaget believed that the child's cognitive development progresses through the four stages, sensorimotor stage,

preoperational stage, concrete operational, and formal operational stage. Piaget believed that for the child to be able to develop concepts and progress from one stage to another, children need to be exposed to problems since problems make them to be creative thinkers (Watson, 1997). The concrete operational stage shows that in class, learners should be given concrete problems that would allow them to manipulate and come up with solutions. This means that integrated science teachers should use problem solving methods when teaching in order to involve learners and enable them to think creatively because problem solving develops and improves learners' creativity and, it also equips learners with problem solving skills for schools and the general community life.

To conceptualize constructivism as a theory in the study is strong built on the beliefs that learner-centred teachers that encourage student(s) participation, promote activeness and increase learning performance which align itself with constructivists position that learners be allowed to construct knowledge through exploration. This because skilled teachers or facilitators are embodiment of knowledge which helps learners to think and create knowledge to fit well in changing circumstances because of the emphasis on participatory classroom activities. Constructivist teachers have positive view about student-centred instructional strategy and are often associated with student-focused knowledge that encourage and also accept learners' autonomy contrary to the traditional teacher centred.

2.3 Related Literature

2.3.1 Learner Centred Approach

Learner centred approach defies a single definition. In broad terms the learner is allowed to explore the learning environment and make use of all the available

resources around him/her where the teacher involvement is less and it is just to facilitate the learning process. In summary, learner centredness is a teaching approach in which the role of the teacher is reduced to guiding, coaching and facilitating teaching.

In this approach, no child is wrong when work or task is given. This is to say that the child might be wrong in your view but in our ever-changing world, the child might be thinking about inventing a different thing which might be of help to the larger society. The learner is always encouraged to pursue all ideas that come in mind. In this approach, the use of real objects or teaching-learning resources is upheld. The facilitator should ensure s/he uses the approach to deliver the lesson. This is because learners should not be thinking in abstract but to know the exact thing and have a first-hand experience of it. This is to say, the special child, regular child and all forms of disabilities should be taken into consideration before, lesson is planned. The approach is also known as democratic education since no child is left behind. Learner centeredness approach views learners as active agents. Learners bring their own knowledge, past experiences, and ideas which impact how they take on new information and learn. Unlike, traditional learning strategy, it was informed by behaviourism where learners are seen as 'blank slates' and instructors as experts who must impact all the relevant information. This approach sees learners as respondents to external stimuli. Martha Kennedy (2016) defines learner centeredness as;

"…a classroom dynamic in which the students participate actively while the teacher might take a seemingly more passive role. It boils down to group work, one-on-one tutoring in the classroom between student and teacher, student presentations…To

learn a skill, students must be directly involved. No teacher can stand there and tell the students how to do something and expect the students to leave the classroom able to do it."

Her definition underpins cognitive learning theory, constructivist learning theory and adult learning theory. Learning theories are influenced by a particular school of thought. One thing that stands out is that the more students are engaged in the learning process, the more they will retain knowledge when they get back to work.

Traditional Teacher Approach is the regular classroom instruction which is based on lecturing, recitation and reading assignments. Although these settings may include pair work, or group work tasks, they are dealt with from a top down perspective. It refers to teaching with lecture, teacher-initiated questioning and home work with clearly specified objectives, and a well-defined content where the teacher has the primary responsibility in delivering the content.

On the other hand, learner-centred approach refers to the teaching learning process where learners are engaged to do individual work, group work, group discussion, class discussion, and conducting a project relevant to science topics which involves collaboration among students as well as groups. The evaluation is conducted based on the learners' conducting the project, project presentation, and peer evaluation apart from the mid-term and final examinations. In the learner-centred approach, "learners are closely involved in the decision-making process regarding the content of the curriculum and how it is taught" (Nunan, 1988a). Jurmo (1989) observes that the level of learner participation is crucial in determining what learner centered approach is about and may participate by simply signing up for a course and being physically

present. What is important, however, is the highest level of participation, where learners have considerable control and responsibility for classroom activities.

The idea of learner-centeredness may have been derived from the concept of childcentered education by Swiss psychologist, Jean Piaget, who contended that the teacher should not interfere with the process of maturation, but act as a guide (Lavatelli, 1973). Similarly, John Dewey's "Democracy and Education" (1916) sought social change through child-centered education. His book has many elements of student-centredness and individual differences. Even as far back as 1916, the subject seemed a major focus of concern in the realm of foreign language teaching which was not only peculiar to foreign language classrooms. In fact, in the 24th yearbook of the National Society for the Study of Education (1925) a part is devoted to "application of individual differences" to the schools (Whipple, 1925).

In addition, Burnard (1999), sums up Rogers' ideas of student-centred classroom as a learning situation where students might not only choose what to study, but how and why that topic might be an interesting one to study. Debating that knowledge is constructed by students, the lecturer is a facilitator of learning rather than a presenter of information, Burnard emphasizes that students have a "choice" in their learning. Moreover, McCombs and Whisler (1997) believes that a "learner-centered" perspective must concern itself with how to provide the most supportive learning context for diverse students–a situation created mainly when teachers value and understand individual student's needs.

Calder (2000) claims that in the late 80s, authorities (Lewis, Rumple, Scriven, Robinson and Carr) define the term "open" learning but realized that "flexible"

learning is similar to the concept by the virtue of extended access to learning through the removal of barriers, and a philosophy of learner-centred provision where learner choice is the key. Open learning is considered as a student-centred approach with the intention to ensure active removal of all study barriers have strongly emerged in the literature on educational science. In as much as assessment in a student-centred classroom is concerned, there seems to be more formative assessment which emphasizes feedback to students and enhance their learning, which does not necessarily add to the end of the course mark. Thus, researchers of learner-centred approach come across diaries, logbooks, journals, portfolios, projects, group work, profiles, peer assessments learning contracts, and negotiated assessment in the literature, all of which might be considered as essential activities contributing to Black's (1999) concern of helping students to take responsibility for their own learning; therefore, self-assessment is often emphasized in this strategy.

Knight (2002) considers contracts as goals set by the student, depending on their learning gaps, which are, in turn, negotiated with the lecturer. Black (1999) and Knight (2002) both show how the students would like to be assessed in order to demonstrate that they have achieved the goals, hence adding 'choice' to what to study as well as 'choice' in how the student will be assessed dramatic change in relationship between teacher and student. In this way the student can suggest self-assessment grades and negotiate self-assessment or peer assessment goals.

Bliss (2006), indicates the importance of sociability and human connections that authentic connection in a student-centred classroom will remove fears of failure, ridicule, family problems, the feeling of outcomes not fitting in identity issues which

can prevent students from deeper learning. In a similar line, Melander (2002) maintains that student-centred education is about coaching the student toward the development of attitudes, skills, and behaviors as a learner, decision maker, and community participant, with success measured in terms of learner outcomes. He holds that the syllabus and learning resources should guide the student's discovery, understanding, and decision-making abilities regarding learning and development in the formal curriculum. It is expected that the approach should shape the student's own capacities for self-assessing learning strengths and development needs identifying opportunities for learning growth and development, planning learning and development strategies, deciding on learning and development actions, reflecting on learning and development experiences, and initiating adjustments in learning and development strategies.

Chan (2001) describes the learner centred approach as a Western approach to teaching and learning, and may not necessarily be transferred to developing countries, like Ghana where there are limited resources and different learning cultures. Also, large class size and scarce resources make it difficult for teachers to determine and fulfil the different needs of different learners in class. Blumberg and Everett (2005) argue that the learner centred teaching method can only be implemented successfully in small classes since it is difficult to implement it in a large class because each learner has to be attended to. In summary, Hedge (2000) identified the challenges of the learner centered approach as follows:

- Lack of or inappropriate text books, learning media and material.
- Lack of teacher involvement in the curriculum development process, syllabus development and selection of text books.

- Shortage of qualified or well-trained teachers capable of successfully implementing the learner centered teaching methods.
- Novice teachers are not provided with sufficient induction and orientation on learner centered teaching strategy.

In Ghana, classes are too big due to poor and lack of infrastructure. There is a serious shortage of qualified teachers, laboratories, equipment and materials for practical subjects such as science, information and communication Technology (ICT). In fact, lack of such equipment and materials make it difficult for teachers to use learner centred teaching method. The high computer illiteracy among teachers is problematic in the implementation of the learner centred method. Most teachers are not information and communication compliance; hence they cannot use computers to implement learner centred method that required the use of computers as a medium of instruction in classrooms. For example, if the Integrated Science teacher wants to present information about volcanoes in video, audio and text, he/she may only succeed to do so if he/she uses a power point presentation through the use of projector and laptop or computer. If the teacher is computer illiterate, he/she cannot manage to plan for and go on to execute such a lesson.

2.3.2 Learner-centred Psychological Principles

Learner-centred is govern by psychological principles that provide a framework for developing and incorporating the components of new designs for educational institutions. These principles emphasize the active and reflective nature of learners.

The perspective is that; educational practice is likely to improve when the educational system is redesigned with the main focus on the learner. The principles are intended to

deal holistically with learners in the realworld learning situations. The principles are divided into cognitive and metacognitive, motivational and affective, developmental and social, and individual difference factors influencing learners and learning. Lastly, the principles are intended to apply to all learners– from children, to teachers, to administrators, to parents and to community members involved in educational system.

The cognitive and metacognitive category emphasize many of the concepts presented by constructivist learning theory. It has been observed that successful learners are those who can use existing knowledge and experience to create new knowledge. The way knowledge construction occurs vary from learner to learner, or even between different subject areas, but "unless new knowledge becomes integrated with the learner's prior knowledge and understanding, the new knowledge remains isolated, cannot be used most effectively in new tasks, and does not transfer readily to new situations, (American Psychological Association (APA, 1997). The principles within this category also emphasize the need for learners to strategically construct goals for acquiring new knowledge, using multiple learning strategies. Instructors, of course, should continually monitor their students' learning strategies and help them to assess their progress. This category also recognizes that learning is greatly influenced by contextual/environmental factors. Instructors, having full knowledge of learning environments, should do their role in adapting these environments to their learners, taking into consideration learners' level of prior knowledge, cognitive abilities, and their learning and thinking strategies (APA, 1997).

The second category, motivational and affective factors, indicate that motivation to learn is greatly affected by learners' internal disposition, such as emotional states, belief systems, and goals. Instructors should therefore develop learning tasks that

enhance the intrinsic motivations of learners. Motivation, according to the APA (1997), is enhanced when learning tasks are coordinated with learners' needs and when they are appropriate in complexity and difficulty to the learners' abilities, which they believe they can succeed.

One of the key points regarding the principles in the third category, developmental and social factors, is that learning is an interactive process. That is, learning occurs best when learners engage cooperatively in learning tasks. According to the APA (1997), in interactive and collaborative instructional contexts, individuals have an opportunity for perspective taking and reflective thinking that may lead to higher levels of cognitive, social, and moral development, as well as self-esteem.

Finally, the fourth category, individual differences, recognize the inherent differences among learners and the need for instructors to account for these differences when designing learning tasks. Namely, the category stresses that learners have innate differences, abilities, and talents, and through a variety of diverse learning experiences have acquired their own unique preferences for how they like to learn and the pace at which they learn (APA, 1997). Instructors not only need to be aware of these differences, but need to adapt their learning environments. Aside from the aforementioned differences, instructors also need to be perfectly aware of diversity with respect to ethnicity, socioeconomic status, language, and among others. Instructors who value diversity of their students, and accommodate such diversity via their instructional methodologies, can enhance the motivation of their students. In short, the ability of instructors to structure learning environments to accommodate diverse learners greatly affect learning outcomes. A final emphasis of this category is upon assessment of learning outcomes. The APA asserts that continual assessment is

necessary, to allow both instructor and student to monitor their progress. Assessment tools can take different forms including performance- based assessments, where the focus is upon the attainment of individual learning outcomes, or self-directed assessments, where the learner appraises his/her own performance.

2.3.3Science Teachers' Pedagogical Knowledge

According to Merriam Webster Online Dictionary (2015) Knowledge is define as information, understanding that one gets from experiences of education. It can also mean a state of being aware of something. Botha and Reddy (2011) asserted, teachers' knowledge can be transferred from a number of domains of knowledge which are all useful for the instruction delivery, and these include; subject matter knowledge, pedagogical knowledge, and knowledge about content of the curriculum is necessary for effective instruction. In the view of Shulman (1986), pedagogical knowledge is basic principle of teaching and classroom management. It explains teacher's knowledge about the processes and practices or methods of teaching and learning. It forms a greater part of teachers' knowledge together with content knowledge.

According to Ako (2017), there exist a variety of abilities and needs in every typical Ghanaian science classroom, thus, makes it a complex social framework. It is of no surprise when Voss (2014) noted that be able to manage classrooms, teachers are required to be aware of how diversify their classroom can be. This will help to have a very insightful teaching and learning. Meanwhile, a teacher can develop habits of the mind and dispositions toward learning if they have a deeper pedagogy and comprehends how student build knowledge and acquire skills in different ways (Mensah, 2019). Hedges and Cullen (2005) for instance maintained that, "teachers

who are well endowed with content knowledge are capable of arousing children's curiosity by giving them a valuable information.

Pedagogical knowledge demands an in-depth knowledge in aspects such as cognitive, social and developmental theories of learning and how to make them applicable to learners (Shulman, 1986). The knowledge on classroom management, lesson plan development and implementation, and student evaluation are all applicable to the learning process (Mensah, 2019). It also includes knowledge about techniques or methods used in the classroom; the nature of the target audience; and strategies for evaluating student understanding.

It has become very crucial to note that to be able to achieve learning objectives, instructors in the course of teaching students should remain focused on the subject matter, content, and incorporated pedagogy classroom objectives. Therefore, the need for integrated science teachers to effectively blend knowledge in content and pedagogy to instruct integrated science in their classrooms (Mensah, 2019). Integrated science teachers' general content knowledge, pedagogical knowledge, knowledge of curriculum materials as well as knowledge of aims and objectives of the integrated science curriculum are essential aspect of implementing the integrated science curriculum, there is a need to examine how the interchange of these aspects of the teachers' knowledge affects their classroom instructional practices.

Looking the role of teacher's knowledge play in the classroom, it is very vital that this study assess the Integrated Science Teacher knowledge in the learner centred approach introduced by NaCCA (2019). As pedagogical knowledge has become a very useful "tool of the trade" and every teacher is expected to possess it (Mensah,

2019)

2.3.3 Teacher's Knowledge about Learner Centred Instructional Strategies

Teachers may effectively practice LCIS when they possess some level of knowledge on it. The level of knowledge possessed by the teacher has more implications on the selection of content, preparation and the used of teaching learning materials and organization of group work to enhance a successful implementation of LCIS.

Researches on teachers' and teacher educators' perceptions and practice of learnercentered education reveal that some teachers are familiar with the term, only a few of them have a fair understanding of the concept and its implications (Ako, 2017; Boakye, 2019; Pomuti & Howar, 1999). Ako (2017) indicated that some teachers were somehow aware of the term "learner-centered education" but considered it as group work activities and noted that the teachers used various techniques to support learners in their learning but they did not necessarily perceive these techniques to be learner centered approach. The group work activities usually use real co-operative learning which is an authentic sharing of knowledge, or support of one another in learning and at times learners work individually whenever there was an opportunity. These group work activities have changed classroom practice indirectly and partially.

Similarly, Van Harmelen (1999) Learner Centered Education (LCE) which is interchangeably used as Child-Centered Education (CCE) is surrounded with many myths or misconceptions. One is that it is linked with particular perception of childhood whiles learner centeredness is concerned with how learning occurs and how knowledge is acquired by learners. Until teachers change this myth of CCE to be LCE, their practice will not be learner-centered since the myth of CCE has infiltrated

the learner-centered classrooms and, have seriously affected the practice of teachers. Therefore, teachers are expected to change their classroom practice accordingly.

While the use of learner-centered teaching is going on smoothly in some educational institutions, problems are being experienced (Marope & Nooman, 1995). For instance, the official meaning of the learner-centred approach to learning does not seem to be focused enough to guide the practicing teachers in the schools. Also, there is an existence of lack of integration of concepts especially between learner-centeredness and assessment, hence learner-centered teaching implies different things to different teachers. Chaka (1998) views a learner-centred curriculum as holistic in nature because it is integrated. Integrated and holistic refer to the notion of connectedness since the learner will be able to make connections of what he or she learns. Imasiku (1999), indicated that since learner-centered education focuses on the learner, it has implications on the role of the teacher and the teaching approach in terms of teaching and learning, for instructional materials, and the way teaching is organized. The teacher has to become a coach or a guide rather than an expert. The learners are to be empowered to think and take responsibility not only for themselves but also for other people's learning and development.

2.3.4 Education Reforms and Science Instructional Pedagogy in Ghana

In 1987, a new structure of education in Ghana became operational based on Government White Paper in 1974 (Adu-Gyamfi et al., 2016). In the reform, science content was extended beyond the traditional conceptual content of physics, chemistry and biology to include applications of science and technology. However, the traditional content was maintained because of little material on technology and development at the basic level of education. It has been concluded that 1987

education reform failed to meet expectations in terms of its coverage, quality, equitableness and economic utility (Ghana Education Service, 2004). AnamuahMensah (1998) said that the scientific culture presented to the African child is more of Euro-American culture which the African is required to imbibe the western culture when learning the scientific culture was part of the causes of the assumed failure.

Based on this, instructional approach recommended for teaching and learning of JHS Integrated science was child centred instruction because the integrated science curriculum emphasis on inquiry process. Inquiry based instruction by National Research Council (NRC) as cited in Appiah (2015) makes learning of science practical since it involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing existing knowledge in the light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, predictions and communicating the results (CRDD, 2012). However, in spite of its benefits and recommendation, Ghanaian Integrated science teachers still use teacher–centred method most often and the problem is the teaching methodology (FreduaKwateng & Ahia, 2005; Ngman – Wara, 2015). Straight lectures or direct-teaching, is likely not to stimulate pupil's interest enough to enjoy science as a form of knowledge construction but function more as a validation of a given knowledge (Fredua-Kwateng & Ahia, 2005). Clearly there is quite a difference between the rhetoric of policy makers and the reality of what happens in the classrooms (Anamuah-Mensah, 1998).

Student-centred learning has taken long time to be implemented because there is considerable confusion and ambiguity over the term "student-centred learning" and what it means in practice (Tangney, 2014). Unlike terms such as flipped learning, authentic learning, problem-based learning and project-based learning, which all have very specific, distinct and clearly defined meanings, student-centred learning does not have one clear, single definition. Others too cite institutional barriers, inadequate instructional resources, shortage of time allocated to each teaching period and lack of motivation to teachers because of unfavorable working condition are responsible for small practice of learner centred pedagogy.

2.3.5 Science Teachers' Learner Centred Instructional Strategies Used in Integrated Science Classroom

Many learner centred teaching methods in teaching science are determined by a number of factors such as availability of resources, the topic being covered, caliber of learners, as well as the teachers' expertise and experience on particular methods (Appiah, 2014). Authorities (McInnis, 2000; Burdett, 2003; Erickson, 2007), have suggested child centred methods and strategies to teaching and learning to promote learning. These include inquiry based method, group work method, demonstration, brainstorming, project work, integration of ICT, discussions, experiment or laboratory teaching etc.

2.3.5.1 Brainstorming

Two heads are better than one is the basis of brainstorming. Not all learning techniques need to be hi-tech and fancy; just choose a topic you want your learners to know about and ask them to volunteer what they already know because they know a great deal of knowledge and you can fill the gaps.

Brainstorming is a group process to generate ideas and or solve problems. It is a method designed to generate ideas to solve clearly defined design problems. Erickson (2007) defines it as where a large or small number of students are given a task to focus on a topic and contribute to the free flow of ideas. Brainstorming session begins by posing a question or a problem, or by introducing a topic after which learners have expressed possible answers and relevant ideas. These are then examined in an open class discussion. The teacher using brainstorming, first, discuss the question among learners and the teacher selects group representatives to explain the consensus to the whole class. The technique provides free environment to present ideas without attracting criticism from any one. Brainstorming allows student to think in pairs or groups about the answer to a question posed by the teacher (Anderson, 2005; Armbruster et., 2009; McDaniel, 2007). Brainstorming helps learners to express their own ideas and listening to what others say, learners are able to adjust their previous knowledge or understanding, and accommodate new information and increase their level of awareness (Erickson, 2007). Derting and Ebert-May (2010) also observe that brainstorming:

- focuses learners' attention on a particular topic or problem.
- generate a variety of rich ideas.
- teaches learners to accept, and respect each other's ideas and opinions.
- encourages learners to share opinions and ideas which builds on their knowledge.
- introduces learners to a practice of collecting ideas prior to beginning tasks such as writing or solving a problem.

2.3.5.2 Group work

Group work also known as cooperative learning is defined as more than one person working together to complete a task or assignment. Group work can take many forms but the goal remains to get students to interact with each other and collaborate to complete a unified task. According to Burdett (2003) and Preszler (2009), it is a method of instruction that allows learners to work together in groups. Preszler (2009) says nowadays, employers value a person's ability to work co-operatively because in the contemporary work places, people work in teams which are usually interdisciplinary and quite diverse so group work helps learners to develop group adjustment. This would positively prepare them for reality at work places. Group work allows learners to be active participants in their own learning, develop their skills such as problem solving, negotiation, conflict resolution, leadership, critical thinking and time management which are vital in the corporate world (Fink, 2004). Fink (2004) asserts that group work exposes learners to diverse ideas and approaches, which enable them to appreciate that a problem can be solved in many different ways, and through combined effort and ideas. It helps learners articulate their ideas, refine concepts and develop interpersonal and communication skills as well as allowing learners to experience situations that resemble the workplace.

Burdett (2003) said the teacher should:

- Develop learners' group work skills by helping them learn how to identify group issues, listen reflectively, and give constructive feedback, structure discussions. Manage their groups, give group presentations and compile reports. Review individual learner's contribution.
- Help learners to monitor their development, reflect on their performance and identify how they can improve.

- Clearly explain the tasks to all group members, and also explain what is expected of them. Equip learners with assessment skills and criteria to assess their group work in general and their own contributions in particular.
- Arrange proper sitting plans well in advance.

Wright (2006) asserts that the success of group work is strongly dependent on the teacher's approach. The teacher has to tell students what they are expected to do during discussions because if learners are not aware of what they are supposed to do in their respective groups they tend to make noise during group sessions.

2.3.5.3 Debates

Andresen (2000) asserts that debates consist of a structured contest of argumentation, in which two opposing individuals or teams defend and attack a given proposition. Protagoras is the father of debate implementation in an educational environment from Athens, Greece (Darby, 2007). It became death in 20th centuries America till it was resurrected over the last three decades in high schools and universities (Freeley, 2009). The reality is that classroom debate has been expanded to students in all subject areas, regardless of their academic level.

Debate is one of the most effective learner-centered teaching strategies, especially when dealing with complex topics or controversial contemporary issues such as industrial waste pollution (Newble, 1995). Debates have enables students to learn how to use the library, to reason, to analyze, to clarify ideas and to present arguments (Gervey, Drout & Wang, 2009). Advocates of debate have demonstrated that debaters consistently value and develop communication and critical thinking skills (Bedir, 2013; Hall, 2011). The Center of Organization and Restructuring of Schools study

concluded that when learners are asked to "express the results of their disciplined inquiry in written, symbolic oral discourse and in performances for audiences" lead to knowledge building (Newmann & Wehlage, 1995). Other studies have reached similar results which is now commonly classified as 'constructivism'. Based on what has been reported in the literature, the main principle of constructivism advocates that learning and education entails the active building of knowledge.

2.3.5.4 ICT Integration

The term technology currently, is an important issue in many fields including education since it has become the knowledge transfer highway in education. Technology integration nowadays has gone through innovations and transformed our societies that has totally changed the way people think, work and live (Grabe & Grabe, 2007). Therefore, educational institutions which are supposed to prepare students to live in "a knowledge society" need to consider ICT integration in their curriculum (Ghavifekr, Afshari & Amla, 2012). Integration of Information, Communication, and Technology (ICT) in education refers to the use of computer in daily classroom instructional process. ICT provides dynamic and proactive teachinglearning environment (Arnseth & Hatlevik, 2012) that improves and increases the quality, accessibility and cost-efficiency of the delivery of instruction to students. Contemporary methods of teaching that promotes learner involvement in class is integration of digital media into the classroom (Harris & Morris, 2009). Software packages enable students to practice, test and evaluate themselves as well as encourage learners to help each other. The use of ICT enables teachers to communicate with students electronically through, emails, chat groups on specific topics to generate questions and answers amongst themselves. The most successful

use of ICT is probably where learners learn to ask questions, learn from each other, so that personal learning networks are established and supported by teachers (Harris & Morris, 2009). Shelly, Gunter and Gunter (2010) attest that when teaching science subjects, the teacher can refer learners to appropriate websites for videos and text material explaining a particular strand such as food chain of different living organisms to watch these videos and read the information for better understanding of food chain. Through the use of the internet, science students can also navigate sites that have videos and information on soil erosion, volcanic eruption, and space exploration. Access to such sites, will enable learners to discover information about these topics on their own, making it easy for them to grasp concepts if such topics are taught in class.

2.3.5.5 Questioning

Questioning is defined by Andresen (2000) as an interrogative sentence or expression that is often used to generate knowledge, explore an issue, an idea or something intriguing. The art of asking questions through effective communication and information exchange underpins good teaching (Erickson, 2007). Questioning can be used to prompt students to think about what is being taught and give the teacher information on where students are up to in their learning which can help teachers to adjust instructions to meet learning needs and support students to progress towards learning goals.

In order for teachers to be able to use questioning effectively, Erickson (2007) suggested teachers should use a variety of question type, as well as varying levels of questioning.

The variety of questions proposed are factual, convergent, divergent, and evaluative or a combination of them. Factual questions are the types of questions that solicit reasonably simple, straight forward answers based on obvious facts and awareness.

Erickson (2007) asserts that factual questions are usually at the lowest level of cognitive and affective processes.

Convergent questions have answers that are usually within a very finite range of acceptable accuracy (Kember, 2009; Erickson, 2007). The questions may be at levels of cognition, comprehension, application, and analysis. Divergent questions, according to Douglas (2009) allows learners to explore different avenues and create many different variations and alternative answers. Douglas (2009) observes that divergent questions often require learners to analyze, synthesis and evaluate.

Divergent questions stimulate imagination and creative thought, or investigative cause and effect relationship, or to provoke deeper thought or extensive investigations (Erickson, 2007; Douglas, 2009). This kind of questioning is good in Natural Science, where learners are supposed to investigate a certain phenomenon up to the extent of conducting experiments. Evaluative questions are questions that usually require sophisticated levels of cognitive, emotional or affective judgement (Erickson, 2007). In trying to answer these questions learners combine multiple logical and affective thinking processes. Learners therefore need to analyze before answering these questions, because they are high order questions. Kember et al. (2009) provided some tips that enable teachers to use questioning effectively in class. He advises teachers to:

- Plan key questions to provide structure and direction to the lesson.

- Phrase questions clearly and specifically, and avoid vague and ambiguous questions.
- Adapt questions to the level of learners' ability.
- Follow up on learners' responses in order to encourage them to continue participating in class.
- Give learners time to think after asking a question.
- Use divergent questions, as question types that are more likely to produce a wide range of answers.

2.3.5.6 Laboratory Teaching

The word laboratory is synonymous with scientific investigation and is defined as a place equipped for experimental study (Omosewo, 2000). Stuart (2009) contends that laboratory teaching sessions are commonly used in the traditional science-based laboratories, but they are also often used in other areas such as computing, medicine, engineering and design. This shows that laboratories cover a broader spectrum, and are likely to develop learners' knowledge and skills in a broader way. Laboratory teaching gives first-hand experience in observation and manipulation of science materials which is superior to other methods of developing understanding and appreciation of science. The learning goals of laboratory experiences include enhancing mastering of science subject matter, developing scientific reasoning abilities, increasing understanding of the complexity and ambiguity of empirical work, developing practical skills and increasing understanding of the nature of science.

Laboratory teaching takes two major forms which are; A situation where by learners work in the laboratory.

- A situation where one person demonstrates.

When students work in the laboratory, Omosewo (2000) attests that learners work informally in pairs or groups where equipment cannot go round or not enough for all learners in the laboratories. He argues that in this scenario teachers can pose a carefully chosen questioning techniques to help learners design experiments which illustrate important concepts.

In the laboratory teaching, there is no substitute for the teacher circulating among the learners, answering and asking questions, pointing out possible applications and generally guiding students' learning (Omosewo, 2000)

2.3.5.7 Demonstrations

Generally, demonstration method is a method of lessons delivery by exhibiting things, events, rules and sequences of activities, either directly or through using instructional media which is relevant to the subject matter (Ekeyi, 2013). Demonstration method aims at showing the process of occurrence of an event according to the teaching materials, how they are attained and the ease to be understood by the students in teaching and learning process. In demonstration method of teaching, teacher actually, performs the task or certain kind of experiments for students to observe and ask various questions concerning the experiment performed. A scientific demonstration is an explanation of a process that is illustrated through an example which serves as proof or evidence of the scientific principles at work.

It is a procedure of doing or performing something in the presence of others either as a means of showing them how to do it or illustrate a principle (Obrien cited in Omosewo, 2000). In simple terms, scientific demonstration allows the student to see

the principles of science at firsthand. Demonstrations are effective for illustrating concepts in class, because they can provoke students to think for themselves (Obrien cited in Omosewo, 2000). For example, if everyday objects are used in teaching Natural Science it becomes easy for learners to be involved and participate actively in class, because the common objects are familiar with learners. These common objects can involve cups, spoons and teaspoons as well as bottles that they usually use at homes. Similarly, Douglas (2009) argues that using objects that learners know such as art objects make learners confident and interested in learning.

Demonstration method of teaching according to McKee et al. (2007) has the following benefits:

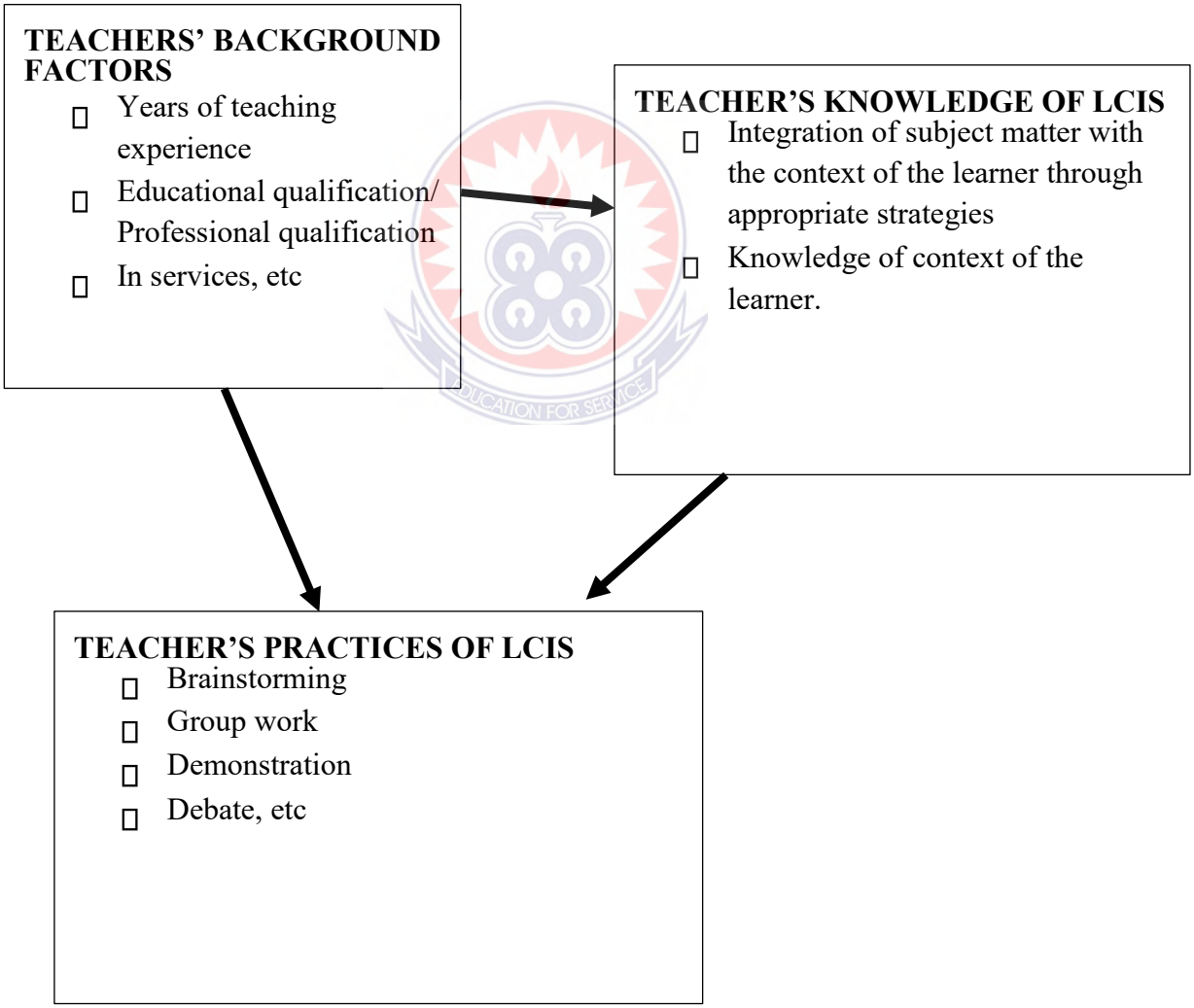
- Demonstrations are an attention inducer and a powerful motivator when used to start or end a lesson.
- Where materials and time are important factors for a particular topic, demonstrations save time and economized material usage in a big class
- Through demonstrations, learners are taught safety precautions to avoid breakages and accidents in the laboratory by showing learners the correct use of apparatus as well as how to secure reliable measurements and results.
- The demonstration method allows the teacher to carry out activities which are dangerous for learners to carry out
- Demonstrations allow learners to observe how a scientist thinks and proceeds.

Teachers Background Factors

Evidence from the education production function shows that teacher experience and education explain little variation in estimated teacher quality than professional qualification (Harris and Sass, 2011). Among teacher characteristics, beliefs, years of

teaching, commitment and personalize learning regardless of race or income level were observed to be significant in explaining instructional methodology adoption (Tangney, 2014). Additionally, it was observed that individuals felt more positive about their skills in terms of general ability or creativity as their experiences with their teachers got more learner-oriented (Altay et al., 2016; Lu & Han, 2018). An overview of teacher variables affecting teachers' approaches to teaching identified by Stes, Gijbels and Van Petegem (2007) include gender, nationality status, teaching experience, and educational training. These variables were termed as teacher demographics. Factors in the teaching context, that influence students' approaches to teaching are number and year of study of students, teaching method in the course and discipline. Student teachers' experiences during teacher education is important in defining the approaches to teaching teachers will adopt in future practices (Stes, Gijbels, and Van Petegem 2007). Diversity of characteristics of the teaching/learning environment during teacher training influence (student) teachers' approaches to teaching in practice, including: the impact of a particular course, modules, and seminars (Knudson and Maxson 2001, Cheng 2002). Additionally, students undertaking action research or qualitative research, thoughtful lesson planning and microteaching exercises are considered to be activities which determine teaching styles (Alpert 2000 and Johnson 2000). Studies on the impact of the teacher preparation programme as a whole on the teaching of student teacher claim positive effects of a course, exercises or programme on student teaching style (Gibbs and Coffey, 2004). Thus, training can increase the extent to which teachers adopt a student-focused approach to teaching. However, other studies dispute the added value of teacher education training as substantiating students' teaching styles (Clark 1985). The type of education or engaged in training specific to the acquisition of knowledge

and skills are believed to be working effectively in teaching professions that require field experience (Oermann & Sperling, 19990. Teachers' adaptation level of student centered education is "high" whereas the qualitative findings reveal that the teachers still adopt a teacher centered education in terms of "Planning", "Application" and "Assessment". Teachers' adaptation level of student centered education is not significant in terms of gender and seniority; teachers' adaptation level decreases from the primary school to high school, and the perception of teachers in terms of practicability of student centered education is not positive.



2.4 Conceptual Framework

Figure 2.1: Conceptual framework of learner centred instructional strategies

Source: Data from Researcher (2021)0

The framework shows the relationship among the variables of the study. Teachers' practices of learner centred instructional strategies are influenced by his or her knowledge of the learner centred strategies and his or her background factors such as years of teaching experience, Educational Qualification and In-Service Training. The teachers' knowledge about learner centred instructional strategies is that the teacher should be knowledgeable of learner characteristics such as ability, the needs, the interests, cognitive style and the home or classroom environment etc. The teacher should be able to integrate the subject matter with the context of the learner through his knowledge of learner centred instructional strategies. The teacher knowledge influences his/her background factors such as educational qualification which is relevant to the subject matter. The teacher should be competent with the subject matter to be able to facilitate the learner. His/her ability to do that will depend on the knowledge of learner centred instructional strategies in any given teaching and learning situation. Teachers are taken through professional training during teacher training programmes. They also have in-service training that help them to developed their skills in teaching at the various levels. They might have taken lessons on learner centred instructional strategies and even use them during their out programmes and their classroom. It is expected they use this skill to facilitate the learner participation in the lesson. The year of teaching experiences have

positive effects on the teacher use of instructional strategies that improve learner participation during the lesson. Progressively the teacher tries new methods to improve the performance of the learner. In other words, teachers try many methods that possibly improve learner's participation during lessons.

Teachers attend workshop that improve lessons.

2.5 Summary

Learner centered approach is traced to Europe and later in America before being adopted in Africa. Learner centeredness is well known teaching strategy among teachers especially natural science teachers. Teachers also practice it during lesson delivery because of the numerous benefits associated with the approach but the opinion of most teachers though diverse, centered on infrastructure and resources limitation. Learner centered approach builds learners confident, develop personal and presentation skills as well as enquiry based and critical thinking. Teachers main concern most especially in Ghana is that learner centeredness is time consuming because in Ghana teachers work with scheme of work of which they must complete to meet external examinations like Basic Education Certificate Examinations requirements. As usual, teachers believe that government and Ghana Education Service have to make appropriate teaching and learning materials available at the right place and time. State of the art classroom blocks with properly connected internet facilities to assist teachers to perform their role as guidance and facilitators' in the classroom.

CHAPTER THREE METHODOLOGY

3.0 Overview

This chapter provides detail description of the methodology employed to collect data for the study. It includes the research design, population and setting of the study, sample and sampling procedures, research instrument, data collection procedures and data analysis. It ends with ethical consideration.

3.1 Research Design

A research design is a plan or blueprint of how one intends to conduct research (Thyer; cited by Mouton, 2001). Furthermore, Huysamen, cited by Fouche and De Vos (1998), refines this definition by specifying that "blueprint offers the framework with which data are to be collected to investigate the research hypothesis or question in the most economical manner". This study adopts mixed method specifically sequential explanatory mixed method design. It involves a two-phase project in which the researcher collects quantitative data in the first phase, analyzes the results, and then uses the results to plan and collect qualitative data for the second phase (Creswell, 2014). The step by step approach to the design is provided in the fig. 3.1

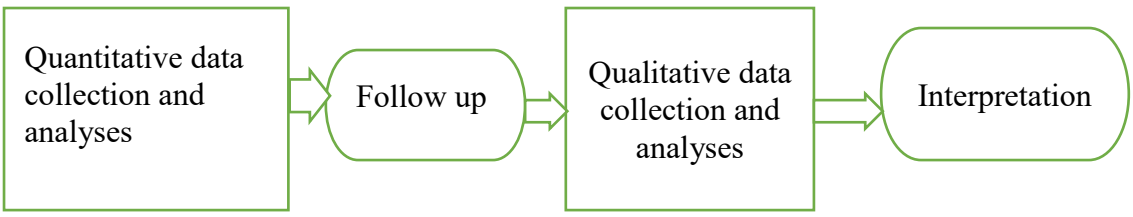


Figure 3:1 Sequential explanatory mixed method design

Source: (Creswell, 2008)

In general, mixed method research approach provides strengths that offset the weakness of both quantitative and qualitative research approaches and provides more comprehensive evidence for studying a research problem than either quantitative or a

qualitative research approach alone (Creswell, 2008). The explanatory sequential mixed methods design (also called a two-phase model; Creswell & Plano Clark, 2011) helps explain and elaborate the quantitative results. Thus quantitative results usually provide a big picture of the research problem such that qualitative data is needed to refine, and explain the big picture to make it more understandable.

The researcher used a questionnaire as the main instrument to collect quantitative data on integrated science teachers' knowledge and practice of learner–centred instructional strategies in Sefwi-Wiawso. The questionnaire is inexpensive and is described as the most affordable ways of collecting data especially self-administered questionnaire. It is also practical way of collecting data.

Observation check list was used to determine teachers' instructional practices utilized in the classroom. Interview was used to explore integrated science teachers' knowledge and instructional strategies used in teaching integrated science. The qualitative data instruments were observation and interview guide. Observations help you to identify and guide relationships with informants, to learn how teachers use learner centered strategy and how they organized and prioritized the learner during the lesson delivery (Kawulich, 2012).

3.2 Setting

The research was conducted in the Sefwi - Wiawso in the Western North Region of Ghana (Figure 3.2)

Figure 3.2: Map of Sefwi - Wiawso Municipality

The Sefwi-Wiawso Municipality has a total population of 139, 200 of which males accounted for 50.1%, and 49.9% being females. The Municipality has a youthful population with 41.2 percent of the population being youth. The aged 65 years and above constituted 5.2% of the population (Ghana Statistical Service, 2010). For education, seven out of ten (71.5%) of the population are literate whiles 28.5% are illiterate. The proportion of literate males (78.5%) is higher than females. The proportion of males who could read and write English and a Ghanaian language was 72.1% as compared to 27.9% of their female counterparts (Ghana Statistical Service, 2014). Two-thirds (67.1%) of the population are cash crop famers, others in forestry 28.1% and a small proportion are professionals (3.6%), managers and clerical (1.2%).

The study area has three tertiary institutions namely Wiawso College of Education, Wiawso and Asafo Colleges of Health and four senior high schools made up of Sefwi Wiawso Senior High School, Sefwi Wiawso Senior High Technical School,

Asanwinso Senior High School and St. Joseph Senior High School. There are one hundred and five public and private junior high schools in the municipality. Sefwi – Wiawso Directorate of Education is divided into eleven circuits: Paboase, Bosomoise, Wiawso "A", Wiawso "B", Anyinabrim, Dwinase, Boako, Asawinso "A", Asawinso "B", Sui and Asafo. The number of basic schools, both public and private, in the Paboase (7), Bosomoise (8), Wiawso "A" (9), Wiawso "B" (8), Anyinabrim (10), Dwinase (13), Boako (13), Asawinso "A" (12), Asawinso "B" (7), Sui (8) and Asafo (10) (Sefwi-Wiawso Education Directorate, 2020).

3.3 Population

A research population is largely well-defined collection of individuals having similar features (Castillo, 2009). The target population is the total group of subjects to which a researcher would like to generalize the results of a study while an accessible population is the group of subjects that the researcher can reach for the study from which the study sample can be drawn (Castillo, 2009). There are 105 public and private Junior High Schools (JHS) in the Municipality. The target population for the study comprised all Junior High Schools teachers in the Sefwi-Wiawso Municipality which was 945. Among this total number of teachers in the municipality, 141 JHS Integrated Science teachers from both public and private schools in the Sefwi-Wiawso Municipality were distributed among eleven circuits (Table 3.1). Private schools integrated science teachers were included to increase sample size which is good for quantitative analysis to yield reliable and valid results that can help to generalize results since in the quantitative data analysis, the larger the sample size, better the results for the generalization of conclusion.

Integrated Science Teachers were used as unit of analysis because of Ghana government policy on STEM in the new curriculum which puts much emphasis on critical thinking skills and passion for innovation to promote technological advances. Integrated Science Teachers knowledge and practice of learner centred approach would help reduce the fear of science and arose pupils interest at the senior high schools to opt for science. According to Ohize, (2017), learning science, assists in the problem-solving and exploratory learning that has fueled success across a variety of tasks and disciplines such as technology.

3.4 Sample Size and Sampling Techniques

A sample is portion of the whole. It is defined as a group of relatively smaller number of people selected from a population for investigation purposes (Alvi, 2016). According to Neuman (2000), a sample is a smaller set of cases a researcher selects from the larger pool, and generalizes to the population. The sample size for this study was 141 Junior High School Integrated Science teachers from 105 schools in the Sefwi-Wiawso Municipality in the Western North Region of Ghana.

The study adopted multiple sampling techniques. The first sampling technique was census, followed by quota, and finally purposive sampling technique. Census technique was used to select participants for the study. The justification for the use of census sample technique was that the sample size was equal to the accessible population in the Municipality since the number of integrated science teachers in the research area was small and formed about 15% of the target population. Also, quota sampling was used to ensure gender representativeness. In addition, purposive sampling was used for the selection of teachers for the interview and observation of Integrated science teachers.

The purposive sampling was used to solicit persons with specific characteristics and knowledge on the phenomenon being studied in a research (Patton, 1990; 2002; Johnson and Christensen, 2004). For example, people may be chosen for a study because they all hold a particular position or they possess a particular attribute that is relevant to the study**.** Purposive sampling was chosen because JHS Integrated Science teachers are the people who can give the required information needed for the analysis. Table 3.1 presents a breakdown of the Municipality into educational circuits and the number of schools and JHS teachers in each circuit. Table 3.1 gives a picture on the distribution of integrated science teachers and the number in each circuit to inform sampling technique to adopt for the study. For, instance, Dwinase and Wiawso 'A' and 'B' have large number of integrated science teachers because of more schools in the capital of the Municipality.

Table 3.1: Distribution of the sample

Name of Circuit	**Junior High School**			
	Public school	**Int. Science Teachers**	**Private school**	**Int. Science Teachers**
Paboase	5	7	2	3
Bosomoise	6	6	2	2
Wiawso "A"	5	9	4	6
Wiawso "B"	6	8	2	3
Anyinabrim	6	6	4	5
Dwinase	8	14	5	7
Boako	6	8	7	9
Asawinso "A"	6	8	6	8
Asawinso "B"	5	7	2	2
Sui	7	7	1	2
Asafo	6	8	4	6
Total	**66**	**88**	**39**	**53**

Source: Sefwi-Wiawso Municipal Directorate, EMIS (May, 2020)

The selection of respondents for the observation and interview was based on quota sampling technique where fifty percent each was assigned to males and females

respectively. The equal selection of male and female teachers was based on European Commission 2020 Horizon guideline, which makes rules for gender inclusion as elements of European Union grant evaluation and monitoring (Rabesandratana, 2021). Purposive sampling technique was used to select circuit and schools since the objective was to ensure representativeness of the sample for the study. According the concept of information power, a sample size of ten(10) for qualitative data analysis gives indepth knowledge on a phenomenon (Hagaman &Wutich, 2017). In empirical studies. Hagaman & Wutich, 2017 confirmed that a sample size of at least 10 for qualitative data analysis should be good to give full description of phenomenon since there is saturation and repetition of information after the twelfth interviewee. Based on the literature, the study used a sample of 10 was deemed sufficient for the analysis to give reliable conclusion.

3.5 Research Instruments

The instruments used to collect data for the study were questionnaire, classroom observation guide/list and interview guide. The questionnaire was used to collect quantitative data on the junior high school integrated science teachers' knowledge on learner centred instructional strategies and observation and interview guide were used to collect qualitative data on the teachers' instructional strategies in their classroom. The instruments were administered sequentially. The questionnaire used in the first phase of the data collection for the study provided primary data on the basis of which the classroom observation and interview guide were carried out at the second phase of the data collection respectively. The observation and interview were done on the same day. After the observation, ten minutes break was allowed before, interview followed. The instruments are described in the following sections.

3.5.1 Questionnaire

A questionnaire is an instrument of data collection that asks participants to give written or verbal replies to a written set of questions Kothari (2004). Many scholars have enumerated the benefits of using questionnaires in a study. For instance, Kothari (2004), noted that the use of the questionnaire is a quick, convenient, and inexpensive method of collecting standardized information for statistical analysis. Besides, Kothari observed that questionnaire provides the opportunity to use large samples in collecting more reliable data. Therefore, the use of the questionnaire is economical in the expending resources in a study.

Another rationale that informed the choice of the questionnaire in this study was based on Bryman (2008) assertion that the questionnaire is appropriate to collect information on attitudes, knowledge, and experience of staff. In addition, questionnaire has ability to ensure anonymity and authenticity in data collection. This claim was alluded to by Bryman who maintained that the questionnaire affords freedom for respondents to give their answers without being interfered with or influenced by the researcher, and thus enhances more thoughtful answers. Despite these merits, the use of the questionnaire has weaknesses. Ary, Jacobs, Razavieh and Sorensen (2006) cited a low response rate and possibly unreliable responses as drawbacks of using the questionnaire. However, the researcher endeavored to increase the response rate by encouraging respondents to fill the questionnaires and submit them promptly. Besides, the items of the questionnaire were simple and few to encourage quick response and submission.

The closed-ended questionnaire was chosen because it helped to reduce the burden of respondents providing their own answers, and facilitated a quick statistical analysis

(Polit & Beck, 2009). Except for the socio-demographic information, the rest of the questionnaire items comprised the Likert-type items. Polit and Beck supported the choice of the Likert-type scale in terms of high degree of validity even if the scale contains a few items, and also have very high reliability.

The questionnaire was made up of three parts (Appendix A). Part I gathered demographic information of the respondents such as gender, age, academic qualification, and work experience. These variables were categorical such that respondents were required to tick (√) only one option as related to them. These items were important so as to provide answers to research question two. Part II contained items on teacher knowledge on learner centred. The questionnaire asked the participants to rate their knowledge on learner centred which were measured on a 5point Likert-scale such as Strongly Agree (SA) = 5, Agree (A) = 4, Neutral (N) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. Part III of the questionnaire gathered the views of the participants on the use of learner-centred approach to improve students' performance integrated science. The respondents were required to choose only one option to reflect their view.

3.5.2 Observation schedule

A non-participant observation schedule was used to collect data on integrated science teachers' classroom practices. The observation schedule was an inquiry based which was developed by Bybee (2006) (Appendix B) and adapted for this study. Bybee model involves five phases (Engagement, Exploration, Explanation, Elaboration and the Evaluation). The adaptation of the observation schedule was to examine teachers use of learner centred technique during introduction, presentation and evaluation stages of lesson delivery. The introduction stage was made up 6 indicators which

sought to find out how teachers stated the purpose of the lesson, create curiosity, raise appropriate questions, elicits responses that uncover prior knowledge, identifies and records student thinking and create the opportunity for pupils to question. The presentation stage was made up of 22 indicators which sought to determine how integrated science teachers practiced learner centred instruction technique while the evaluation stage was made up of 7 indicators which sought to find out how teachers evaluated their lessons and guided pupils to apply concepts. The use of any activity on the checklist was identified by ticked against that behaviour. In this identification, all judgments were used liberally; for instance, a mere occurrence of an item was seen as being used.

3.5.3 Semi-structured interview guide

Semi-structured interview guide (Appendix C) was used to collect qualitative data to validate the information provided on the questionnaire. After quantitative analysis, the researcher designed a set of key questions before the interview takes place, but builds in considerable flexibility about how and when these issues are raised. The researcher allows a considerable amount of additional topics to be built on, in response to the dynamics of conversational exchange (Dampson & Mensah, 2014). Semi-structured interviews ensure flexibility of follow-up questions that may arise in the course of interviewing and create room for easy responses to these questions (Bryman, 2008).

The interview guide was made up of 4 items which sought further clarification on the information provided on the questionnaires. The 4 open-ended items on the interview allowed for further probing based on the responses given by the participants.

3.6 Validity of the Instruments

Validity of a research instrument is determined by how well it measures the concept(s) it is intended to measure (Awanta & Asiedu-Addo, 2008; Ruland, Bakken & Roislien, 2007). It indicates the degree to which an instrument measures the construct under investigation. Face and content validity were used for the instruments.

3.6.1 Face validity

The researcher gave the instruments to colleagues' graduate students of the University of Education, Winneba and the supervisor to establish the face validity of the instruments. They were requested to carefully scrutinize and assess the relevance issues such as length of questions, framing of questions, and ambiguity. The feedback from the graduate students and the supervisor were used to adjust the instruments.

3.6.2 Content validity

Content validity is a measure that gauges whether there is adequate coverage of all the research questions (Cooper & Schindler, 2008). It indicates whether the technique assesses or measures what it is supposed to measure (Ruland, Bakken & Roislien, 2007). In other words, it is a judgmental assessment on how the content of a scale represents the measures. An effort was made to ensure that the items of the instrument covered all the research questions posed in the study which were supposed to be answered from data obtained from the questionnaire, interview guide and observational guide. Also, supervisors and some lecturers were served with copies of the questionnaires, interview guide and observation schedule to determine whether the items covered all the research questions. Face to face discussion with these people helped to cover the necessary content that can answer the research questions appropriately.

3.7 Reliability of the Instruments

Reliability refers to the consistency and dependability of a test results. It is often defined as the degree to which a test is free from errors of measurement (Ebel & Frisbie, 2007). A test is reliable if similar result repeatedly obtained that is, the extent to which results are consistent over time and if the results of a study can be reproduced under a similar methodology (Ebel & Frisbie, 2007). The criteria used were: credibility, dependability, confirmability, transferability, thus their consistency over time and confirmability, thus, how well suited them are with the objectives of the study

3.7.1 Questionnaire

In order to ensure the reliability of the questionnaire, the questionnaire was piloted using twenty teachers in Juaboso District of the Western North Region of Ghana. This is because the District has similar features with the study area. The reliability of the items on the instrument was verified by examining the Cronbach Alpha reliability coefficient of the instrument. The analysis of the items on the instrument for the pilot test was done using the Statistical Package for Social Sciences (SPSS) software version 22. The overall Cronbach alpha value for integrated Science teachers' level of knowledge on learner centred instructional strategy questionnaire was 0.6. The result indicates that the items on the questionnaire had reliable internal consistency and therefore capable of measuring what the instrument purported to measure. The result is in line with Creswell (2014) benchmarked Cronbach Alpha reliability coefficient of greater or equal to 0.50.

3.7.2 Observation schedule

Two Integrated Science teachers with long service experience were sampled and trained as research assistants. They were trained on the purpose of the study, and how to administer the instruments. These teachers became research assistants who observed one lessons each of Integrated Science teachers' who were not participants in the second phase of the data collection. The results of the observations by the assistants and that of the researcher were compared and discussed to resolve any discrepancies. This was followed up by another set of observations by the assistants and the researcher for the former to further improve their skills on the administration of the instrument. The results for the inter-rater reliability for first and second trails were 70% and 76% respectively. The improvement from 70% to 76% is within the range reported in the literature (Patton, 2002)

3.7.3 Semi-structured interview guide

The interview guide was also pilot tested to identify potential deficiencies before it was used for the actual study. Some of the wordings and sentences were re-structured and re-framed respectively before the interview guide was used for the actual study. Bell (2008) points out that, the usefulness of a pilot exercise is to get the bugs out of the instrument so that respondents in main study will have no difficulties in completing it. Best and Khan (2006) affirmed that, when assessing the scope of the guide, it is important to review whether it allows participants to give a full and coherent account of the central issues and incorporate issues they think are important. The trustworthiness and credibility of the instrument were determined.

a) Trustworthiness of the Interview Guide

Trustworthiness is to evaluate the worth of qualitative research. To establish the trustworthiness of a qualitative study, researchers have to ensure credibility, transferability, dependability and confirmability of qualitative findings (Babbie, Mouton, Voster & Prozesky, 2009). In this study, the researcher adopted Babbie, et. al., (2009) model of establishing trustworthiness as a means of evaluating the worth of the study through elements such as confirm, dependable and transfer of instrument. The model was adopted because it was conceptually developed and is widely accepted and used by qualitative researchers.

b) Credibility

The semi structured interview guide was subjected to credibility test to determine how confident the researcher is in the truth of the research findings (Babbie, et. al., (2009). The credibility of this study was increased by the use of member checks. This was determined through peer review process where the recorded interview responses and transcripts were presented to participants to verify. The findings were also italicized by the researcher in every step of data analysis to provide justification for the decision taken (audit trial).

c) Transferability

Semi structured interview was subjected to transferability to determine how the researcher demonstrated that the research findings were applicable to another context (Patton, 2007). To facilitate transferability of the results, the researcher reviewed literature extensively to support claims in the findings.

d) Confirmability

Confirmability refers to a proof that data and interpretation of findings are not fabrications from the researcher' imagination, but are truly derived from participants (Babbie et al., 2009). To establish this, the interviews were audio recorded and transcribed verbatim.

3.8 Data Collection Procedure

The researcher obtained letter of introduction from the Department of Basic Education of the University of Education, Winneba which was used to obtain permission from the Municipal Director of Education and Heads of the Junior High Schools to carry out the study.

Table 3.2: Schedule of data collection

Visit	Purpose
First visit	Distribution of letters and getting acquainted with Head teachers and JHS Integrated science teachers
Second visit	Taking teachers through the purpose of the exercise and Administration of questionnaires
Third Visit	Collection of questionnaires
Fourth visit	Observation of the sampled teachers
Fifth Visit	Interview of the sampled integrated science teachers

Data were collected in three phases. The first phase involved the administration of the questionnaires. The second phase involved observation while the third phase involved interviews. The arrangement in Table 3.2 guided the data collection phase of the study.

3.8.1 Quantitative phase

The researcher went to the various schools and distributed the questionnaire to the teachers in the Municipality. The researcher encouraged the teachers to complete the questionnaires within a day for the researcher to collect the completed instrument. This was to ensure that teachers did not get the opportunity to communicate among themselves or refer to other materials for information. It took ten days for the researcher to administer the questionnaires to the selected teachers in the Municipality.

3.8.2 Qualitative phase

After the collection of the quantitative data, the researcher went to the participants in the selected schools to observe their lessons and interviews. Two teachers were observed and interviewed each day. The observation and the interview lasted for five days. The researcher and the assistants observed and ticked items of the observation checklist of practices exhibited by the teacher in the process of lesson delivery. The key used to score participant's performance on the observation schedule were: No Evidence = 0; Minimum Evidence = 1; Some Evidence = 2; Clear Evidence = 3; Clearer Evidence = 4. The interview was done ten minutes break after the lesson observation for the teachers to rest for some time.

In order to maintain confidentiality in this study, the researcher used symbols, T1, T2, T3, T4, etc, to represent each of the observed teachers (participants). The JHS science teachers were not given specific topics to teach for the classroom observations. Integrated Science Teachers taught topics based on their scheme of work for the term. Each Integrated Science teacher was observed once and each observation lasted for about 70 minutes equivalent to a double period stipulated on the school's teaching

time table. Each participant was interviewed ten minutes after the observation. The researcher further probed the participants for more information. The one-on-one interview duration was about 30 minutes. The interviews, with the permission of the interviewees were audio-tape recorded and later transcribed by the researcher.

3.9 Data Analysis

According to Berg cited by Ako (2017) data analysis involves organizing data into manageable themes, patterns, trends and relationships. The data collected for the study was analysed separately as quantitative and qualitative data.

3.9.1 Quantitative data analysis

Descriptive statistics and Correlation function (Spearsman Correlation) of Statistical Product for Service Solution (SPSS) software version 22 were used to analyse the quantitative data. The descriptive function of SPSS was used to organize the sample's responses to the items of Part II and III of the questionnaires into frequencies and converted into percentages. The results of the analysis of the items of part II were used to answer research question one while those of part III were used to answer research question four.

Spearman Roll correlation was used to establish possible relationship between JHS integrated science teachers' background factors and their knowledge of learner centred approach.

According to Leech, Barrett and Morgan (2005), Pearson Product-Moment correlation technique allows concurrent determination of relationship between varying variables.

The correlation provides information on the closeness of two variables. It is used when the data is interval in nature as derived from the Likert scale (Pallant, 2012; Tabachnick & Fidell, 2001).

Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. The correlation result being significant at $p < 0.05$ means that the probability of obtaining the correlation by chance is five out of 100 (5%). An alpha value of 0.05 indicates that the risk of concluding that a correlation exists and actually, no correlation exists is 5%. The p-value tells you whether the correlation coefficient is significantly different from zero (0), (Obilor, &r4 Amandi, 2018).

3.9.2 Qualitative data analysis

The data collected through the observational schedule was used to validate the teachers' responses on the quantitative data and also to determine whether the instructional strategies of integrated science teachers were inquiry-based and child-centred. The data was analysed based on themes and patterns after transcription. This involves subjecting the data to severally analytical phases such as: familiarizing yourself with your data, transcribing the data, reading and re-reading the data, writing down initial ideals. Generating initial codes by coding interesting features of the data in a systematic way across the entire data set by collating data relevant to each code. The developed themes were checked in relation to the coded extracts and the entire data set in order to generate thematic map of the analysis (Braun & Clarke, 2007). Another step was developed `to define the analysis to refine the specifics of each theme and generate clear definitions and names for each theme which allows selection of clear final analysis of selected extracts relating to the research questions and

literature and finally to produce scholarly report of the analysis (Braun & Clarke, 2007).

The responses from the interviews were audio-taped and transcribed verbatim. The transcripts were read severally to familiarize with the structure and also to identify the unique themes that best corresponds to each research question. The transcripts were later coded inductively and the codes were developed into themes. This led to identifying and establishing relationship among ideals and putting them into set on basis of logical similarities. The data was organized under the various themes generated from the codes to facilitates the discussion. For the sake of anonymity, T1, T2, to T10 were assigned to the respondents in the interviews schedule and used to present the data.

3.10 Ethical Consideration

Ethical issues that were considered in this study were the permission to informed consent and voluntary participation for data collection, confidentiality, anonymity and the protection of participants (Berg, 2001; Patton, 2002).

Informed Consent: the participants were told of the relevance of the project and how they can participate.

Voluntary Participation: participants were not force to participate but voluntarily participated in the data collection process. They were informed that at any point in time they can opt out of the process.

Confidentiality and Anonymity

Confidentiality and anonymity were ensured that no one could identify the participants from the information provided. This was done by not indicating names, addresses and particular names of individual schools of participants. All these were not indicated on the formal report presented. Participants were given code names instead of their real names.

CHAPTER FOUR RESULTS

4.0 Overview

This chapter focuses on the presentation of the results. The chapter is structured into five broad sections. The first section focuses on the demographic data while the remaining four sections issues present the results of each of the four objectives and their corresponding research questions.

4.1 Demographic Information on the Study Sample

Demographic information of each participant was collected. Table 4:1 presents the demographic characteristics of the respondents. A questionnaire was administered to 141 integrated science teachers both in Public and Private schools in the Municipality. Out of the141 targeted respondents, 128 participants completed and submitted their questionnaire making a return rate of 90.8%. Out of the 128 integrated science teachers, 71.9% was from Public schools and 28.1% from Private schools. This attested to the fact that more than half of the integrated science teachers in the Municipality are from public schools. This is not news, since we have more public schools than private. Also, public schools' teachers do part time teaching in most of these private schools.

Additionally, Table 4.1, showed that, out of 128 teachers, 57.8% (n=74) were males and 42.2% (54) were females. This showed that majority of integrated science teachers in the Municipality at the time of this study were males. From Table 4.1, majority of the teachers (67.2%, 86) in the Municipality were professional teachers, 32.8% (42) were non-professional teachers.

Table 4.1: Summary of Demographic Characteristics of Public and Private Integrated Science Teachers in Sefwi Wiawso Municipality (n = 128)

Demographic Profile		Number of respondents (n= 128)	Percentage (%)
School Type	Public	92	71.9
	Private	36	28.1
Sex	Male	74	57.8
	Female	54	42.2
Professional Status	Professional Teacher	86	67.2
	Non-Professional Teacher	42	32.8
Professional qualification(s)	SSCE HND	18	14.1
		23	18.0
	Cert 'A' 4-year\Cert 'A' Post Sec	3	2.3
	Diploma (Basic/ Education)	36	28.1
	B.Ed. Basic education	46	35.9
	B. Ed. Science degree	2	1.6
Number of years of teacher experience	0-3 years	6	4.7
	4-6 years	28	21.9
	7-10 years	30	23.4
	more than 10 years	64	50.0
Junior high classes taught	JHS 1	19	14.8
	JHS 2	24	18.8
	JHS 3	8	6.3
	JHS 1&2	7	5.5
	JHS 1&3	34	26.6
	JHS 2&3	30	23.4
	JHS 1,2 &3	6	4.7

Source: Field Data, 2021

It also emerged that Bachelor of Education (B.Ed.) degrees (37.9%, 46) was the highest academic qualification for the JHS Integrated Science teachers. This was followed by Diploma in Basic Education (28.1%, 36), then followed by SSCE/WASCE (14%, 18).

Table 4.1 further showed that, integrated science teachers had varied years of teaching experience. The teachers' years of teaching experience ranged from less than a year to ten years and above. The respondents who had taught for less than 1 to 3 years were 6 (4.7%, 6) while those who have taught between 4-6 years were (21.9% 28). While teachers with 7-10 years of teaching experience were 30 (23.4%), 50% (64) of the respondents had more than 10 years teaching experience. This indicates that average teaching experience is about seven.

The results further indicate that 14.8% (19) of the respondents taught in JHS 1, 24 (18.8%) in JHS 2 and 8 (6.2%) in JHS 3. It was further observed that 7 of the respondents (5.5%) taught in JHS1 and 2, 34 (26.6%) in JHS 1 and 3, 30 (23.4%) in JHS 2 and 3 and 6 (4.7%) in JHS1,2 and 3. This showed that majority of teachers taught more than one class. The implication is that the Municipality needs more qualified teachers especially in the villages and hinterland in the Municipality

4.2 Research Question 1

What is the level of integrated science teacher's knowledge on learner centered instructional strategy in Sefwi-Wiawso Municipality?

The research question sought to find out the level of JHS integrated science teachers' knowledge on learner centred instructional strategy. The sample's response to items on part II of the questionnaire (Integrated Science Teachers knowledge on learner centred) were organized into percentages, mean scores and standard deviations. The analysis was based on Dess, Lumpkin and McFarlin (2005) mean score that when the individual variable mean is less than the average (strongly agree to strongly disagree) indicate low level and vice visa for high level.

Table 4.2: Teachers knowledge level on learner centred instructional strategies

Indicator	Obs	Percentage Responses					Total	MS	SD
		SA	A	N	D	SD			
1 Learner-centered approach is the best method to teach integrated science in JHS	128	21(27)	38(49)	23(30)	11(14)	6(8)	100	2.77	0.43
2 With learners centered students are able to share ideas among themselves	128	23(29)	32(41)	22(28)	12(15)	12(15)	100	3.58	0.49
3 Student's participation is very strong when learning is centred among them	128	27(34)	36(46)	19(24)	8(10)	9(12)	100	3.58	0.49
4 Performance of students increases when lesson is centered on them	128	27(35)	36(46)	18(23)	9(11)	10(13)	100	3.42	0.49
5 Students ask questions in integrated science when lesson is centered on them	128	29(37)	34(44)	19(24)	9(12)	9(11)	100	3.17	0.744
6 In learner-centered, students are allowed to share ideas together when teachers act as facilitator	128	34(43)	30(39)	16(21)	20(25)	0(0)	100	2.78	0.19
7 Students relate well with teachers when they are involved in the lessons	128	33(42)	30(36)	10(13)	18(23)	11(14)	100	3.38	0.49
8 Students are able to find solutions for themselves when lesson is cantered on them	128	34(44)	33(42)	13(17)	9(12)	9(13)	100	3.69	0.47
Grand mean score								**3.35**	

*Frequency in parenthesis

Thus, a mean score of 2.9 or less represents low level while mean score greater than or equal to 3 represents high level (Dess, Lumpkin & McFarlin, 2005).

The result of the analysis is presented in Table4.2. Table 4.2 indicates that the mean scores ranged from 2.77 to 3.69. It is only one item (items 6) that had a mean score below the cut-off point of 2.9 score. The high mean scores indicate that respondents generally showed high level of knowledge about learner centred instructional strategies. This is exhibited by the reasonable high level of grand mean score of all the indicators of (**M**= 3.35). The high grand mean score of 3.35, indicates therefore that

the JHS Integrated science teachers collectively had high level of knowledge on learner centred instructional strategies.

Also, the specific mean score for each of the indicators showed varied mean scores which indicate the importance of the variable in JHS integrated Science teachers' knowledge level. Respondents generally do not believe that learner-centred approach is the best method to teach integrated science in JHS since it had the least mean score (**M**= 2.77; SD=0.425). However, these respondents believed that with learner centred approach, learners are able to share ideas among themselves (**M**= 3.58; SD=0.496); learners' participation is very strong (**M**= 3.58; SD=0.496). They further agreed that performance of students increases when lesson is centred on students (M = 3.42; SD=0.496); learners ask questions in integrated science classroom when lesson is centred on them (**M**= 3.17; SD=0.744); in learner-centred, students are allowed to share ideas together when teachers act as facilitator (M= 3.17; SD=0.379).

Additionally, the results revealed the respondents' understanding of the fact that learners relate well with teachers when they are involved in the lessons (M = 3.38; SD=0.486). The findings also showed that the respondents believed learners are able to find solutions for themselves when lesson is learner centred (M = 3.69; SD=0.465). In ordinal ranking, learners centered students are able to share ideas among themselves, Student's participation is very strong when learning is centred among them and Performance of students increases when lesson is centered on them are the most important items that explain knowledge on learner centred instructional strategies.

Generally, the results from each of the indicators show that the respondents (Teachers) had reasonable understanding of the implications for practicing learners' centred

strategy. The standard deviation revealed that there are no high dispersions among the individual observations. The overall level of JHS integrated science teacher's knowledge on learner centred instructional strategy is high across all the relevant indicators.

Research Question 2

What relationship exists between integrated Science Teachers' Background factors and Knowledge level on learner centred instructional strategy?

4.3 Testing the Research Hypothesis One

H0: There is no statistically significant relationship between JHS integrated science teachers' background factors and their knowledge level on learner centred instructional strategies

H1: There is statistically significant relationship between JHS integrated science teachers' background factors and their knowledge level on learner centred instructional strategies

This research hypothesis sought to determine the relationship between teachers' background factors (Years of teaching experience, Professional qualification, Inset and their knowledge level on learner centred instructional strategy. Spearman Rho correlation analysis was run between JHS integrated science teachers' background factors and their knowledge level on the learner centred instructional strategy.

The descriptive statistics of teachers' background factors is presented in Table 4.3. Among the JHS Integrated Science teachers, teachers background factors (TBF), average mean score is 3.24, professional qualification had the highest mean score of

3.60 followed by in- service training with a mean score of 3.53 while, years of teaching experience had a mean score of 2.65. (Table 4.3)

Table 4.3: Descriptive statistics of integrated science teachers' background factors

Background factors	Mean Score	Std Dev
Professional qualification/ Education(PQ)	3.570	1.243
Year of teaching Experience(EX)	2.64	1.072
In-Service Training	3.533	1.084
TBF	3.24	2.354

Source: Field Data, 2021

From Table 4.3, professional qualification and in-service training had the highest mean scores above the benchmark of three (3.0) and this makes these two variables (professional qualification and in-service training), important determinants of the background factors. This is not surprising, because professional qualification means the teacher had full knowledge of pedagogical theories that makes perfect teacher. In addition, the high mean score of in-service training attests to the importance of workshops and conferences that are organized by Ghana Education Service and other agencies. Hence teachers should always try to attend these workshops and conferences.

Table 4.4 presents the analysis of the hypothesis two (2) that tests significance of the relationship between integrated science teachers' background factors and their knowledge level on learner centred instructional strategies using Spearman Rho correlation.

From Table 4.4, the correlational results between teachers' background factors and

JHS integrated science teacher's knowledge level on the learner centred instructional strategies revealed that there is positive but weak correlation (r=0.153, p>0.05) between integrated science teachers' background factors and knowledge level of JHS integrated science teachers on learner centred instructional strategies and also insignificant relationship between professional qualification and knowledge level of JHS integrated science teachers on learner centred instructional strategies.

Table 4.4: Spearman Rho correlation: Relationship between integrated science teachers' background factors and knowledge level on learner centred instructional strategies

Indicator	(KL)	PQ	EX	INSET	TBF
Level of Knowledge (KL)	1				
Professional qualification/ Education (PQ)	0.172*	1			
Years of teaching Experience (EX)	0.118	0.139	1		
In-Service Training (INSET)	0.023	-0.014	0.089	1	
Teachers Background Factors (TBF)	0.153	0.746**	0.492**	-0.068	1

Note: * P≤ 0.01, **P≤0.05 and *** P≤ 0.01 **Source:**

Field Data 2021.

This weak positive correlation was statistically insignificant at 5% level. It can be deduced that, there is enough evidence to accept the null hypothesis that there is no statistically significant relationship between JHS Integrated Science teachers' background factors and their knowledge level on learner centred instructional strategies. Hence, the hypothesis two (2) shows that there is a statistically significant relationship between JHS Integrated Science teachers' background factors and their knowledge level on learner centred instructional strategies cannot be supported.

Though correlation is not causation, what is established in this work is a mere relationship between teachers' background factors and JHS Integrated Science Teachers knowledge level on learner centred instructional strategy. The positive sign result means that an increase in any of the background factors of teachers also

increase that of JHS Integrated Science teachers' knowledge level on learner centred approach. The study therefore concludes that teachers' background factors do not have significant relationship with teachers' level of knowledge on learner centred instructional strategy. It can be established that integrated science teachers' background factors generally associate with teachers' knowledge on learner centred strategy.

Specifically, the correlation between years of teaching experience ($r=0.118$, $p<0.05$), in service training ($r=0.023$, $p<0.05$) on one hand and knowledge level on the other hand were statistically insignificant. The implication is that experience, and in-service training of teachers do not have a great effect on introduction of new policies and methods of teaching which include learner centred instructional strategy. Surprisingly, there was negative weak correlation between level of knowledge on learner centred approach and professional qualification. This may be attributed to pre service or new teachers with no experience in the system and seniority thinking bias like I would not worry myself since I am about retiring.

4.5 Research Question 3

To what extend is JHS integrated science teachers' background factors relate to their practice of learner- centred instructional strategies.

The research question three (3) sought to determine the extent to which JHS Integrated Science Teachers' background factors relate to their practice of learnercentred instructional strategies.

Spearman Rho correlation was run between JHS Integrated Science Teachers'

background factors and their practice of learner- centred instructional strategies. Table 4.5 presents descriptive statistics on learner centred instructional strategies. It can be shown that the overall mean score was 2.77 with a range of mean score of 1.36. This range mean score of 1.36. shows that JHS Integrated Science Teachers hardly practice learner centred instructional strategies. Table 4.5 showed that the grand mean score was 2.77 and this mean score indicates low level (Dess, et. al., 2005) of practice of learner centred instructional strategy by the Integrated Science teachers.

Table 4.5: Descriptive Statistics on Teachers Learner Centred Instructional Strategies

S/n		Percentage (%) Responses							
	Strategy	**SA**	**A**	**N**	**D**	**SD**	**Total**	**MS**	**SD**
1	Cooperative/Group Method	23 (30)	**34** (43)	21 (27)	13 (16)	9.4 (12)	100% 128	2.98	1.00
2	Problem Based Method	27 (34)	**35** (45)	20 (25)	12 (15)	7 (9)	100 128	3.16	0.93
3	Inquiry /Discovery Method	29 (37)	**36** (46)	16 (21)	13 (16)	6 (8)	100 128	3.21	1.24
4	Discussion Method	27 (35)	**38** (48)	18 (23)	11 (14)	6 (8)	100 128	3.35	1.10
5	Field Trips Method	29 (37)	34 (44)	19 (24)	9 (12)	9 (11)	100 128	3.13	1.16
6	Brainstorming Method	30 (39)	**34** (43)	16 (25)	20 (25)	0 (0)	100 128	2.78	1.11
7	Role Play Method	**33** (42)	28 (36)	10 (13)	18 (23)	11 (14)	100 128	2.32	0.93
8	Project Works Method	25 (32)	15 (19)	**34** (43)	15 (19)	12 (15)	100 128	2.13	0.89
9	Laboratory/Practical Work	10 (13)	9 (11)	21 (27)	**38** (48)	23 (29)	100 128	1.99	0.83
10	Demonstration Method	18 (23)	31 (40)	**30** (38)	11 (14)	10 (13)	100 128	2.68	1.00
	Grand Mean Score							**2.77**	

Key: SA=Strongly Agree=5, Agree=A=4, Neutral=N=3, Disagree=D=2, Strongly Disagree=SD=1

Note: percentage and frequency in parenthesis **Source:**

Field Data, (2021).

Based on the 5 point Likert scale, Table 4.5 showed tha discussion Method had 38% (48) agree followed by discovery(inquiry) with 36% (46) agree and problem-based method had 35% (45) agree. It appeared that JHS integrated science teachers mostly used discussion method followed by discovery or inquiry, and problem based. The fourth most important instructional technique was the use of brainstorming with 34% agree to it. In order of ordinal basis, cooperative, and role play are other instructional techniques that are also used most often by JHS integrated science teachers in the classroom. Thirty-eight percent (38%) disagree that Project work and laboratory or practical works are used by JHS integrated science teachers. These strategies had the least mean scores of about 2 each which indicates less frequent use of these instructional techniques. The JHS Integrated science teachers explained that these methods (laboratory and project works) are time consuming and resource oriented so they hardly use laboratory and project works. Some of the teachers complained of money to buy teaching and learning materials to organize laboratory or project work.

For laboratory method, one of the JHS Integrated Science Teachers' said:

> *We are very much aware of the learner centred approach and its benefits but no basic school in our municipality, I mean JHS has science laboratory. I wanted to use SEWASS Science lab but it did not work. The Headmaster could not give us car or money so now I use problem-based method because WAEC repeat questions [T3].*

This is an experience of an JHS Integrated Science teacher who had the zeal to use the laboratory method to teach integrated science but s/he was faced with absence of laboratory and money to take the learners to the Sefwi Wiawso Senior High school (SEWASS) for the lesson. His or her view confirmed the findings for objective one established earlier on that integrated science teachers have high knowledge level on learner centred instructional strategies but are not able to apply the learner centred instructional strategy because of limited resources and time. This means, that

integrated science teachers' selection of instructional techniques is influenced by many factors like availability of science laboratory, teaching and learning materials among others. Further analysis was done to test for the relationship between integrated science teachers' background factors and practice of learner centred instructional strategies using Spearman Rho correlation.

4.6 Testing the Research Hypothesis two

H0: JHS integrated science teachers background factors significantly relate to their practice of learner centred instructional strategy

H1: JHS integrated science teachers background factors do not relate to their practice of knowledge level on learner centred instructional strategy

The results of the Spearman Rho correlation on teachers' background factors and their practice of learner centred instructional strategies are shown in Table 4.6 below.

Table 4.6: Spearman Rho Correlations between Integrated Science Teachers' Background Factors and Practice of Learner Centred Instructional Strategies

Indicator	PLC	EX	PQ	INSET	Gender
Practice of learner centredness(PLC)	1				
Year of teaching experience (EX)	0.109	1			
Professional qualification (PQ)	0.132	0.139	1		
In-Service Training (INSET)	-0.018	0.089	0.341	1	
Background factors	**0.092**	0.492**	0.746**	-0.068	

Note: * P≤ 0.01, ** P≤ 0.05 and *** P ≤ 0.1

The results of Spearman Rho correlation analysis of teachers' background factors and practice of learner centred instructional strategies in Table 4.6, showed that the associated correlation for JHS teachers' background factors and practice of learner centred instructional strategies is greater than 0.05, implying that there is no

statistically significant relationship between JHS Integrated Science teachers' background factors and practice of learner centred instructional strategies.

Specifically, JHS integrated science teachers' background factors like professional qualification and practice of learner centred instructional strategies shows a statistically insignificant relationship between the practice of learner centred approach and JHS teachers' background factors. In spite of the fact that correlation does not mean causation, it can be stated that professional qualification as a background factor had no significant influence on practice of learner centred approach. In addition, practice of learner centredness and years of teaching experience is less great than 0.01 which means that there is statistically insignificant relationship between practice of learner centredness and JHS integrated science Teacher' years of teaching experience. This result, though insignificant, it may be probably due to numerous policies and frequent changes in policy direction at Ghana Education Service. On the other hand, there is a positive correlation between JHS teachers' experience, and practice of learner centred approach but they are statistically insignificant. The relationship between teachers' background factors and their practice of learner centred instructional strategies is not significant hence there is no enough evidence to accept that JHS integrated science teachers background factors relate to their practice of learner centred instructional strategy

4.7 Research Question 4

What instructional practices do JHS integrated science teachers' use in their classroom?

The research question sought to find out integrated science teachers' classroom instructional practices. An inquiry-based observational checklist developed by Bybee

was adapted by Boakye (2019) was used to observe each of the ten JHS integrated science teachers. An observation checklist was used to collect data to answer the research question. A total of ten JHS integrated science teachers were observed in the classroom. The data was analysed under three themes namely introduction stage, presentation stage and evaluation stage. The results are presented in Tables 4.7, 4.8 and 4.9 respectively.

4.7.1 Learner Centred Instructional practices used by JHS integrated science teachers in the classroom at the introduction stage

This sub-section sought to find out integrated science teachers' learner centred instructional practices used at the introduction stage of their science lesson in the classroom. The results are presented in Table 4.7. Table 4.7 shows the overall rating of JHS integrated science teachers use / application of learner centred instructional strategies in integrated science lesson at the introductory stage during their lesson observation. This stage consists of six indicators with mean percentage score of about 68%. The rating ranged from 0 (no evidence) to 4 (clearer evidence). The maximum frequency for each indicator was 40. It was assumed that maximum score is four (4) and we had ten teachers so four multiple by ten gives 40. Also, participants had 24 maximum indicator. Thus, the number of indicators was six (6) multiply by the number of maximum score of four (4) gives 24. The respondents' total percentage frequency scores varied between 50.0 % (12) to 83.3% (20).

Table 4.7: Matrix of classroom instructional practices used by JHS integrated science teachers in the classroom at the introduction stage

S/N	Introduction stage	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total
1	States the purpose and	2	3	2	1	2	4	2	1	3	2	55.0(22)

	expectations for earning											
2	Creates curiosity and gets pupils attention	2	2	1	2	1	2	3	4	4	3	60.0(24)
3	Raises appropriate questions	3	4	3	2	4	2	3	4	4	3	80.0(32)
4	Elicits responses to unearth prior knowledge	2	4	2	4	1	3	4	2	2	4	70(28)
5	Links prior knowledge to topic	4	3	2	1	3	2	4	2	2	3	65.5(26)
6	Create the opportunity for pupils to question	2	4	2	4	3	4	3	1	3	4	75.0(30)
Total percentage % (freq.)		62.5 (15)	83.3 (20)	50.0 (12)	58.3 (14)	58.3 (14)	70.8 (17)	79.2 (19)	58.3 (14)	75 (18)	79.2 (19)	

Note: * The value for all the teachers for each indicator is 40 (10*4) and for individual teacher is 24(6*4)

Key: 0 = No Evidence, 1= Minimum Evidence, 2 = Some Evidence, 3 = Clear Evidence, 4 = Clearer Evidence Note: under the heading "total" is percentage value and frequency in parenthesis

This means that all the ten teachers demonstrated the practice of learner-centred instruction strategy at the introduction stage of lesson delivery. It can be shown that with exception of item one (1), about 80% of JHS Integrated Science teachers almost appeared to use all the instructional practices at the introductory stage.

4.7.2 Learner Centred Instructional practices used by JHS Integrated Science teachers in the classroom at the presentation stage

This section sought to determine integrated science teachers' instructional practice used at the presentation stage of their science lesson delivery in the classroom. This stage involved 22 indicators with average score of 45% (horizontal summation). The results are presented in Table 4.8. which shows the overall rating of integrated science teachers at the presentation stage of the lesson delivery. The rating ranged from 0 (no evidence) to 4 (greater evidence).

Table 4.8: Matrix of Classroom Instructional Practices Used by JHS Integrated Science Teachers in the Classroom at the Presentation Stage

S/N	Presentation Stage	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total
1	Encourages pupils to work together	2	2	1	1	2	1	2	1	2	1	37..5(15)

2	Provides common experiences	2	1	3	2	2	2	3	2	3	2	55.0(22)
3	Observes and listens as student raise question	1	2	2	3	2	3	1	2	2	3	52.5(21)
4	Asks probing question to redirect students	2	1	2	3	1	3	3	2	2	3	55.0(22)
5	Provide time for students to puzzle through problems	4	2	2	1	2	0	2	2	3	2	50.0(20)
6	Divides the class for small group work	2	0	3	2	1	2	1	3	1	1	40.0(16)
7	Adds to the collective memory by recording ideas	3	2	2	2	3	1	3	1	2	3	55.0(22)
8	Encourages pupils to explain their ideas in their own words	2	1	2	3	1	3	2	1	3	2	50.0(20)
9	Asks for justification and clarification from pupils	2	1	2	2	1	2	2	1	2	3	45.0(18)
10	Directs lesson by formally providing definitions	1	2	1	2	2	2	1	2	3	2	45.0(18)
11	Uses audio-visual or electronic resources	2	2	1	0	1	1	1	1	1	1	27.5(11)
12	Uses student previous experiences	2	1	2	3	2	1	3	2	1	3	50.0(20)
13	Encourages pupil to pupil interaction	1	2	1	2	2	2	1	3	1	1	40.0(16)
14	Using classroom norms and discussion etiquette	2	1	2	2	3	2	1	2	2	1	45.0(18)
15	Wait time after asking questions	2	1	2	1	1	2	2	1	2	1	37.5(15)
16	Questions that challenge another thinking	1	2	2	1	1	1	1	2	2	3	40.0(16)
17	Questions that justifies	2	3	0	1	3	2	1	0	1	2	37.5(15)
18	Questions that allow pupils to change their mind	2	2	3	1	2	1	2	1	4	2	50.0(20)
19	Encourage pupils to use formal labels	3	2	4	1	2	4	1	1	2	4	60.0(24)
20	Encourage pupils to apply or extend concept	2	3	1	1	2	3	0	2	3	3	50.0(20)
21	Remind pupils of alternative explanations	1	1	2	1	3	3	1	2	2	3	47.5(19)
22	Refer pupils to existing data and evidence	2	2	1	3	2	2	1	2	1	2	45.0(18)
Total % freq.		**48.9**	**40.9**	**46.6**	**40.0**	**47.7**	**48.9**	**39.8**	**40.9**	**51.1**	**54.5(48)**	
		(43)	**(36)**	**(41)**	**(37)**	**(42)**	**(43)**	**(35)**	**(36)**	**(45)**		

Key: 0 = No Evidence, 1= Minimum Evidence, 2 = Some Evidence, 3 = Clear Evidence, 4 = Clearer Evidence. **Note:** under the heading **"total"** is percentage value and frequency in parenthesis **Source**:

Field Data, 2020

The maximum rating for each indicator was 40 and that of each participant was 88

(22x4). The respondents' total percentage frequency scores varied between 39.8% (35) to 54.5% (48). The overall rating of the ten teachers on the indicators ranges from 27.5% to 55.0 % given average rate of 45%. This is an indication that teachers in general showed little evidence of practicing learner-centred approach during presentation stage of lesson delivery. The integrated science curriculum recommends the use of inquiry-based approach to teach in order to allow learners explore and develop the necessary scientific experimental skills of pupils and assist them to build upon their scientific concepts and principles.

4.7.3 Learner Centred Instructional Practices Used by JHS Integrated Science Teachers in the at the Evaluation Stage

Table 4.9: Matrix of Classroom practices used by integrated science teachers at the evaluation stage

S/N	Evaluation stage	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Total %(f)
	Observes pupils as they apply new concepts	3	3	2	2							70.0(28) 1 3 4
2	Compares ideas of pupils to concepts taught	1	2	3	2	3	2	2	4	1	2	55.0(22)
3	Uses different assessment techniques	2	3	3	2	3	4	2	3	1	3	65.0(26)
4	Allows pupils to assess their own learning	3	2	4	2	4	2	3	2	3	3	70.0(28)
5	Asks open ended questions	2	2	3	2	2	3	4	2	2	2	60.0(24)
6	Evaluates collective memory of the class	2	3	2	4	2	3	3	2	4	2	67.5(27)
7	Brings closure to lessons	3	3	2	1	3	1	4	3	3	2	62.5(25)
Total % freq.		**57.1 (16)**	**64.3 (18)**	**67.9 (19)**	**53.6 (15)**	**71.4 (20)**	**67.9 (19)**	**75 (21)**	**67.9 (19)**	**60.7 (17)**	**60.7 (17)**	

*Frequency in parenthesis

Key: 0 = No Evidence, 1= Minimum Evidence, 2 = Some Evidence, 3 = Clear Evidence, 4 = Clearer Evidence

Source: Computed from Field Data, 2020

This part sought to find out if JHS integrated science teachers use learner centred approach to close lesson through formative assessment in their classrooms since instruction and assessment go on concurrently. Table 4.10 shows the percentage frequency of integrated science teachers' use of formative assessment strategies to evaluate their lessons. The rating ranged from 0 (no evidence) to 4 (greater evidence) with an average percentage score of 64.3%.

The maximum frequency for each indicator was 40(4x10) and that of each participant was 28(7.4). The respondents' total percentage frequency score on the observation schedule varied between 53.6% (15) to 75.0% (21). Respondent T7 obtained 75.0% (21) being the highest and respondent T5 obtaining 71.4% (20). Respondents T3 obtained 67.8% (19) and respondent T2, obtained 64.3% (18). Also, respondent T9 and T10 obtained 60.7% (17) each. Also, respondent T4 obtained the lowest percentage among the respondents of 53.6% (15). This means that all the respondents showed evidence of using learner-centred assessment techniques to evaluate their lessons.

This means that the teachers showed clearer evidence of using learner centred instructional strategies to evaluate lessons. The integrated science teachers in generally showed some evidence of using child-centred assessment strategies to evaluate their lessons.

CHAPTER FIVE DISCUSSION

5.0 Overview

This chapter focuses primarily on the discussion of the results in the previous chapter. The chapter is structured according to the four specific objectives which underscore

the entire thesis. The relevant research questions and hypotheses have been recalled, main findings presented and implications drawn from these findings.

5.1 Integrated Science Teacher's Knowledge on Learner Centred Instructional Strategies

The first specific objective sought to determine JHS integrated science teacher's knowledge on learner centred instructional strategy. It was found that Junior High School Integrated Science teachers' have reasonably high level of knowledge on learner centred instructional strategy as indicated by the grand mean score of 3.35(see Table 4.2, pg.67) but analysis of interview data showed that unavailability of facilities and other resources made them to reduce their strict usage of the learner centred approach.

The findings are consistent with one of the National Teaching Council core values professional knowledge. The contemporary teacher must show evidence of this core value hence knowledge on the learner centred approach goes to confirm the standard stated above. For instance, the teacher should be aware that students are co-creators in the teaching and learning process and therefore teachers should be aware of that no answer is wrong (Miller, 2012) in the face learner centred instructional strategy. Therefore, the high knowledge of the JHS Integrated Science teachers within the study area on learner-centred instructional strategies is not out of place. Evidence of high knowledge level on learner-centred instructional strategies add to the existing literature.

The high level of knowledge on learner centred approach also has theoretical implications. The findings suggest that the participated teachers are generally aware

about the relevance of the uniqueness of learners, differences in individual's patterns of development and the active nature of student learning in teaching and learning.

This provides empirical support to the Locke's theory as stated by (Mark, 2005) that skilled teachers or facilitators are embodiment of knowledge is supported in this study because learners think and create knowledge rather than always being taught. This knowledge is critical for learners to fit well in changing circumstances. Evidence that teachers within the study setting are aware of this fact implies that Locke theory has extended practical reality.

Besides the theoretical relevance of the finding of high level of knowledge on learner centred approach, it also supports prior literature (Boakye, 2019; Stepanek, 2000). Stepanek revealed that there is a general agreement that effective learning requires students to be active in the learning process and this has led to the emphasis on participatory classroom activities. The study of Boakye (2019) also found that teachers strongly believed in learner-centred instructional strategies since it encourages student(s) participation, promotes activeness and increases learning performance.

Nevertheless, the findings in this study are inconsistent with the findings and conclusion drawn in the study of Appiah (2014). Appiah found low level of teachers' knowledge on recommended instructional strategies including role play. According to Appiah (2014) the low knowledge level together with the adoption of inappropriate instructional practices in the teaching and learning could hinder effective science instruction in the classroom. One possible reason for the different results is the fact that Appiah (2014) conducted his in a District that is close to a university which attracts teachers with high qualification and access to further studies give teachers

divided attention. Teachers have to divide their time for their further studies and teaching as professional job such that they mostly pay little attention to new curriculum and new professional policy. However, in Sefwi Wiawso Municipality, high level of teachers' knowledge could be explained by the fact that they are less busy and have rich years of teaching experience**.** Similarly, Nonkukhetkhong et al. (2006) observed that teachers were not confident about the learner-centred approach, hence low implementation due to the contextual constraints. Nonkukhetkhong et. al., (2006) suggested that the policy should require educational authorities to equip or support schools with sufficient facilities, resources and conducive learning environments, to make the policy goals realistic and possible to achieve.

The evidence about the specific knowledge indicators such as encouraging pupils to apply concepts, think pair sharing, group work and problem solving on learnercentred instructional strategies found in this study imply that learner-centred environment grows out of curricular decisions and in-class strategies which encourage students' interaction with the content, with one another and the teacher, and with the learning process. The practical implication of this finding is that this knowledge could influence instructional procedure and outcomes, selection of instructional materials and methods of assessment. The deployment of this knowledge is dependent on the policy direction.

The relatively high level of knowledge about learner-centred instructional strategy suggests that stakeholders should be able to supply the appropriate teaching and learning resources and aid to promote adoption and implementation of this instructional strategies. The findings also imply that resistance to change or balancing instructional strategies by a teacher may be possible.

5.2 Integrated Science Teachers' Background Factors and their Knowledge Level on Learner Centred Strategies

The theme is developed from the second objective of the study. This objective sought to determine the relationship between JHS integrated science teachers' background factors and their knowledge level on learner centred instructional strategies.

The study found a weak insignificant positive relationship between teachers' background factors and knowledge level on learner centred instructional strategy. Correlation ($r=0.153$, $<p=0.05$) (see Table 4.4, pg. 64) implies that JHS integrated science teachers' background factors (professional qualification, teaching experience, in-service-training) generally do not determine teachers' knowledge level on learner centred instructional strategy. Specifically, (see Table 4.4), it also emerged that professional qualification was the most significant contributor to teachers' knowledge level on learner-centred instructional strategy. The result is in line with Khayrazad (2013) finding that teachers' professional development is a key factor to successful integration of learner-centred method in classroom teaching.

Further, theoretical contribution of the findings can be seen from constructivist beliefs about how students learn best depends on how teachers facilitate learning" (OECD, 2013a, p. 165). Teachers' background factors such as professional training and years of teaching experience influence teachers believe and ability to allow learners to explore in learning environment. JHS Integrated Science teachers use experience to develop variety of instructional strategies that are linked to learner centred approach. Constructivist theoretical assumption implies that teachers can gain knowledge through their own experiences developed on the job even without a special training in learner-centred instructional strategy. The weak correlation relationship between

teachers' background factors and knowledge level on learner-centred instructional strategy, projects low level application of learner centred instructional strategies and undermined practical relevance of the constructivist theory.

The significant positive effect of professional qualification ($r=0.172$, $p\leq.0.05$, see Table 4.4) on knowledge level about learner-centred instructional strategy found in this study supports the view that some professional teachers are constructivists. Thus, according to Moustafa, Ben-Zvi-Assaraf and Eshach (2013) constructivist teachers have positive view about student-centred instructional strategy and are often associated with student-focused knowledge and are capable to encourage and also accept learners' autonomy contrary to the traditional teacher centred.

Empirically, the findings are consistent with the several prior research findings on learner-centred instructional strategy (Boddy et al., 2003; Keiller, 2018; Moustafa et al., 2013). Keiler (2018)'s investigation about the roles and identities of teachers in student-centred instructional strategy, found that teachers' own identities, experience in observing students developing knowledge as evident in students' outcome influence their knowledge about students' centred instructional strategy. Teachers identities, roles and experiences may be consolidated and reconceptualised teachers' background factors. The evidence found in this study affirms the conclusion reached by Keiler (2018). Similarly, teachers' years of teaching experience are central to pedagogical choice, identity development, and past experiences affect teacher identity

(Eick & Reed 2002; Rex & Nelson 2004). Thus, experiences shape teachers' identities and choice of teaching philosophy.

The findings further affirm the evidence found in the study of Rodriguez and Ponce (2013) that professional (qualified) teachers have deeper understanding and clearer knowledge of student-centred instructional strategy. Also, Grier and Johnston's (2009) argument that, teacher identity is based upon the core beliefs one has about teaching, efficacy and confidence which is in line with the finding here. Sharing with this position is Davis et al. (2006) that teachers' personal histories and professional experiences influence their professional identity development. Thus, professional status is important on knowledge about learner-centred instructional strategy.

The implication is that in developing teaching and learning policy such as learner centred instructional strategies, teachers' background factors should be considered as an essential success element. This is because professional teachers have inherent knowledge and support for learner-centred instructional strategies as against their counterparts who are not professional teachers.

The insignificant effect of teachers' background factors on teachers' knowledge on learner-centred instructional strategy coupled with the theoretical contribution of Lev Vygotsky that the use of instructional strategy is bounded on teachers' attributes implies that teachers' background factors are not crucial to actively engaged in seeking, developing and constructing knowledge and applying it.

5.3 Integrated Science Teachers' Background Factors and Practice of Learner Centred Instructional Strategies

This sub-section focuses on the third objective of the study. This objective sought to determine the extent at which JHS integrated science teachers' background factors influence practice and adoption of learner centred instructional strategies. To achieve

this specific research objective, the study employed Spearman Rho correlation analysis to generate estimates to provide understanding of the dynamics of the results.

The major finding was that there was a no statistically significant relationship between background factors and practice of learner centred instructional strategy. However, Table 4.6. shows that the sub component of background factors;
professional qualification had a positive and significant correlation with the teachers practice of learner centred instructional strategies.

Moffart cited by Westberg (2014) revealed that teachers feel the need to be in complete control of a class and be seen as principal performers so they hardly implement learner centred approach. They feel threatened when students are encouraged to raise challenging questions as a process of learning especially female teachers may dislike student-centred classrooms in general due to the typical female role within groups. Therefore, teacher characteristics such as thinking and perception influence their adoption of learner centred instructional strategy. Lack of appropriate knowledge on constructivism pushes teachers to have a limited application of Learner centred Approach (Mtitu, 2014).

The findings imply that although teachers' background factors could drive their level of knowledge on learner-centred instructional strategy, they may not translate automatically to the practice of students' centred instructional strategy without redefining their roles as facilitators. Despite some of the background factors of teachers exhibiting positive and significant relationship with practice of learnercentred instructional strategy, their general effects are insignificant.

5.4 Application of Learner Centred Instructional Practices used by Integrated Science Teachers in the Classroom

Learner centred instruction is an instructional approach in which pupils influence the content, activities, materials and pace of learning. It is the recommended instructional approach by Ghana Education Service(NaCCA, 2019). In this instructional approach, the pupil (learner) is placed at the centre of the learning process and the instructor provides pupils with opportunity to learn independently from each other and guides them in the skills they need to develop effectively. This section looks at the fourth specific objective of the study which focused on the application of learner centred instructional practices, integrated science teachers use in their classrooms. Consideration was given to introductory stage, presentation stage and evaluation stages of lesson delivery.

Observational guide results showed that majority of JHS integrated science teachers in the Sefwi Wiawso Municipality of the Western North Region generally adopted learner centred instructional strategy at the introduction and evaluation stages of lesson delivery. JHS Integrated Science Teachers used previous knowledge level of their pupils as main point for their lessons and created the basis for inquiry-based instructional approach.

The average mean score of the rating of the 10 teachers for all the six indicators measuring usage of learner centred approach at the introduction stage was about 68% (see Table 4.7). This showed that the JHS integrated science teachers actually applied learner centred teaching strategies in lesson introduction stage. Again, overall rating of the 10 teachers on the raising appropriate questions during instruction (3rd indicator) was 80%. The implication is that JHS integrated science teachers had good

content knowledge and also aware of learners' knowledge level such that right questions were asked by the teachers. The second highest rating indicator was an opportunity for pupils to question (75%, see Table 4.7). This showed that majority of the teachers did well in creating opportunity for the pupils to question during the science lesson. The third highest score (70%, see Table 4.7) indicator was on eliciting prior knowledge of the pupils. The JHS Integrated Science Teachers provoked learners' responses to unearth their prior knowledge. This helps teachers to relate science concepts to real contexts of the pupils. This facilitated the pupil's understanding of the science concepts. Creation of curiosity and gets pupils attention had a percentage score of 60%. This shows that, majority of the teachers used curiosity to get pupils attention during integrated science lessons which helped draw pupils' attention and participation in the lesson. However, the first indicator which was to state the purpose and expectation had the least score of 50% (see Table 4.7). Despite this, the average percentage score of 68% (Table 4.7) indicated that JHS integrated science teachers applied learner centred strategies at the introductory stage of lesson delivery.

Empirically, this supports the findings of Shank cited in Ako (2017) that leanercentred instruction with authentic questions generated from student's experience is the central strategy for teaching science at the basic schools. Theoretically, the finding is consistent with the constructivists' view that learning is a process of building up experience where prior knowledge and experiences add to new understandings (Shank, 2006). The outcomes are also consistent with the recommendation of UNICEF (2014) which states that, child-centred instruction demands that lessons be built on previous knowledge and skills of students.

Observational guide for lesson presentation stage had 22 indicators and results showed that the overall rating for the twenty-two indicators was about 45%. This may be explained relatively that JHS integrated science teachers hardly used learner centred instructional strategies during lesson presentation stage.

At the presentation stage, only 27.5% (see Table 4.8) of the teachers used audio-visual or electronic resources possibly because teaching and learning materials were hardly available in most basic schools in Ghana such that sophisticated ones like audio - visual aid cannot be available especially in the study area. Teachers were found explaining everything to the learners. Integrating digital media into the classroom according to Harris and Morris (2009) is one of the contemporary methods of teaching that promotes learner involvement in class. Among the twenty-two indicators, the nineteenth indicator; encouraging pupils to use formal labels had a percentage score of 60% indicating that JHS integrated science teachers are careful about safety precautions in the laboratory because of toxic related chemicals. The finding supports DeJarnette (2012) that learners should be guided to create their own knowledge through inquiry or scaffolding. Indicators (2, 4, and 7) probing questions to redirect students, provides common experiences and add to the collective memory by recording ideas had a percentage score of 55% each. The indication is that teachers affirm and confirm students' answers from pupils which means that JHS integrated science teachers have a high content knowledge and pedagogical skills that is why they are able to redirect questions. Also providing common experiences for pupils implies that JHS integrated science teachers ensured equity and inclusivity during lesson delivery. It also supports one of the characteristics of learner centred approach that there is no right or wrong answer. Indicators three (observes and listens as student

raise question) and 21 (remind pupils of alternative explanation) had percentage scores of 52.5% and 47.5% respectively. The score for observes and listens as student raise question proved that teachers are able to manage their classrooms but the low score for providing pupils with alternative explanation indicates classroom realities that there exist gaps between the intended pedagogy-learner centredness and its implementation. This implies that the teachers' classroom setting was not fully learner-centred. The pupils were only engaged in group discussions about the topics being taught. Also, it was observed that 50% of the teachers provided time for students' puzzle through problems in order to generate solutions, while only 40% of teachers observed divided their class into small group works, 37.5% of the teachers encouraged pupils to work together. It can be deduced that the low practice of these learner centred strategies may be due to poor infrastructure and limited furniture in the Junior High School classrooms. These hinder classroom instructional management during instruction and this affected instructional practices.

Teachers are encouraged to apply classroom norms or routine in their classrooms to create conducive environment that helps the learners to concentrate. About 45% of JHS Integrated Science Teachers were able to use classroom norms. Also, 40% of the teachers were able to give questions that challenged the thinking ability of the learners. The low percentage scores confirm Osei (2004) finding that integrated science teachers assume primary responsibility for the communication of knowledge to students.

The evaluations stage of the observational guide had seven indicators. The results of the practice of learner centred instructional strategies at the evaluations stage showed

that the grand percentage score for all the ten teachers was 64% (Table 4.9). Thus, majority of the teachers showed evidence of application of learner centred instructional approach at the evaluation stage.

Seventy percent of the JHS integrated science teachers showed evidence of engaging pupils to apply new concepts to their daily lives which is in line with the recommendations of the integrated science curriculum. Allowing pupils to assess their own learning accounted for 70%. Furthermore, greater number of teachers asked open ended questions to evaluate their lessons which indicated a good assessment approach. About 63% of the teachers observed generally evaluate their lesson with learner centred instructional strategies. The results generally showed that, integrated science teachers practiced formative assessment during their science lesson closure. However, 55% of JHS integrated science teachers compared ideas of pupils to concepts taught and that shows that teachers involved learners in lesson closure.

The findings that teachers generally follow learner-centred instructional strategies at the introductory stage of the science class and the evaluation stage but little evidence at the presentation stage. This may be attributed to the objective of covering a large volume of scheme of work by JHS integrated science teachers in order to meet their Municipal Directorate policy of one examination for all schools in the municipality. Therefore, although they may adopt learner-centred instructional strategies in some parts of the lesson delivery, they are not likely to follow the recommended approach throughout the lesson period because of more content to cover and time constraint.

The evidence found in this study also supports some empirical evidence documented in the literature (Bayat & Naicker, 2012; Jo-An & Reigeluth, 2011; Tawalbeh, &

Asmari, 2015). Bayat and Naicker (2012) revealed several examples to the practice of learner-centred instructional strategy. Jo-An and Reigeluth (2011) identified institutional barriers that hinder the implementation of learner-centred instructional strategy. Thus, the institutional structure favours the use of teacher centred approach instead of learner centred for teaching of integrated science since it gives room for flexibility and ability to complete scheme of work. Thus, the little evidence of the implementation of learner-centred instructional strategy at the presentation stage found in this study is consistent with the existing literature.

Policy implication of the findings is that learner centred instructional policy is good but government provide appropriate resources to allow the municipal education directorate to build classroom blocks, good laboratory and TLMs to assist teachers practice learner centred approach in full. With the increasing number of professional teachers addressing institutional barriers should be of high concern to the municipal director of education.

CHAPTER SIX SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Overview

This is the concluding chapter of the thesis. The chapter focuses on the summary, conclusions and recommendations of the thesis. It presents the summary of the main findings, conclusion drawn from the main findings and the recommendations emanating from the findings and the conclusions.

6.1 Summary of the Study

The study investigated Junior high school integrated science teachers' knowledge and practice of learner–centred instructional strategy in the Sefwi-Wiawso Municipality. The study was to determine integrated science teacher's knowledge on learner centred instructional strategy; relationship between teachers' background factors and knowledge level on learner centred instructional strategy, the extent to which teachers' background factors influence practice of learner-centred instructional strategy; and identify teachers' instructional practices in the science classroom that are learner-centred approach.

To understand JHS integrated science teachers' knowledge on learner centred approach, background factors impact on knowledge and practice of learner centred instructional strategy in science classroom, the following objectives were considered:

1. Determine JHS integrated science teacher's knowledge on learner centred instructional strategy in Sefwi-Wiawso Municipality.
2. Determine the relationship that exists between JHS integrated science teachers' background factors and their knowledge level on learner centred strategy
3. Determine the extent to which JHS integrated science teachers' background factors influence their practices of learner- centred instructional strategy
4. Determine Junior High School integrated science teachers' learner centred instructional practices in the science classroom

The study adopted explanatory sequential mixed method design. One hundred and twenty-eight JHS integrated science teachers in Sefwi-Wiawso Municipality were

involved in the study. Data were collected through classroom observation, interview and questionnaire administration on integrated science teachers' knowledge on learner centred instructional strategy, teachers background factors and instructional practices. Quantitative data were analysed using descriptive statistics in the form of percentages and inferential statistics (Spearman Rho Correlation). Thematic analysis was used for qualitative data obtained from the interview.

6.2 Main Findings

The main findings were:

It was found that the teachers within the study area have high level of knowledge about learner centred instructional strategy but they do not use it most often because of infrastructure deficits and unavailability of teaching and learning materials.

The study found that teachers' background factors contribute significantly to the teachers' knowledge on learner centred instructional strategy. It also emerged that experience and in-service training made the most significant contribution to teachers' knowledge of learner-centred instructional strategy.

There is no relationship between JHS integrated science teachers' background factors and practice of learner centred instructional strategy. It further emerged that professional qualification exerts strong, positive and significant correlation with practice of learner-centred instructional strategy

Results from the observational guide showed that majority of JHS integrated science teachers in the Sefwi Wiawso Municipality of the Western North Region

demonstrated partial practice of learner-centred instruction strategy. Generally, JHS integrated science teachers adopted learner centred instructional strategy at the introduction and evaluation stages of the lesson. However, teacher-centred instructional strategy is used by teachers at the presentation stage of lessons delivery.

6.3 Conclusion and Implications

This study provides literature on Junior High School integrated science teachers' knowledge level on learner centred instructional strategies, relationship between teachers' background factors, knowledge level and practice of learner centred instructional strategy.

The JHS integrated science teachers have high knowledge on the learner centred instructional strategy. The finding puts the need to make sure supervisors do the needful by going round to make sure teachers use the recommended instructional strategy of Ghana Education Service. Since the integrated science teachers are aware of it, means to adopt it would not be a problem. What is left is to engage teachers on the ground to know the issues concerning the inquiry-based method. The knowledge about learner centred instructional strategy would enable the Junior High School integrated science teacher to use alternative learner centred instructional strategies to teach science concepts to make them understandable to learners. Some of these alternative instructional strategies include examples, problem solving, inquiry-based method, project work, discussion and demonstration.

Also, the insignificant relationship between JHS integrated science teachers background factors and knowledge level on learner centred approach means that educational authorities at the Municipal assembly now have roadmap for professional

development session. Continuous professional development session should consider important variables such as professional qualification as it was vital in the implementation of the recommended instruction strategy. The Municipal Director of Education, should resist consistent transfers and high attrition to avoid shortage of qualified staff who have been trained and are needed and difficult to come by.

Though no relationship existed between teachers'background factors and practice of learner centred approach, a significant relationship was found between professional qualification and practice of learner centred approach. Since the integrated science teachers are aware of recommended instructional strategies and know it, it is onus on the Ghana Education Service as well as Sefwi Wiawso Municipal Director of Education, to ensure that most of the teachers have the minimum educational certificate for teaching in the municipality. Although further research is needed to elaborate and substantiate the findings of this study, at least it provides initial evidence of science teachers' knowledge level on learner centred approach, teachers background factors, relationship between background factors, knowledge level and practice of learner centred instructional strategy

The study also revealed that teachers hardly used learner centred approach at the lesson presentation stage. The likely barriers that limit application of learner centred approach would make the recommended instructional strategy for the teaching of science in Ghana popular and help move the country along with technological evolution. Municipal Directorate of Educate must supply the needed equipment and resources to help teachers apply the inquiry-based method. Science laboratories and laboratory equipment availability may help teachers practice learner centred instructional strategies. Supply of required resources, and provision of infrastructure

will promote application of learner centred pedagogical thinking for the development of science and technology since the world has become technology world. It may also help to replicate the results of this study after the needed resources and facilities are provided.

6.4 Recommendations

Following the high level of increased teachers' knowledge on learner-centred instructional strategy, it is recommended that Municipal Directorate of Education should make it an objective to emphasis on learner-centred instructional strategies and promote it in terms of benefits and paradigm shift especially integrated science teachers have to use it in their lesson delivery to promote pupils interest in science for Ghana to benefit fully from technology revolution. This is because technology revolution has shown importance of science. The Integrated Science teachers' high knowledge about learner centred approach requires Municipal Director of Education, School Improvement Support Officers (SISO) and head teachers to double their steps on supervision of teaching to ensure that teachers practice inquiry- based method with special focus on learner centred strategies as a policy to be followed by the teachers.

Based on the weak and insignificant relationship between integrated science teachers' knowledge level on learner centred strategies and background factors of teachers, it is strongly recommended that the Municipal Directorate of Education, must regularly organize professional development workshops for JHS integrated science teachers in particular since professional qualification workshops count to help teachers refresh their knowledge, be current on professional practice and knowledge as well as new policies of government. Teaching and learning workshops for JHS integrated science professional qualification should be considered because background factors like,

professional qualification and in service training improve JHS integrated science teachers' knowledge level and practice of the learner centred approach. The newly trained teachers should be considered when organizing teaching and learning workshops since it may help in efficient resource allocations and develop newly trained teachers professionally.

Though there is no relationship between background factors and practice of learner centred strategies, it is still imperative to look at specific teacher background factors that can help promote and achieve the intended objectives of the Ministry of Education. The researcher recommended that the Municipal Directorate of Education should liasse with the Municipal assembly to supply the needed resources to help teachers practice learner-centred instructional strategies.

Given the partial and low practice of learner-centered instructional strategies in this study, it is recommended that Municipal Directorate of Education and head teachers should study why teachers hardly practice the recommended instructional practices. Though the literature has identified factors like large class size, absence of science laboratories as well as lack of equipment, if their study yields the same factors then Ghana Education Service and Sefwi Wiawso Municipal Director of Education should help supply the needed resources that can help promote practice of learner centred approach to help teachers scale down their roles to facilitators where pupils would be seen as co-creators of knowledge. Sefwi Municipal Directorate of Education should organize in-service training on the improvisation of instructional materials for Integrated Science teachers especially those in the rural areas. This will help vary their instructional strategies so as to reach the individual pupil in class. The

improvised instructional materials would also help pupils to develop scientific concepts on their own as they interact with them.

6.5 Suggestions for Further Studies

Following the focus of the present study, findings, conclusions and the matters arising, the study make the following suggestions for future studies on learner-centred instructional strategy:

1. This study limited the scope of the investigation to the perspective of integrated science teachers, future studies may look at the perspective of students as co-creators of knowledge. Since proponents of learner-centred believe that students are responsible for their own learning and goals, it would be insightful to explore their knowledge level and attitude requires for such instructional strategy
2. Future studies may also explore challenges for implementing learner-centred instructional strategy. Even though it is evident in the present study, future researchers could explore the challenges and resource requirement for the implementations to give us more in-depth knowledge on it.

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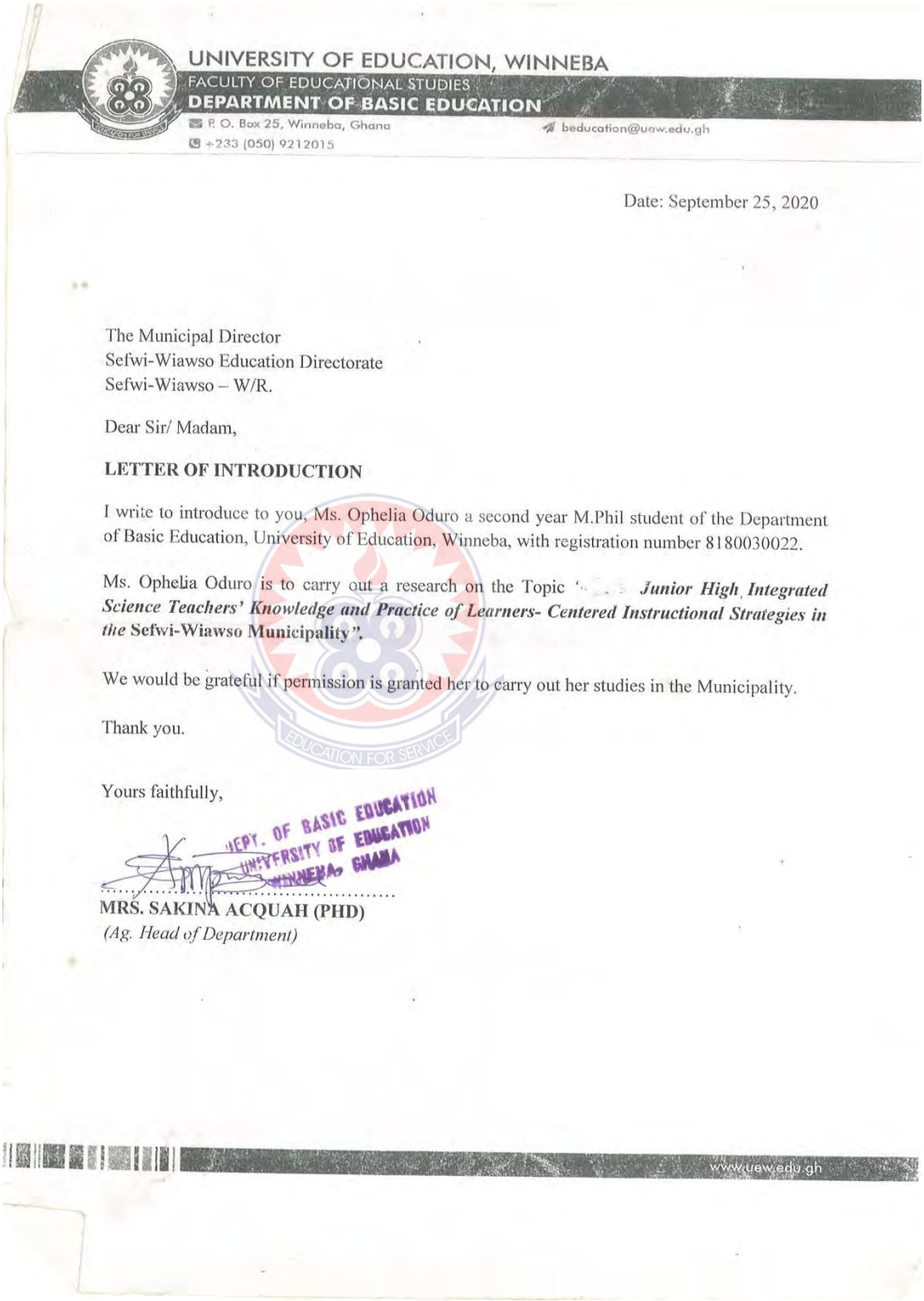
APPENDICES

APPENDIX A INTRODUCTORY LETTER



UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF EDUCATIONAL STUDIES
DEPARTMENT OF BASIC EDUCATION
P. O. Box 25, Winneba, Ghana
+233 (050) 9212015
beducation@uew.edu.gh

Date: September 25, 2020

The Municipal Director
Sefwi-Wiawso Education Directorate
Sefwi-Wiawso – W/R.

Dear Sir/ Madam,

LETTER OF INTRODUCTION

I write to introduce to you, Ms. Ophelia Oduro a second year M.Phil student of the Department of Basic Education, University of Education, Winneba, with registration number 8180030022.

Ms. Ophelia Oduro is to carry out a research on the Topic '*Junior High Integrated Science Teachers' Knowledge and Practice of Learners- Centered Instructional Strategies in the* **Sefwi-Wiawso Municipality".**

We would be grateful if permission is granted her to carry out her studies in the Municipality.

Thank you.

Yours faithfully,

DEPT. OF BASIC EDUCATION
UNIVERSITY OF EDUCATION
WINNEBA, GHANA

.....
MRS. SAKINA ACQUAH (PHD)
(Ag. Head of Department)

www.uew.edu.gh

APPENDIX B

QUESTIONNAIRE FOR MEASURING JUNIOR HIGH SCHOOL INTEGRATED SCIENCE TEACHERS' KNOWLEDGE AND PRACTICE OF LEARNER – CENTRED INSTRUCTIONAL STRATEGIES IN THE SEFWIWIAWSO

Introduction

Dear Colleague, thanks for agreeing to participate in this study. The purpose of the study is to explore junior high school integrated science teachers' knowledge and practice of learner-centred instructional strategies they employed in their integrated science lessons. It is hoped that the information you provide will inform the stakeholders, teachers, GES Sefwi-Wiawso municipality and the curriculum developers. Thank you.

Instruction

Please read the following statements and kindly provide the information required. The first part seeks background information about you while the second part requires your honest opinion on teachers' knowledge and practice of learner -centred. In most cases you will be required to select the option that best describes your approach to practice of learner centred of integrated science in the Junior High school at the last part.

Your identity will not be disclosed in the report. That is why you do not provide your name. Whatever information you will provide will remain anonymous and it will not in any way affect your status as integrated science teacher

Part I

Background Information

Kindly provide the following information either by writing or ticking at the appropriate place.

1. Indicate where you teach a. Public [ ] b. Private[ ]

2. Sex: a. Male [ ] b. Female [ ]

3. Academic qualification:

a. G.C. E Ordinary level [ ] b. G.C.E. Advance level [ ] c. SSSCE/WASCE [ ]

d. Diploma Basic Education [ ] e. Bed. Basic Education [ ] f. HND [ ]

g. Bed. Science degree [ ] h. others (specify).....

4. Professional qualification(s):

a. Cert 'A' 4-year [ ] b. Cert 'A' Post Sec [ ] c. Diploma (Basic Education) [ ]

d. Diploma in Education [ ] e. B.Ed. Basic education [ ] specialization .....

5. Number of years of teaching experience:

0 - 3years [ ] 4 – 6years [ ] 7-10years [ ] more than 10 years [ ]

6. Junior high classes taught

a. JHS 1 [ ] b. JHS 2 [ ] c. JHS 3 [ ] d. JHS1& 2 [ ]

e. JHS 2&3 [ ] f. JHS 1&3 [ ] JHS1, 2&3 [ ]

PART II

This questionnaire is designed to elicit your honest view on science teachers' curriculum knowledge. Please kindly give the best responses you can. You are to answer the questions and give reasons where necessary. Tick [√] for the answer chosen. Thank you.

Section A: What are the JHS integrated science teachers' knowledge level of learner centred instructional strategies in the Sefwi-Wiawso Municipality

1. Do you use different methods of teaching in your classroom? a)

Yes ( )

b) No ( )

2. If the answer to question 1 is yes, what are your reasons for using different methods of teaching?

Tick (√) all the reasons that apply

a) It is a subject requirement ( )

b) It is a requirement of the MOE ( )

c) It is a school requirement ( )

d) For improving the learning and teaching process ( )

e) For motivating and stimulating learning ( )

3. What is your understanding of the following terms: Learner-centred education (LCE) and learner-centred methods of teaching?

1. Specify the type of training you received on LCE during your pre-service teacher training programme (i.e. during your training as a student-teacher)

2. Which methods of teaching listed below do you use in your teaching?

Tick (√) all that apply

a) group work method ( )

b) discussion method ( )

c) question and answer method ( )

d) project work method ( )

e) independent inquiry method ( )

f) discovery method ( )

g) debate ( )

h) field trip ( )

i) simulations ( )

j) lecture method ( )

No	Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
1	Learner-centred approach is the best method to teach integrated science in junior.					
2	With learner centred students are able to share ideas among themselves					
3	Students participate well among themselves					
4	Involving students much in science lessons makes them active in class					
5	Students ask questions in integrated science when lesson is centred on them					
6	In learner-centred, students are allowed to share ideas together when teachers act as facilitator					
7	Students relate well with teachers when they are involve in the lessons.					
8	Students are able to find solutions for themselves when lesson is centred on them.					
9	Performance of students increases when lesson is centred on them					
10	Student's participation is very strong when learning is centred among them.					

PART III

This questionnaire is designed to elicit your honest view on assessment practices in the science classroom as stated in science curriculum. Please kindly give the best responses you can. You are to answer the questions and give reasons where necessary. Tick [√] for the answer chosen. Your responses will be treated in confidential and will be used only for research purposes. Your identity is not required; hence your objectivity and truthfulness are highly counted upon for the needed outcome. Thank you.

SECTION A: 4. TO WHAT EXTENT WILL THE USE OF LEARNERCENTRED INSTRUCTIONAL STRATEGY HELP IN THE IMPROVEMENT OF STUDENTS' PERFORMANCE IN INTEGRATED SCIENCE IN SEFWI WIAWSO?

No	Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
1	Students enjoy learning science when teachers centres the lesson among them					
2	Students enjoy science lessons when tutor uses TLMs to teach					
3	Students participate well in class when teachers allows students to share ideas with the use of TLMs.					
4	Students perform better in science class when tutors involve them in activities					
5	Learning science using TLMs makes it easy to understand science concepts.					
6	Learning science among colleagues encourage students to share ideas in class					
7	Learning science among colleagues encourage students to increase their performance in class					
8	Teachers using learner-centred to teach integrated science makes students active in class					
9	integrated science practical/experiment helps students to make use of real materials to find solutions to problems.					
10	Learning integrated science in groups helps students to share ideas					
11	Learning integrated science in groups helps students to ask questions among ourselves					
12	Students perform better in integrated science class when involve involve them in lessons.					

APPENDIX C

OBSERVATION SCHEDULE FOR JUNIOR HIGH SCHOOL SCIENCE

TEACHERS CLASSROOM INSTRUCTIONAL PRACTICES

	Inquiry stages	**Teachers Behavior**	**Frequency of episode**	**Percentage score**
Introduction	Engage / elicit	1. State the purpose and expectations for learning 2. Creates curiosity and gets student attention 3. Raise appropriate questions 4. Elicits responses that uncover prior knowledge 5. Identified and records student thinking 6. Create the opportunity for pupils to question		

Activities	Explore	7. Encourage pupils to work together 8. Provide common experiences 9. Observes and listens as student raise question 10. Asks probing question to redirect students 11. Provide time for students to puzzle through problems 12. divide the class for small group work		

	Explanation	13. Adds to the collective memory by recording ideas 14. Encourage pupils to explain in their own words 15. Asks for justification and clarification from pupils 16. Directs lesson by formally providing definitions 17. Uses audio-visual or electronic resources 18. Uses student previous experiences 19. Encourages pupil to pupil interaction 20. Using classroom norms and discussion etiquette 21. Wait time after asking questions 22. Questions that challenge another thinking 23. Questions that justifies 24. Questions that allow		

	Expand/ elaborate	pupils to change their mind 25. Encourage pupils to use formal labels 26. Encourage pupils to apply or extend concept 27. Remind pupils of alternative explanations 28. Refer pupils to existing data and evidence		
Evaluation	Evaluates	29. Observe pupils as they apply new concepts 30. Compare ideas 31. Uses different assessment techniques 32. Allow pupils to assess their own learning 33. Ask opened ended questions 34. Evaluate collective memory of the class 35. Bring closure to the lesson		

APPENDIX D

INTERVIEW GUIDE FOR INTEGRATED SCIENCE TEACHERS' KNOWLEDGE AND CLASSROOM INSTRUCTIONAL PRACTICES

1. Are you aware of the learner centred instructional strategy? If Yes, what do you understand by learner centred instructional strategy.
2. How will you compare learner centred instructional strategy to teacher centred instructional strategy?
3. Do you practice learner centred instructional strategy? If yes, can you mention some of the learner centred instructional strategies.
4. How do you think teachers' background factors can influence the practice of learner centred instructional strategy?

APPENDIX E

INTRODUCTORY LETTER FROM GHANA EDUCATION SERVICES

GHANA EDUCATION SERVICE
(WESTERN NORTH REGION)

REPUBLIC OF GHANA

Municipal Education Office
P.O. Box 75
Sefwi Wiawso

15th June, 2021.

In case of reply the number and date of the letter should be quoted

Tel: 0243119850
E-mail: swiawsodeo@yahoo.com
sefwiwiawso@ges.gov.gh
My Ref. No.: MEOW: 5869/08/14
Your Ref No.: .....

PERMISSION LETTER

MS. OPHELIA ODURO

STAFF ID: 558215

I wish to inform you that permission has been granted for you to conduct a research in the Municipality in partial fulfillment for Philosophy in Basic Education degree.

Thank you.

.....
(ABRAHAM FLETCHER)
MUNICIPAL DIRECTOR OF EDUCATION
SEFWI WIAWSO

MS. OPHELIA ODURO ✓
UNIVERSITY OF EDUCATION, WINNEBA
WINNEBA

CC:
THE HEADTEACHERS
SELECTED SCHOOLS
SEFWI WIAWSO MUNICIPAL