UNIVERSITY OF EDUCATION, WINNEBA

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF SCIENCE EDUCATION

INTEGRATED SCIENCE INSTRUCTIONAL APPROACHES IN SELECTED SENIOR HIGH SCHOOLS IN THE GOMOA EAST DISTRCT

SARAH YEBOAH MENSAH

AUGUST, 2014

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A DISSERTATION IN THE DEPARTMENT OF SCIENCE EDUCATION, FACULTY OF SCIENCE EDUCATION, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF THE MASTER OF EDUCATION DEGREE IN SCIENCE EDUCATION OF THE UNIVERSITY OF EDUCATION, WINNEBA.

AUGUST, 2014

DECLARATION

Student's Declaration

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

Signature……

Date……

Supervisor's Declaration

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

Name of Supervisor: PROFESSOR JOHN K. EMINAH

Signature……

Date……

DEDICATION

I dedicate this book to my two lovely and handsome boys Joseph William Yaw Mensah and Joseph William Kwabena Mensah (The Juniors). They have been struggling with me going up and down travelling with me to submit my research work for corrections. At such tender ages, I was leaving them behind while attending lectures.

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ABSTRACT

This study was designed to investigate the instructional approaches utilized in selected senior high schools during integrated science lessons. The persistent poor performance of senior high school (S H S) students in the research area in integrated science prompted this study. The target population comprised senior high schools in the Gomoa East and West District of the central region. The accessible population however consisted of senior high school in the Gomoa East District. Of the eight senior high schools in the District, three of them (2 public schools) and (1 private school) were purposively selected for the study. The main instrument used was a questionnaire. This was supplemented with interview schedules. The total number students in the three selected schools were 1325 and data was collected from 243 students and 25 integrated science teachers. Before being used for the study, a pilot test was conducted to check the reliability of the main instrument. The results from the three schools showed that while the teachers in the private school utilized the guided discovery approach, their colleagues in the public schools used mostly the lecture method. It was also found that most of the teachers in the public schools did not specialize in science. Additionally, the teachers in the public schools did not organize practical activities. Hence the students had no opportunity to handle equipment and materials during integrated science lessons. Based on the findings of the study it was recommended that as much as practicable, only teachers who specialized in science should be asked to teach integrated science.

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INTRODUCTION

Overview

This chapter is devoted to the background to the study, the problem statement, objectives and the research questions formulated. Also presented are the limitation, delimitation and abbreviations used in the study.

Background to the Study

Science is a broad field of knowledge and deals with observed facts and the relationship, among those facts. It has been shown (through many recent studies) that the way students conceptualize science influences the way they learn science and the way they think about science. There are also constructivists' perspectives to suggest that it is important to gain an appreciation of students' conceptualization of scientific knowledge in order to facilitate their cognitive or mental development and further understanding of topical scientific issues.

For the development of science there is the need to eliminate certain beliefs and perceptions and encourage the rapid development of science and technology among individuals. Also instructional approaches used in science lessons will have to be reviewed to help students understand concept taught and to motivate them to love and like the subject. Since the senior high school level is meant for the acquisition of scientific knowledge and attitudes, the CRDD (Curriculum Research and Development Division) of the Ministry of Education has designed the SHS integrated science syllabus in a way that will develop the students' understanding of scientific concepts and principles. However evidence from the researcher's school and the classes she teaches shows that an appreciable proportion of SHS students lack conceptual understanding of a lot of the integrated science topics. Available records at the Gomoa East

District Education Office also indicate that the performance of SHS students in integrated science (over the years) has been declining. There have been speculations that root cause of the problem is the instructional approaches utilized by the teachers during integrated science lessons. This view appears to be supported by Owusu (1999). He noted that inappropriate teaching methods or techniques (instructional approach) used by some teachers have contributed to the poor performance of students in science at the SHS level.

Researchers such as Parku (2012), Owusu-Sekyere (2012) and Lawson (2007) have provided evidence to the effect that how science teachers conduct their lessons affect the level of comprehension demonstrated by students during science lessons. Parkus' (2012) study was conducted in the Gomoa East Distrct. However it focused only on junior high schools. Owusu-Sekyere (2012), on his part conducted his study in the Afigya-Sekyere East District of the Ashanti Region. These two researchers found that the teachers were not organizing their lessons in ways calculated to maximize the students' learning.

Lawson (2007), however focused on how selected upper primary teachers in the Akwapim North District organized their science lessons and found that their instructional approaches were not process-oriented. The three researchers found that although the teachers were physically present during science lessons, they did not teach to the students understanding. It appeared that the observed teachers dominated the science lessons and thus did not give opportunities to the students to handle teaching and learning materials and manipulate equipment and apparatus.

Although there appears to be valid reasons to suspect that integrated science teachers in the study area are not teaching the subject as prescribed, no study was found that was designed to investigate the issue. Information obtained from the district office states that in spite of

repeated complaints by some students in the study area about their dissatisfaction with the general instructional approaches used by their teachers. Some attempts had been made to obtain empirical data on the issue. For this reason, this study was designed with SHS integrated science instructional approaches in view. This is meant to determine the extent to which the instructional approaches used by SHS integrated science teachers in the study area conformed to the program prescriptions.

Statement of the Problem

A number of problems affect the teaching and learning of science at the S.H.S level in Ghana. There is some evidence that unworkable instructional approaches, lack of teaching materials, lack of qualified teachers and infrastructural facilities affect the teaching and learning of science.

This has resulted in the abysmal performance of students in integrated science. In spite of the organization of extra classes/lessons for science students, the performance of S.H.S science students has not shown any significant improvement over the years.

In the case of integrated science, recent Chief Examiner's Reports for the subject at the S.H.S level indicate a downward trend in the performance of the candidates. The weaknesses reported on exceeded the strong points of the candidates. Although the Chief Examiner has been offering suggestions to address the candidates' weaknesses, the situation appears to defy all attempts to remedy it. This point to the complex nature of the factors that affect S.H.S students' performance in integrated science. The situation is the same in the study area where the researcher teaches integrated science. Although studies have been conducted into aspects of the teaching and learning of integrated science (Kavianu, 2013; Parku, 2012) no study to that effect has been conducted in the research area. For this reason, this study was designed in the Gomoa

East District to determine the factors that caused the poor performance of the students in integrated science and the type of instructional approaches used in teaching integrated science in the Gomoa East District.

Purpose of the Study

The primary purpose of the study was to determine the various instructional approaches utilized by senior high school integrated science teachers in the Gomoa East District during science lessons. Secondly the study was designed to determine the available instructional materials and how they were used during science lessons.

Objectives of the study

This research was designed to determine:

i. The qualification and areas of specialization of the science teachers.
ii. The instructional approaches used by the integrated science teachers during science lessons.
iii. The available instructional materials and how they were used during science lessons.
iv. Whether there are differences in the instructional approaches utilized by the integrated science teachers in the private and public schools.
v. The teachers' attitudes towards integrated science.
vi. The students' attitudes towards integrated science.
vii. The nature of the student-teacher verbalizations during integrated science lessons.

Research Questions

The following research questions directed the investigations in the study:

1. Are the science teachers in the selected schools qualified to teach science?

2. What instructional approaches are predominantly used by the integrated science teachers during science lessons?
3. Are there differences in the instructional approaches utilized in the public schools and the private school during integrated science lessons?
4. What materials are available in the schools and how are they used during science lessons?
5. What are the students' attitudes towards integrated science?
6. What are the teachers' attitudes towards integrated science?
7. What is the nature of the student-teacher verbalizations during integrated science lessons?

Significance of the study

This research would add knowledge to existing one which would increase the teachers' level of knowledge in science teaching to solve daily problems to many situations. Student's attitude and perception towards science will change.

This research would also provide avenues and the necessary information to curriculum designers in designing appropriate curriculum materials for science teaching. This would help modify the ways and approaches for science teaching to enable teachers teach to the level and understanding of all kinds of ability groups which would in turn increase students' love and effort for the subject. In this case teachers would not be jumping topics over topics but rather motivate the students.

Delimitations of the study

The study involved only three out of the eight senior high schools including a private senior high school in the study area. This apart, the study was limited to only the SHS 1 and 2 classes in the selected schools. The teachers and their students were observed. As the study did not

concern teachers' and student's knowledge of concept in science, no instrument on subject matter content knowledge was administered.

Limitations of the study

Some of the students were not present in school on the day of collection and others have also misplaced their questionnaires.

Abbreviations Used

J H S - Junior High School

CRDD - Curriculum Research and Development Division

SSCE - Senior Secondary Certificate Examination

W.A.E.C - West Africa Examination Council

SCHOOL A- Private School

SCHOOL B- Public School

SCHOOL C- Public School

CHAPTER TWO

LITRATURE REVIEW

Overview

The literature review was done under the following sub-topics

- Importance of teachers' qualifications and areas of specialization vis avis their knowledge of the subject matter.
- What influences the teaching and learning of science in the schools?
- Materials available in the school and how they are used.
- Nature of verbalizations.
- Student's attitudes to the learning of science.
- Attitudes of the Teacher towards Teaching of Science.
- Literature related to the topic.

Importance of teachers' qualifications and areas of specialization vis avis their knowledge of the subject matter

Bilesanmi (1999) found that teachers' experience was highly significant to students' academic achievement in mathematics. Cooney (1990) opined that students do not understand mathematics when it is taught by an ineffective teacher. Izumi and Evers (2002) buttressed this by saying that teacher quality is the most important among other critical factors like quality curricula, funding, small class size and learning situation.

George (2004) attributed poor achievement of students in mathematics to teacher qualification, inadequacy of materials as well as administrative factors. In teaching mathematics, Adesina (1982) and Fafunwa (1985) opined that with the exception of holders of minimum of B.Sc in Mathematics, many other teachers would be confronted with problem of teaching secondary

school mathematics syllabus effectively. Hence, Lassa (1985) argued that no one gives what he/she does not possess. He further said that no matter how good a course curriculum is, if we do not have well trained, qualified and motivated teachers, we may not achieve the desired goals.

In view of this, a teacher is someone who has been exposed to a good measure of training in a teaching subject area as well as in professional education: such professionally qualified teachers may according to the Federal Ministry of Education, Nigeria (2004) fall into a number of academic categories.

Mkpa (1987) regarded the trained teacher as someone who underwent and completed his education in a formal teacher training institution or in a planned programme of training. Among such areas of training may include principles and practice of education as well as being exposed to an observed period of internship either after or as part of the period of training. People who fall within this category should under normal circumstances be able to fulfill the various functions expected of teachers within and outside the four walls of the classroom. Furrugia (1987) perceived a professional teacher as one who possessed professionally based knowledge in the theory and practice of education as well as find job satisfaction in the belief that he/she is making an important contribution to the social, cultural and economic development of his/her country. Such a teacher should equally, be able to understand students' abilities to exploit educational benefits of the social context within which he/she lives. He/she should be able to assist students to reach their full intellectual and social potentials. According to Adieze (1986) non-qualified and non-professional teachers in teaching profession are killing the profession because they are not really teachers. He regarded them as "bird" of passage that create unnecessary vacuum whenever they see greener pasture and better prospect in the

profession they are originally trained for. The comparison of students' scores in mathematics achievement test based on teachers' qualifications becomes necessary in order to know if formal teaching methods has any significant effect/influence on students' performance in mathematics or not. Teaching and learning of mathematics depends to a large extent on teacher's own knowledge of the content and ability to adequately deliver the instruction to the students. However a lot of variables may inhibit or hinder effective dissemination of knowledge to the understanding of the content by the students, such variables may be lack of qualified teachers, teachers' qualification, experience, inadequate use of instructional materials among others.

Influences on the teaching and learning of science in schools

Studies have identified factors influencing interest or attitude toward science. The topics of this research are gender, classroom/teacher, curriculums, achievement, and culture. Among these factors, the most significant factor that shows the consistent result is the classroom/teacher factor. The cultural factor is recently regarded as important. Other factors show inconsistent results.

Gender

In spite of a long history of research about gender effects, there is a disagreement about gender influence on interest in science. Numerous studies show that boys show more interest than girls, although this difference is stronger in physics than in biology. The predominant thesis interprets that it is a consequence of cultural socialization that offers girls considerably less opportunity to deal with technological device (Osborne, 2003). Especially, Kahle (Kahle and Lakes, 1983; Smail and Kelly1984) argued, that the lack of experience in science leads to a

lack of understanding of science and contributes to negative attitudes to science" (quoted from, Osborne, 2003, p.1063).

However, there is now some evidence that girls no longer hold such a stereotypical aversion to careers in science and are confidence of their ability to undertake science courses Havard, (1996) quoted from Osborne, (2003).found that some girls aged between 10 and 15 reported strong interest to science. These findings suggest that gender itself may now only contribute a minor part in attribution of achievement and interest. Girls do not choose science courses in spite of ability because they do not want to limit their vocational choices in scientific careers. In addition, a science teacher has a tendency to emphasized instrumental value of science rather than intrinsic value as knowledge. In conclusion, these researches showed that some girls have interest in science as much as boys have, but interest in science is not the central interest to girls.

The Classroom and the Teacher

Many studies show that classroom environment has a significant influence on students' interest in science. Myers and Fouts (1992) found that the most positive attitudes were associated with a high level of involvement and personal support, strong relationships with classmate and use of a variety of teaching strategies and unusual learning activities (Osborne). Haussler and Hoffman (1992) indicate that the best predictor of students' interest in physics is the self-concept, which depends on favorable learning environment.

Especially there is much evidence that the quality of the teaching is a significant determinant of attitude to school science. Hendley et al (1995) found that one of the most frequently given reason for liking or disliking the subject was a teacher-related comment. Tobias (1990) also shows that many college students attributed their uninterested attitude toward science to the uninteresting lecture such as focused on problem-solving technique and lacked an intellectual

overview of the subject (Osborne, 2003). Therefore, these studies conclude the need for good teaching to increase student's interest and engagement.

Haussler and Hoffman (1997) drew a list of guidelines teachers could use to stimulate student's interest in a class. They also gave an effort to train teachers to use the guidelines. For example, two items of the guidelines are to provide opportunities to marvel and to link content to prior experience. The intervention in which teachers applied these guidelines was effective to enhance students' interest as well as students' achievement. Good teaching, which catch and hold student's interest, can be connected with the theory about situational interest and Dewey's view of interest.

The Curriculum

Curriculum research has been conducted severally but results are not yet convincing. However, recent studies indicate that there are some desirable effects of the curriculum on boys and girls (Dawson, 2000; Harp & Mayer, 1997; Hausser & Hoffman, 1997). The curriculum may have an effect on interest because curriculum gives a guideline for teaching. Therefore, more studies must be conducted.

Learner Achievement

There are some disagreements about effects of achievement on interest. It is possible to think that there can be some relation. One longitudinal study by Oliver and Simpson (1988) showed strong relationship between attitude towards science, motivation to achieve, and self-concept, about his ability quoted from (Osborne, 2003). However, research evidence offers little support for strong relation between achievement and interest. Lee and Brophy's (1996) analysis of motivation pattern showed that high achievers in science are not always interested in science. Weinburg's (1995) meta-analysis of the research suggested that there is only a moderate

correlation between achievement and interest, although this correlation is stronger for high and low ability girls quoted from (Osborne, 2003).

The influence of Culture

Recent studies have a concern about the cultural difference in attitude or motivation. Some studies showed the influence of ethnic origin is found to be more significant than gender. Taylor (1993) and Modood (1993) found that Asian students more prefer science for their degree in university than White students do. Woodrow (1996) interpreted that this phenomenon results from Asian parent's effect on children's choice of careers in science quoted from (Osborne, 2003). Cultural difference in motivation is interesting and more research should be conducted.

Materials available in the school and how they are used

The types of materials available in the school are very important and contribute greatly to the achievement of academic success. The material available will determine the type of instructional approach to be used in a particular lesson. The use of non-book instructional materials commonly known as teaching aids and teaching apparatus. The use of non-books instructional materials (NBMs) has assumed some sophistication in some schools yet there is an apparent lack of interest in usage among teachers trained in the 1980s and '90s (Opoku-Asare, 2000). This is attributed to major changes that occurred in the curriculum and structure of teacher education in 1979, which devolved responsibility for instructional materials usage from art specialist to all subject tutors. Currently, because development and use of instructional materials is not emphasized in the pre-service education of teachers, among other things, many teachers are unable to positively influence students learning in Ghana. On the whole every significant use of instructional material should be utilized.

Electronic resources are becoming increasingly popular in integrated science, particularly with the introduction of interactive whiteboards and the ready availability of free video clips online. Many of the materials used in class were generated by the teachers from the wide range and variety of resources (including books and online resources). This trend means that the quality of the materials, and of the students' learning through them, is dependent on teacher knowledge, skill and commitment. There were many examples from the case study schools and evidence from the survey of the extensive use of 'first-hand' resources such as materials on the school on the school compound. Students are more likely to acquire individual books as resources rather than sets of books, outside visits and artifacts'.

The nature of student-teacher verbalizations during science lessons

Self-verbalization may not facilitate performance when students can adequately handle the task demands. Because self-verbalization constitutes an additional task, it even could hinder performance if it distracted children from the task at hand. Thus, Denney (1975) modeled performance strategies for 6-, 8-, and 10-year-old normal children on a 20-question task. Older children who verbalized strategies while they performed scored better than children who did not verbalize, and verbalization seemed to interfere with the performance of 6-year olds. The verbalizations, which consisted of specific strategies, apparently proved too distracting for the youngest children. Among normal children ranging from 3 to 10 years, strategy modeling plus self-verbalization yielded no benefits on different cognitive tasks compared with strategy modeling alone (Denney & Turner, 1979). Subjects constructed their own verbalizations, which may have been less distracting than Denney's (1975) specific statements. Coates and Hartup (1966) also included 7-year olds and found that verbalization of the model's actions did not improve subsequent reproduction compared with passive observation. These children could

adequately regulate their task attention and cognitively process the model's actions without verbalizing.

Overt strategy self-verbalization forces children to attend to strategies and is a form of self-rehearsal, which should promote strategy encoding and subsequent availability when children engage in comprehension activities (Denney, 1975; Fuson, 1979). Self-rehearsal of information to be remembered facilitates later performance (Asarnow & Meichenbaum, 1979; Coates & Hartup, 1969; Jackson & Calhoun, 1982; Keeney, et al. 1967).

The performance benefits of strategy self-verbalization were expected to be, greater for the older children (i.e., third and fourth graders) than for the second graders. Although developmental research has lent some support to Vygotsky's hypothesis in that the amount of spontaneous private speech decreases as children become older (Fuson, 1979), research also demonstrates that the proportion of private speech that is self-regulating increases with age (Fuson, 1979). Other research shows that self-regulating private speech does tend to become covert with age (Rubin, 1979). Greater use of covert speech that includes strategies ought to facilitate strategy application to the extent that children utilize covert speech when subsequently given comprehension exercises. Older children also were expected to perform better than younger subjects because the deficiencies. It seem possible that the demands of self-verbalization might compete with those of the listening comprehension task, Which could hinder the youngest subjects' encoding of strategies and subsequent availability of that encoding.

According to Bandura, different procedures change behavior in part through the common mechanism of creating and strengthening perceived self-efficacy (Bandura, 1977, 1981, 1982b). Self-efficacy refers to personal judgments of one's capability to perform behaviors in

specific situations that may contain ambiguous, unpredictable, or stressful elements. Self-efficacy can affect choice of activities, effort expenditure, persistence in the face of difficulties, and task accomplishments. Efficacy information is conveyed through self-performances, vicarious (observational) means, verbal persuasion, and physiological indexes.

Strategy self-verbalization was expected to promote self-efficacy more than not verbalizing strategies. The present subjects initially observed a teacher verbalize comprehension strategies, after which they verbalized the strategies prior to applying them to questions. Such teacher modeling is a vicarious source of efficacy information; that is, telling children to verbalize the same strategies represents a close match to the modeled behavior and implicitly conveys that children can succeed if they do so (Schunk, 1982). This type of close match can create a sense of personal control over achievement outcomes, which is hypothesized to promote self-efficacy (Bandura, 1982a). Children's initial sense of efficacy is substantiated later as they successfully apply strategies. Schunk (1982) investigated the effects of different types of self-verbalization; the type that represented the closest match to the model's verbalizations promoted self-efficacy the most. No hypothesis was advanced on whether self-verbalization would affect self-efficacy differently across grades because there was no theoretical or research evidence on this point.

Students' attitudes towards the learning of science

Being one of the constructs of the affective domain, attitudes have been researched for more than 40 years (Aiken & Aiken, 1969; Koballa & Crawley, 1985; Koballa, 1988). The need for conducting studies, related to attitude, was undertaken for two main reasons; namely the attitudes' feasible power to predict future behaviors like subject and career preferences of students (Koballa, 1988; Osborne, Simon & Collins, 2003), and the correlation existing between attitude and academic achievement (Schibeci, 1984; Shrigley, 1990; Weinburgh, 1995;

Osborne & Collins, 2000). In their meta-analysis of attitude related factors that predict future behaviors, Glasman and Albarracín (2006) concluded that there is a correlation between attitudes and future behaviors'; that is, attitudes are a potential for predicting future preferences, especially if there is a direct interaction between participants and the attitude object (i.e. objects that related to attitude like science lessons). Actually, studies that examined the correlation between attitude and academic achievement did not provide consistent results. Schibeci (1984), for instance, found a strong relationship between attitude and achievement. Shrigley (1990), on the other hand, argued that there is only moderate relationship between attitudes toward science and science achievement.

A literature on attitude conducted by Osborne concentrated on a range of aspects (Osborne et al., 2003) such as defining attitude and making a distinction among similar terms (Koballa, 1988), defining attitude objects (Spall, Dickson & Boyes, 2004), and developing attitude constructs (Kind, Jones & Barmby, 2007). Since these concerns are necessary for deeper understanding of the theory of attitudes, all three aspects have been documented for accumulation of information related to the importance of attitudes in education required science programs to include science-related attitudes. One of the aims of the Turkish secondary school science program, for instance, was to develop positive attitudes toward science (Ministry of National Education [MNE], 2007). This led to a consideration of what is meant by the apparently simple term "attitudes toward science" and also "scientific attitudes". Gardner (1975) made a distinction between these two concerns, describing the latter as a scientific thinking and questioning strategy that can be treated under the cognitive domain (Osborne et al., 2003), whereas describing "attitudes toward science" as a learned tendency to evaluate in certain ways, which is the aspect within the scope of the present study.

The attitudes toward science are related to positive or negative feelings about scientific objects and enables prediction of scientific attitudes (Koballa & Crawley, 1985). Schibeci (1983) argued that various objects can be related to attitudes like science lessons, scientists, science in real life, and etc. This leads to the question-do students differ in their attitudes toward science? This critique question has already been the subject of research by studies (Havard, 1996; Spall et al., 2004) pointing out that treating different branches of science lessons under the general heading (i.e. science) may cause deviated results; that is, students' attitudes toward chemistry and physics or any other branches of science may vary. In fact, subject preference studies (Havard, 1996; Osborne & Collins, 2000) are not very common due to the objectiveness problems related to the measurement; that is, students give answers to the items within the scale in a relative manner (Osborne et al., 2003) which may not indicate the real situation. Among limited studies, Osborne & Collins (2000) investigated 16-year-old students' attitudes toward science lessons and found that chemistry is the least favorite branch of school science.

"Attitudes toward science" has been treated most of the time as a unique concept, but analyses are needed to check whether the scale is one-dimensional as this is important for both reliability and validity concerns (Osborne et al., 2003). The attitude literature confirmed that there are constructs that contribute in varying proportions to the attitudes of students (Osborne et al., 2003) which are formed with respect to contexts (Barmby, Kind & Jones, 2008). Overall, both the nature of sampled individuals and attitude itself require controlling for dimensionality of the scale used to collect data. Kind et al. (2007) developed a set of constructs in order to solve the problems related to the dimensionality of scales which are importance of science, learning science in school, practical work in science, science outside of school, self-concept in science, and future participation in science. Eccles and Wigfield (1995) combined the constructs

"interest, importance, and utility" under the term "task value" which can be defined as the degree to which an individual trusts a task for accomplishing an individual's needs or goals.

Since attitudes are not the same towards different objects and issues confirmed that attitude, in most cases, is a multidimensional variable (Gardner, 1995), it is thus crucial to define the scope of the study, explicitly. The focus of the current study is on secondary school students' attitudes toward science as a school subject in Turkey (Grades 9-11).

Besides defining attitudes and dimensions of attitude, the literature deals widely with the factors affecting attitude toward science. Grade levels (Hofstein, Ben-Zvi, Samuel & Tamir, 1977; Yager & Yager, 1985; Simpson & Oliver, 1990; Francis & Greer, 1999; George, 2006; Barmby et al., 2008), gender (Hofstein et al., 1977; Harvey & Stables, 1986; Francis & Greer, 1999; Barmby et al., 2008), achievement (Weinburgh, 1995; Salta & Tzougraki, 2004) are some of the most investigated factors affecting secondary school students' attitudes toward science. However, this paper will discuss solely the studies that focused on the effects of gender, grade level, and interaction of them (i.e. gender and grade level) on attitudes toward science as a school subject.

According to the Longman Active Study Dictionary of English (2007) an attitude is a way of feeling, thinking or behaving towards a particular issue. It may be positive or negative. Those with positive attitude may love and have a good feeling about the concept and will think and behave well towards that particular object issue. Those with the negative attitude will hate and dislike the issue and will therefore have a lukewarm attitude towards science.

Selmes (1968) carried out investigation on how S.H.S pupils perceive science. He found out that S.H.S pupils have the perception that science is boring, difficult to pursue and it requires

only brilliant students who can pursue it, therefore it was assumed that only boys or males can do the course (science)

Pupils perceive science to be difficult and that it is not easy to pass therefore they try to memorize concepts in other to pass their examination without getting the understanding of the concepts. Hence cannot use it to solve everyday problems.

Analysis of the fact that science is difficult and needs to be memorized shows that science is unchanging and is recognized in the pupils' attitudes towards science and teachers should not teach science as a collection of many different things gathered together(conglomeration)of unconnected facts but as a knowledge about the world they live in. This attitudes of the learners may be due to the methodology and the learning materials available e.g. from analysis of research in one of the schools, the pupils were not allowed to handle practical equipment or apparatus because they were perceived to be harmful and will hurt the pupils. The learners thus gradually believe that science was harmful and have to be avoided.

According to Block et al. (2009), transactional learning relies on a student ability to internalize the text to think about the text and relate it to what he or she already knows and care about. The first stage of transactional learning encourages private thought in order to relate it to past knowledge, while in the second stage the student discuss as a group, getting multiple perspectives on the same texts. Open ended discussion rather than teacher directed questioning allows for individual thought to take place and thus the knowledge becomes more personal and deeply in gained. The attitude literature includes various studies that investigated gender differences in students' attitudes toward science courses. Some of the studies reported that female students' attitudes toward science lessons were higher than male students' (Hofstein et al., 1977; Dhindsa & Chung, 1999). Some of the studies, on the other hand, found the opposite

situation in their cases; that is, boys had more positive attitudes to science lessons than girls (Harvey & Stables, 1986).

Inconsistent results of the studies may arise from various factors such as examining different constructs of attitudes (Osborne et al., 2003), not considering dimensionality of data (Rennie & Parker, 1987), and not analyzing the interaction between grade level and gender (George, 2006; Cheung, 2009). The literature confirms that gender and grade level can interact with each other (George, 2006); that is, female or male students may have different attitudes toward science as time passes. However, the number of studies that investigated the interaction effect on attitude is low. Cheung's (2009) study is an informative one which explored the interaction effect between grade level and gender on secondary school students' attitudes toward science lessons in Hong Kong. Attitude toward science lessons was evaluated using four dimensions that were liking for science theory lessons, liking for science laboratory work, evaluative beliefs about school science, and behavioral tendencies to learn science. According to the results of the study there was a significant interaction effect between grade level and gender on secondary school students' attitudes toward science lessons.

Attitudes of Teachers towards Science

High-quality teachers are essential to improving the teaching and learning (Darling-Hammond, 1997). Teaching practice and instructional decisions influence the quality of students' academic performance and their motivation, effort, and attitudes toward school and academic pursuits (Hidi & Harackiewicz, 2000). They also promote or reduce students' learning and achievement (Hardre & Chen, 2005). Research involving both secondary and older students appears to indicate a relationship between teacher behaviors and students' attitudes toward science (Haladyna, Olsen, & Shaughnessy, 1982; Myers & Fouts, 1992). Students with positive

attitudes toward science are more likely to be found in classrooms that have high levels of involvement, teacher support, and use of innovative teaching strategies (Myers & Fouts, 1992). Teachers who lack ability, confidence, and enthusiasm for the subject tend to use less stimulating, more didactic methods and did not respond effectively to students' questions (Osborne & Simon, 1996). Such teachers also were more likely to have students with poor attitudes toward science. Effective teachers adapt learners' needs and evaluate how information should be presented. To meet these demands, teachers need to adjust instruction to student ability levels and background. In fact, one study showed that teachers' teaching style and instructional decisions are the most noticeable factors in students' attitude toward science (Jarvis & Pell, 2005).

Therefore, the researcher surveyed teachers about their teaching practices to understand how their approaches might affect students' knowledge and attitude toward science as the result of a simulation learning experience.

Amedeker (1998) stated that the use of English Language throughout science lessons by teachers prevents some of the pupils from participating in lesson becoause they do not understand the language as a result do not get the understanding of the science concepts and become dull since they don't understand the concept of science. The teacher's use English throughout their teaching and this made the pupil lose interest in the subject and expects few enthusiastic ones who can understand and take part. The teacher's view or thoughts about science and their comments either encourages or discourages the pupils, like the perception of some teachers towards science and science related courses example, science is for brilliant pupils, science is difficult for poor pupils.

The teachers approach or methods of science teaching and the teaching / learning materials they use as a factor will also influence the pupils attitudes either positive or negatively e.g. the use of lecture, brainstorming etc. will make the subject boring and difficult to understand therefore will memorize solution to pass examinations which will not bring about learning. But the use of discussion and pupils centered approach will make the subject interesting and will like the course and learn to understand without memorizing for exams.

An appropriate teaching material makes the teacher's teaching easy and more meaningful to the pupils and teachers as well.

Block et al.(2009), situated practice is when a teacher provide tools, tricks, or tips for a student to practice while he or she is reading rather than give an answer right away, a teacher will remind a student of these practice points in order for that student to use these tools more readily until they are second mature . Then when a student encounters another similar situation he or she has the tools in mind to go forth and reading is enjoyable, smoother and past time

Conceptual learning utilizes idea that a student can comprehend a subject better if given multiples resources and test on that subject, thus providing a broader understanding and building a bridge between reading comprehension and genuine understanding of the subject (block et al. 2009).

Literature review related to the topic

Anamuah-Mensah (1992) identified the co-existence of three most opposed world views that is scientific, nature and religious views. These views create conflicting mental situations for the child especially in problem-solving situation and this influenced the pupil's thoughts and attitudes.

According to Eminah (1998) interactions with nature, openness, experimentation, naturalistic explanations and record keeping are critical for the growth of science in society.

Amedeker (1998) in his work came out with the fact that, in public or government schools the use of English Language has also had effect on pupils' attitudes toward science.

Factors identified that influence pupils attitude towards teaching and learning of sciences are:

(1).The use of English Language in teaching and learning of science instead of native language.

(2).The attitudes of science teachers toward teaching and learning of science.

(3).The use of inappropriate methods for teaching science.

(4).Inadequate use of teaching / learning material

According to Block et al. (2009), individual schema-based learning operates under the understanding that a student's schema is "his or her organized knowledge of the world" and that this provides a basis to process read information, have a point of reference with which to infer meaning, summarize information, and be able to remember information read at later dates (p. 263). All of these skills are key to developing fluent reading comprehension. In this case, a teacher helps create this schema by providing hints and ideas with which a student can relate to and work from while reading silently.

According to Block et al. (2009), situated practice is when a teacher provides tools, hints or tips for a student to practice while he or she is reading. Rather than give an answer right away, a teacher will remind a student of these practice points in order for that student to use these tools more readily until they are second nature. Then, when a student encounters another similar situation, he has the tools in mind to go forth and reading is a smoother, enjoyable pastime.

Conceptual learning utilizes the idea that a student can comprehend a subject better if given multiple resources and texts on that subject, thus providing a broader understanding and

building a bridge between reading comprehension and genuine understanding of the subject (Block et al., 2009).

According to Block et al. (2009), transactional learning relies on a student's ability to internalize the text, to think about the text and relate it to what he or she already knows and cares about. The first stage in transactional learning encourages private thought in order to relate it to past knowledge, while in the second stage the students discuss as a group, getting multiple perspectives on the same text. Open ended discussion rather than teacher-directed questioning allows for individual thought to take place and thus the knowledge becomes more personal and more deeply ingrained.

Finally, traditional instruction requires the use of a basal reader (textbooks designed to help students learn to read) primarily with exercises already included in the book or with a teachers' edition for support. This is based on the fact that basal-reader instruction has proven to improve a student's basic literacy abilities. As such, an additional 20 minutes per day would add to that already increased effect on developing further reading comprehension (Block et al., 2009).

Block et al. (2009) chose each of the schools, four elementary schools and one middle school, at random, from school districts that represented a variety of socioeconomic populations. Each classroom and student was assigned a random number and referred to throughout the experiment. They further had principals randomly assign classes to control or experimental groups, making sure that the rooms were alternated. The teachers that participated were all volunteers.

All teachers were of comparable skill level and experience and all students' entrance requirements were identical. Teachers received a 40 hour training session on how to implement each of the methods described above. They were not allowed to use any material or resources

outside those provided by Block et al. (2009). Their lesson plans were created for them and assigned so that each experimental learning environment occurred in at least every grade during every six week period in each school.

CHAPTER THREE

METHODOLOGY

This chapter was treated under the following sub – topics.

a) Design of the study

b) Population and sampling.

c) Instrumentation.

d) Data collection procedure.

e) Data analysis.

Design of the study

The study was carried out in a suburb of Gomoa East District called Fetteh in the Central Region of Ghana. The District Education office is situated at Afransi. The towns in the District have eight (8) senior high schools- five public senior high schools and three private senior high schools.

The descriptive survey design was used to collect data in this study. According to the available data, there are eight senior high schools in the study area. According to Van Dalen (1979) a survey research should involve at least 10-15% of the accessible population. Three of the eight schools in the study were selected. This number constituted 37.5% of the accessible population and is in conformity with van Dalen (1979). The utilization of the survey design was meant to enable the researcher gather data from a wide variety of respondents than would have been possible with a single case study.

Population and Sampling Procedure

The research was done in three selected senior high schools in the town, two public schools and one private school. The study involved form one science and General arts students who were

one hundred and sixty (160) students and all form two students who were eighty three (83). The selection of the school was randomized and it represented the sample from the whole school population for studies. The population of the three selected schools of study was one thousand three hundred and twenty five (1325) students and twenty five teachers or staff.

The integrated science teachers and the students in the selected schools formed the research subjects for the study

Instrumentation

The instruments used to collect data were questionnaires, interview schedules and document analysis.

The questionnaire was the main instrument. It contained 30 items and was based on Simpson-Troost Attitude Questionnaire-revised (STAQ-R). STAQ-revised is a revised form of Simpson-Troost attitude questionnaire that was developed by Owen et al (2008) to assess adolescent commitment to and achievement in science. STAQ has 22 Likert items that examine attitude towards science but I added 8 items to it regarding cultural and ethical properties of our country Ghana. I added some demographic questions as gender and economical class and collect student's scores in science from the high schools from which students had been chosen. This showed that the items in the questionnaire had strong internal correlation. Then a total of 185 grade 12 students (age 17-18 years) from secondary students of Gomoa east district (Fetteh) were chosen to participate in research who answered to 30-item questionnaire that assesses their attitudes towards science. The interview which was the second supporting instrument was in two different categories that is the student level and the teacher's level. The interviews for the pupils will be on the studies. Interviews of the pupils to identify or observe their attitude towards learning, understanding and perception of science.

The interview was conducted based on the sample. Each interview session comprised 15 items. The students' interest, background and perception about science and how they responded to scientific questions and facts were probed during the interview sessions.

Design of the instruments

The questionnaire which was the main instrument and comprised thirty likert-type items, twenty two and additional eight ethical questions based on the Ghanaian culture. Students were ask to answer the questions confidentially by not writing their names on their paper and not write any teacher's name.

The interview schedules comprised items asking for background information such as qualifications, areas of specialization, and teachers' approaches to science teaching and learning of science.

Scoring the instruments

In scoring the main instrument for the research, a frequency approach was adopted. Responses obtained were categorized and frequency of each category of responses calculated. The percentages of the category of responses were also calculated. This was done because coding schemes had been developed by the researcher to help in the organization of the data.

Reliability of the Main Instrument

The reliability of instrument was determined a pilot test before being used for the study; it was done with the help of an experienced researcher. The reliability co-efficient of the questionnaire instrument was determined using Pearson's product moment correlation formula. The values obtained were 0.972 and 0.978. From the correlations co-efficient obtained it was evident that there was high degree of agreement between the researcher and the co-observer. The questionnaires were administered in a school which had characteristics similar to those in the

sampled schools. A different school was used for the establishment of the reliability of the main instrument so not to contaminate the sample for the study.

Validity of the Main Instrument

Before being used to collect data, the questionnaire underwent content and face validation analysis. The questionnaire and interview schedule protocols were also given to the supervisor of the study. He compared the items in the instrument with the objectives of the study and made modifications in the instruments after thorough examination of the research questions to ensure that the instrument collected the relevant data. The face validation of the instruments was done with the help of experienced researchers who had worked on STAQ-R project in the study area.

Data Collection Procedure

Data was collected from the schools on separate days. To preserve anonymity, the schools was coded as school A (private), school B (public), school C (public). Before then familiarization visit were made to the schools to seek permission and to establish rapport with the research subjects.

In each school questionnaire were distributed to the selected students and their teachers. The teachers and students were given one week to complete the questionnaire. Additionally, all the teachers and randomly selected students were interviewed on aspects of their integrated science lessons.

Data Analysis

Frequency counts of the data collected were done and later converted into simple percentages. The analyzed data was then categorized based on the research questions formulated for the study.

The analyzed data was then used to answer the research questions. Portions of the data were also subjected to narrative description to compare the predominant instructional approaches in the selected schools.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This chapter is devoted to the presentation of the results of the study. The results are presented based on the research questions formulated for the study. Additional data collected during the study will be added including some suggestions from the surveyed teachers and students.

Back ground information on the research subjects

The actual sample used in the study consisted of 243, students and 25 science teachers in the three schools selected for the study in the Gomoa East District. Fifteen (15) of the teachers were men and ten (10) of them were women. Hundred and thirty one of the students were males and hundred and twelve of them were females. The students' ages were between fifteen and nineteen years. The tables one (1) and two (2) present the sex distribution of the research subjects.

Table 1: Sex distribution of the teachers

Sex	Number	Percentage (%)
Male	15	60
Female	10	40
Total	**25**	**100**

Table 2: Sex distribution of the students

Sex	Number	Percentage (%)
Male	131	55
Female	112	45
Total	**243**	**100**

The purpose of this study was to determine integrated science instructional approaches.

Presentation of the Results by Research Questions

Research question one (1):

Are the science teachers in the selected schools qualified to teach science?

From the results obtained in the study it was shown that all the science teachers in the surveyed schools were trained and qualify to teach in the senior high school but some were not qualify to teach the subject they were handling.

In the schools where this research was conducted 25 science teachers were surveyed and each had a specific qualification. Five (5) of the teachers were teaching physics, (ten) 10 teachers taught biology (eight) 8 taught chemistry whiles 6 of them taught agricultural science. The summary of the data are shown in the tables below, that is table 3, table 4 and table 5 which shows the qualification, areas of specialization, subject teaching and the teaching experience of the various teachers surveyed in the schools for the study. Table 3 shows the record of teachers in the private school and table 4 and 5 shows the record of teachers in the public schools.

Table 3: Teachers' qualifications and areas of specialization in school A.

Qualification	Area of specialization	Subject Teaching	Teaching experience
B.Sc Physics	Physics	Physics	2
B.Ed Chemistry	Chemistry	Physics	6
M.Ed Biology	Biology	Biology	4
B.Ed Biology	Biology	Biology	5
M.Ed Chemistry	Chemistry	Chemistry	6
B.Ed Chemistry	Chemistry	Chemistry	4
B.Sc Agric	Agric science	Agric science	5
B.Ed Agric	Agric science	Agric science	8

Table 4: Teachers' qualifications and areas of specialization in school B.

Qualification	Area of specialization	Subject Teaching	Teaching experience
B.Ed Physics	Physics	Physics	5
B.Ed Chemistry	Chemistry	Physics	4
B.Sc Biology	Biology	Biology	6
B.Ed Biology	Biology	Biology	7
M.Ed Biology	Biology	Chemistry	4
M.Ed Biology	Biology	Chemistry	2
B.Sc Biology	Biology	Agric science	6
B.Ed Agric	Agric science	Agric science	8

Table 5: Teachers' qualifications and areas of specialization in school C.

Qualification	Area of specialization	Subject Teaching	Teaching experience
B.Ed Physics	Physics	Physics	6
B.Ed Chemistry	Chemistry	Physics	7
M.Ed Biology	Biology	Biology	3
B.Ed Biology	Biology	Biology	5
M.Ed Chemistry	Chemistry	Chemistry	6
B.Ed Biology	Biology	Chemistry	9
B.Sc Biology	Biology	Agric science	2
B.Ed Biology	Biology	Agric science	5

Out of this most of them did not have the right qualification to teach their subject? For instance three (3) of the five (5) teachers teaching physics specialized in chemistry, and were supposed to be teaching chemistry, four (4) of the agric teachers read biology whiles in school and three (3) of the chemistry teachers did biology in school but were asked to teach integrated science due to lack of teachers in that area.

Research question 2:

What instructional approaches are predominantly used by the integrated science teachers during science lessons?

From the lessons observed it was found that most of the teachers used the lecture method and also the discussion method. Only few teachers used the guided discovery approach. The results have been summarized in the table 6, 7 and 8

Table 6: Instructional approaches used in school A (private)

TEACHERS	INSTRUCTIONAL APPROACHES
1	Guided Discovery
2	Guided Discovery
3	Lecture Method
4	Brainstorming
5	Discussion
6	Lecture Method
7	Role Play
8	Guided Discovery

Table 7: Instructional approaches used in school B (public)

TEACHER	INSTRUCTIONAL APPROACHES
9	Lecture Method
10	Lecture Method
11	Lecture Method
12	Discussion Method
13	Lecture Method
14	Lecture Method
15	Discussion Method
16	Discussion Method

Table 8: Instructional approaches used in school C (public)

TEACHERS	INSTRUCTIONAL APPROACHES
17	Lecture Method
18	Lecture Method
19	Lecture Method
20	Discussion Method
21	Role Play
22	Lecture Method
23	Lecture Method
24	Lecture Method
25	Lecture Method

The good and brighter ones were allowed to answer most of the questions leaving the weak ones behind. Most of the teachers' questioning and answering approaches were very poor and biased. One of the objectives of the senior high school integrated science is to equip students with the foundation of science and help them to solve daily issues scientifically and teachers should make sure they used instructional approaches that will help them acquire these skills with ease and be able to apply it to daily lives. One of the methods that could help students develop problem solving approach is the Guided Discovery Approach. This method was hardly used.

With the Guided Discovery Approach, students needed learning experiences that will drive them towards inquiry learning. Sunds and Carin (1985) pointed out that, the Guided Discovery Approach gets children actively involved in the process of discovering scientific ideas and

concepts on their own, with the teacher giving instructions. The teacher gives a question to the class and guides them on how to do it. Students collect, classify, analyze and evaluate data to come out with their own findings to solve the problem with the teacher acting as a facilitator. The students thus had the opportunities to use materials and equipment to develop their scientific process skills, attitudes and knowledge group activities.

Research question 3:

Are there differences in the instructional approaches utilized in public schools and the private school during integrated science lessons?

From the study it was found that the instructional approaches used in the private schools were different from those used in the public schools. The predominant instructional approaches used in the public schools and the private school are summarized in the Table 9.

Table 9: shows the differences in instructional approaches utilized in the public and private senior high schools.

Table 9: Predominant instructional approaches utilized in the selected schools.

SCHOOL	STATUS	INSTRUCTIONAL APPROACHES
A	Private	Guided Discovery Method
B	Public	Lecture Method
C	Public	Lecture Method

In the public schools because there was little or no supervision, the teachers tend to use the lecture method to teach with the reason that they do not understand the concept and cannot teach to the level of the students. Some too complained of not having enough teaching materials so had to teach in the abstract. Some of the teachers also had the view that because they were teaching subjects outside their subject areas they could not use the best method but

were forced to lecture. In the private school there were sufficient materials to teach with and supervision was effective. Teachers teaching subjects outside their areas were taking through some in-service training to get them abreast with their new subjects. This caused the teachers to adopt the guided discovery approach to teach to the level of the students. In the private school the teachers were forced to teach with the child-centered approach so the students develop understanding of concepts. Teachers in the public schools taught for teaching's sake and for their salaries and did not care how they did it.

Research question 4

What materials are available in the schools and how are they used during science lessons?

The results from the study showed that different materials were used by the teachers during science lessons. The materials included charts, pictures, diagrams, fruits and materials from the environment.

Tables 10, 11 and 12 show the available materials in the schools and how they were used during science lessons.

Table10: Materials available and how they were used in school A .

MATERIALS AVAILABLE	HOW THEY WERE USED
Glass ware, plastics ware, wooden materials, metals, laboratory tables and chairs, chemicals(solid and liquid), Gas, Litmus paper, filters paper etc.	Teachers used this material in the teaching process, allowed and assisted students to manipulate and handle the materials to have hands- on experiences and understand the various concepts.

The table above represent school A which is a private school had almost all the materials for teaching science .they also had qualified staff to handle the materials and to teach the students because they had upper hand on the materials. Teachers were also assisted by expects on how to use the materials to teach and students were allowed to handle the materials so students had a practical feel of the concept. Most of the students had then interest and showed positive interest in the subject.

Table11: Materials available and how they were used in school B.

MATERIALS AVAILABLE	HOW THEY WERE USED
Glass ware, plastics, metals.	Teachers used them for demonstrations. Students are not allowed to handle the materials with the assumption that they will be damaged.

In school B which is a public school were having problems with science materials they lack science laboratory and therefore do not have materials so science was taught in isolation and students do not have a practical feel of the concept, they only see few of the materials when the teachers bring it to the classroom for demonstrations. Most of the students could not identify simple science materials which affected the students understanding and interest in the subject.

Table12: Materials available and how they were used in school C.

MATERIAL AVAILABLE	HOW THEY WERE USED
Glass ware, plastics, metals.	Teachers used them for demonstrations during science lessons

.

In school C which is also a public school also had a problem with the materials available for science teaching and learning therefore the students were not having practical's, the few materials available were used for demonstration during science lessons and students were not allowed to handle the materials to have a practical feel of it which makes science boring difficult to learn. The majority of the students had a negative attitude towards science and wish that integrated science was optional to choose

Among the students there were general appreciation of more interactive, person-to person approaches to teaching and learning whereby teachers, fellow pupils and visitors were valued as resources. Students generally appreciated electronic resources for learning and many found them more real, more interesting and more memorable than books. Students welcomed materials where their learning had been pre-packaged by the teacher and ready-made for examination and revision purposes. Students' own understanding and commitment affected how they viewed science materials. The observed students had mixed responses to the portrayal of integrated science. Some students also found that science materials helped to break down negative stereotypes of science.

The students brought fruits and other food items to class based the on teacher's instruction. Items in the environment that were used in science lessons included leaves, flowers, tree barks, stones, tins, and plain mirrors. Most of the glass wares were provided by the school. The use of materials in the environment was in line with the senior high school integrated science curriculum. The students were to be encouraged to see the environment as a resource for science learning. Even when there were lots of trees, flowers, stones, insects, etc around some teachers taught science without any materials and ask students to open their science textbooks during integrated science lessons to see pictures of what they were talking about. Some of the

students surveyed did not have the recommended science books and sometimes sat idle or sat close to a friend to see the pictures. Some of such pictures did not show all the parts of the organisms being studied. The students sometimes only saw the lateral views or the ventral views and also the longitudinal or transverse sections. Some of the teachers also did not possess the requisite knowledge on the science materials available and so could not use them to teach. So they always taught in the abstract. This was a reflection of the level to which science teaching and learning had sunk in the study area.

Materials and equipment in the laboratories equip and support the students' science learning to help them develop their process skills like observation, manipulation and experimentation.

The study also revealed that in almost all the lessons observed most of the teachers did not improvise teaching and learning materials that were not readily available. In one of the schools, only two teachers used materials in the environment to teach. Most teachers had the view that materials for science teaching are inadequate in the public schools, comparing it with the private school there were enough materials and even fruits and vegetables needed for experiments were provided by the school. Students were allowed to handle practical equipment with supervision.

In senior high schools, students have to be provided with more materials for them to interact with, so that science becomes real and more related to their everyday life experiences. Teachers should provide friendly environments in the classrooms for effective teaching of science. The use of materials can make a difference in the lives of the students. There was evidence that the instructional materials in all three schools were grossly underutilized by the teachers in the study schools. The fact that some teachers were not making use of these resources indicated apathy, sheer reluctance and a lack of goodwill towards their students. This could be attributed

to the lack of rapport between the heads and teachers, fear of accountability, budgetary constraints, lack of support for good classroom practice and unprofessional handling of supplies and facilities on the part of the head masters. Since the head masters oversaw school supplies, teachers had to ask for what they required in their classrooms.

Research question 5:

What are the students' attitudes towards integrated science?

According to the teachers, most of the students did not have interest in science. The teachers noted that, the students did science because it was compulsory at that level and that if they had the chance they will drop it. The dislike on the part of the students could be due to the teachers' methods of teaching. Students should be encouraged to develop positive attitudes towards science by making integrated science lesson more interesting and less boring.

The students' attitude towards science learning has been summarized in Tables 13, 14 and 15.

Table 13: Male and female students' attitudes towards the learning of science in school A.

SEX	ATTITUDES TOWARDS SCIENCE
Male	Positive
Female	Negative

In school A which is a private school in the district, all the students did science but some weak students among them, most were girls showed a negative attitude towards science with the view that science is difficult but the boys had a positive attitudes towards science and always took part in the teaching process which increased their interest in the science concepts.

Table 14: Male and female students' attitudes towards the learning of science in school.

SEX	ATTITUDES TOWARDS SCIENCE
Male	Negative
Female	Negative

In school B which was a public school did not have a well-established science laboratory therefore students learn in abstract which wane their interest and showed negative attitude towards science most of the students wished they could drop the science subject for another and had the view that they were learning for examination sake.

Table15: Male and female students' attitudes towards the learning of science in school.

SEX	ATTITUDES TOWARDS SCIENCE
Male	Negative
Female	Negative

In school C which was a public school did not have a well-established science laboratory therefore students learn in abstract which wane their interest and showed negative attitude towards science most of the students wished they could drop the science subject for another and had the view that they were learning for examination sake.

For this to be possible, it is necessary for the teachers to motivate the pupils by reinforcement techniques, adequate and relevant activities that can generate a lot of group interactions in class. With science, the use of the senses in teaching will enable students to learn science better and understand the world in which they lived.

Some of the students have developed negative stereotypes of science and scientists, whom they viewed as mad scientists." Others described scientist as "hard" or "old," "frightening," and

"colourless" (Rogers and Ford, 1997). Several reasons have been suggested for these negative attitudes including students undesirable experiences in previous science courses and with instructors, lack of needed skills to learn and apply scientific concepts, lack of motivation to work hard in science classes, home background, school and classroom environments, biases of peer groups, the media's portrayal of scientists, and students' perceptions of rewards associated with learning science, to name a few (Rogers and Ford, 1997). Science anxiety, the fear of science learning and apprehension toward scientists and science-related activities are also as a result of these factors (Rogers and Ford, 1997).

The way science is taught, both at the high school and college level, also plays a major role in shaping students' attitudes toward science. According to a study by Cherif and Wideen (1992), which addressed the question of whether a problem existed for science students moving from high school to the university, students were presented with selected aspects of scientific dogma at the high school and university levels rather than being taught the innovative and visionary character of science and the value that such knowledge has to the educational process. Some of the students in this study reported that they were confused because the information they learned in Junior High School contradicted the information they gained in their high schools science classes. As the study concluded, this dogmatic approach to teaching science, coupled with the drastic cultural changes that students undergo as they transition from one level to another affected their attitudes toward and performance in college-level science courses.

In addition, a positive attitude toward science may improve students' academic performance not only in science classes, but in other classes as well. Why should this be so? Science is a way of knowing and understanding through the exercise of reason, a construction of the mind based on actual observation to explain natural phenomena. Science, by choice, "is limited to questions

that can be approached by the use of reason, questions that can be answered by the discovery of objective knowledge and the elucidation of natural laws of causation" (Futuyma 1983, 170). The practice of the discovery of objective knowledge involves observation of events (or the acquisition of data), followed by inference regarding possible causes (forming alternative hypotheses), and, finally, testing to select the best explanations (Cherif et al. 2001; Moore 1993). The mental discipline and rational approach of "the scientific method" have been successfully adopted in many other disciplines, such as business, law, the social sciences, and others.

It is therefore in the interest of society, and the responsibility of educators, to improve students' attitudes toward science, and to prepare students to live in a highly scientific and technological society. The future of our society will be determined by citizens who are able to understand and help shape the complex influences of science and technology on our world (Ungar, 2010).

Research question 6:

What are the teachers' attitudes towards integrated science?

It was also observed that most of the teachers lacked interest in science as some of the topics were very challenging to them. They selected topics they could teach. They left out the difficult ones. Some teachers have the view that science is generally regarded as difficult subject because, it involved serious thinking and exactness in arriving at conclusions and this reflected in their teaching. Some teachers also have the view that since it is integrated science and not their major areas they will later drop it alongside the education ladder. They therefore taught the subject anyhow.

The results of teachers attitudes towards science teaching is summarized on Table 13, 14 and 15

Table16: The attitudes of teachers towards integrated science in school A.

TEACHER	ATTITUDE TO SCIENCE
1	Positive
2	Negative
3	Positive
4	Positive
5	Positive
6	Positive
7	Positive
8	Negative

In school A, most of the teachers were trained and had a well-established laboratory to teach students so most of the teachers had a positive attitude towards science and were able to teach to the students understanding. They also allowed the students to have a practical feel of the concepts of science. In-service training was regularly organized for the teachers to upgrade their knowledge and was always ready to learn which increases their understanding of the concepts and teach to the level and understanding of the students.

Table17: The attitudes of teachers towards integrated science in school B.

TEACHER	ATTITUDE TO SCIENCE
9	Negative
10	Negative
11	Negative
12	Positive
13	Negative
14	Positive
15	Negative
16	Negative

In school B majority of the teachers had a negative attitude towards the teaching of science because most of them were not teaching their area of specialization and was also not having the necessary materials to teach, they always teach in abstract which made it difficult to teach to the understanding of the students and so teachers always feel bored and showed negative attitude towards the subject. Some of the few teachers, who showed positive attitude towards science, were the teachers teaching their area of specialization and even without the teaching materials could teach to the level of the students.

Table18: The attitudes of teachers in towards integrated science in school.

TEACHER	ATTITUDE TO SCIENCE
17	Negative
18	Negative
19	Negative
20	Positive
21	Negative
22	Negative
23	Negative
24	Negative
25	Negative

In school B, majority of the teachers had a negative attitude towards the teaching of science because most of them were not teaching their area of specialization and was also not having the necessary materials to teach, they always teach in abstract which made it difficult to teach to the understanding of the students and so teachers always feel bored and showed negative attitude towards the subject. Some of the few teachers, who showed positive attitude towards science, were the teachers teaching their area of specialization and even without the teaching materials could teach to the level of the students.

The results show that the teachers in the study did not perceive themselves adequately prepared and competent enough as the main reason for their reluctance to teach integrated science. Rather than disclosing personal inadequacies, such as insecurities about teaching science and technology or fear of difficult questions by students, the teachers in the study focussed on external obstacles, such as lack of suitable materials, lack of a structured science and

technology teaching-method, and lack of preparation time. This implies that context factors may play a large role in teacher attitudes towards science and technology. However, this aspect has thus far been hardly examined in conjunction with other attitudinal aspects in empirical studies on teacher attitudes towards science and technology (Van Aalderen-Smeets, in press) and its influence on actual teaching behavior thus remains largely unclear. In the present study, it was observed that the inexperience trained teachers focused on external obstacles to quite a large extent, while the elaborately trained teachers held very different perceptions on the importance of structured materials and methods. This interesting difference is reflected on in more detail below, where will show those teachers' differential perceptions of internal and external factors that may hinder (or foster) their teaching of science and technology could be integrated in a new theoretical framework of teachers' attitudes towards science and technology.

The results of the study confirmed my assumption that secondary school teachers perceive a difference between their professional and personal attitudes. When asked explicitly, the majority of the science teachers in my sample stated to experience a difference between the two attitude objects. In addition, they reported that in their view the two constructs could develop independently. Most notably, when probed about the different underlying components and sub-attributes of their attitudes, the teachers predominantly talked about their professional attitudes towards teaching science and technology and reported having very little feelings for or beliefs about these topics in their daily life. Furthermore, some teachers clearly had a more positive attitude towards teaching science and technology than towards science and technology in their personal life. Apparently, attitude can develop to a different extent and in different directions. In my view, teachers' distinctive approach towards their personal and professional attitude

towards science and technology underscores the importance of treating personal and professional attitude as two separate objects of attitude in future qualitative and quantitative studies.

Furthermore, teachers hardly commented on their self-efficacy. Instead, the less trained teachers referred largely to external obstacles in their teaching environment. In the remainder of this discussion, the results that relate to attitude were examined.

Research Question 7

What is the nature of the student-teacher verbalizations during integrated science lessons?

From the interview held it was notice that most of the teachers in the three selected schools use the local language to teach science. The students after classes also uses the local language to communicate among their colleagues and therefore do not have the upper hand on the official language (English) for teaching and learning which has great influence on the performance of the students. During class lessons, most of the teachers use the local language as a nature of verbalization but write in the official language (English), so the students were having problem how to translate the verbal communication to the non-verbal communication which affected the students' understanding. The results of the nature of verbalization used in each of the three selected schools are shown on table 19.

Table 19: Nature of verbalizations used in the three selected schools.

SCHOOL	STATUS	NATURE OF VERBALIZATION
A	Private	Teacher and student initiated
B	Public	Mainly teacher initiated
C	Public	Mainly teacher initiated

In school A both the teacher and students' took part in the teaching process students' were allowed to come out with their views, whiles in school A and B the teachers mainly initiated the lessons and at the end of the period leaves the class.

In school A all the teachers used English as a medium of verbalization so the students had the understanding of the language when used in the classroom and were able to understand what was being taught. In school B most of the teachers used the local language to communicate to the students both inside the classroom and outside the classroom which made the students difficult to understand science concept introduced in English. It made the students performed badly during their end of term examination and final exams.

In school C it was also seen that most of the teachers used the local language more than using the official language so the students were familiar with the local language than the official language (English) which affected the science teachers' delivery and teachers' could not explain to the understanding of the students especially in using some scientific terms. Comparing the results obtained in the three selected schools, it was observed that the nature of verbalization had great influence on the performance of the students' in that case students in school A performed better than the students in school B and students in school C.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS

Overview

This chapter deals with the summary of the major findings and conclusion based on the results from the findings. Suggestions for further studies as well as recommendations to educational administrators, science teachers and researchers, are also provided.

Summary of the major findings

A survey of instructional approaches in integrated science utilized by integrated science teachers in the senior high schools in the Gomoa East district was undertaken. The major findings made are as follows:

1. All the science teachers had the qualification to teach science, starting from a first degree to a second degree. The study showed that most of them were teaching subjects that were not their areas of specialization.
2. The study also revealed that most of the teachers had not gone through any in-service training.
3. The study further showed that most of the teachers did not use teaching learning materials but rather taught in the abstract, some also used only materials from the environment to teach.
4. The study again showed that students were not allowed to manipulate materials during science lessons and so they did not interact with the materials; this exerted a negative impact on the understanding of the students.
5. Most of the teachers did not have the requisite skills to teach science and had negative attitudes towards science and so taught science without any interest.

6. Most of the students did not have interest in integrated science as they saw it to be boring.
7. Some students did not understand the scientific terms used and so held the view that science was difficult.
8. The low language achievement of the present sample was as a result of inadequate attention during instruction and failure to generate relevant verbal mediators that would guide performance.
9. Most of the students in the study believed that integrated science will not take them anywhere since they will drop it along their education ladder.
10. Students who engaged in no practical activities held the perception that science was difficult.

Conclusions

From the summary of the major findings of the study, the following conclusions were drawn:

The majority of the teachers did not possess the appropriate background to teach the subject allotted to them. The teachers themselves were aware of their handicap and could perform better in their areas of study.

The inability of the teachers to provide and use appropriate teaching and learning materials was causing the students to think that science was boring, and not useful.

The study showed that science teaching and learning in the selected schools of study are not encouraging enough despite the enormous intervention of the ministry of education, Ghana education service, regional's and districts education services, parent teachers associations, and other stakeholders.

From the findings of the study it can also be concluded that the performance of students depends greatly on the type of instructional approaches used by the teachers.

Recommendations

Based on the findings in the study the following recommendations are made to improve the teaching and learning of science in the senior high schools

1. Science teachers in District should be made to teach their respective areas of study to be able to teach to the level of the students.
2. Science teachers in the District should be those trained to acquire both content and pedagogical skills.
3. Science teachers in the district should try to use co-operative and guided discovery approaches to teach integrated science lessons.
4. Science teachers in the District should try and teach science using the enquiry method for the students to gain the skills required for effective science learning before leaving school.
5. The District Education Office and other stakeholders should provide the necessary materials for teaching and learning of science.
6. Science teachers in the District Should look at the type of language used in the teaching of science.
7. The district should recruit to teach science should be those with interest in the field and not people looking for their daily bread.
8. Some Teachers in the District could not use simple English to explain scientific terms. In-service training should be organized for resource personnel to explain to the teachers (especially in my deprived area of study) some of the scientific terms.

Suggestions for Further Studies

1. This study should be replicated on a larger scale to cover a more representative sample of schools.
2. Another study can also be conducted to determine the various strategies to use to bring about effective teaching and learning of science.
3. This study should also be conducted in other Districts in different Regions in Ghana to bring out the differences in the instructional approaches in different senior high schools in Ghana.
4. There should also be a study on gender differences in science teaching and learning approaches.
5. A case study should be conducted to determine whether there are differences in the instructional approaches utilized in public and private senior high schools.
6. There should be a case study to determine the nature of the verbalizations used in science teaching.

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APPENDIX A

QUESTIONAIRE FOR THE TEACHERS

Answer the following questionnaire by filling the blank spaces and ticking the correct answers

Choose only one box. Confidentiality is assured

1. Name of school…….
2. District……
3. **Age** ☐
4. **Sex**: Male ☐ Female ☐
5. Area of specialization ……
6. Area of teaching …….
7. Number of years teaching ……...
8. Number of years of teaching present subject …….
9. Have you attended any in-service training in the district?……..……
10. Number of students teaching as a whole……..……..……
11. Average number of students in a class……..
12. Time allocated for a period……
13. List at least three (3) challenging topics…….
14. What language do you use in the teaching process?…….
15. What is the main language of interaction among the students? …….
16. What method do you use during science lessons?……..
17. Do students write their own notes? yes ☐ no ☐
18. If yes how do they spell some scientific terms?.....
19. What is the text book to students ratio? ……

20. Are the text book provided by the students? Yes ☐ No ☐

21. Is the text books used along with the teaching process? Yes ☐ No ☐

22. If no why ……

23. If yes why……...

24. Does the teacher use the same text book with the students? Yes ☐ No ☐

25. If yes why……

26. If no why……..

27. Are teaching and learning materials used in the teaching process? Yes ☐ No ☐

28. If yes why……..

29. If no why……..

30. Are students always present during science lessons?……

APPENDIX B

QUESTIONNAIRE FOR STUDENTS

Answer the following questions by filling in the blank space and ticking the boxes provided below. Confidentiality is assured.

1. **Age** ☐
2. **Sex** Male ☐ Female ☐
3. Course of study……
4. Form ……
5. Do science teachers teach to their understanding? Yes ☐ No ☐
6. Do the teachers dictate note during science lessons? ……..……..
7. Do the teachers write notes on the board during science lesson?…….……..
8. How do the teachers teach during science lessons?…….……
9. What language do the teachers use during science lessons?……..…….
10. Are the students involve in the teaching process?…….……..
11. Do each students have textbooks?……
12. Do teachers give exercises in class?…… ……
13. Are students allowed to manipulate science materials?……
14. What are the students attitudes towards integrated science?……
15. What are the students interest in science?…….……
16. Do they understand the scientific terms used during science lessons?…... ……
17. What is your opinion about the way science are taught in the school? ……
18. How do you think science should be taught for effectiveness? ……
19. Are weak students considered during science lessons?……

20. How are group activities formed? ……..…….

21. What is the textbook to students' ratio?…….……..

22. Who provides the textbook? ……..…….

23. Are they allowed to use the text book during science lesson? Yes ☐ No ☐

24. If yes why…….

25. If no why……..

26. Do the teachers use teaching and learning materials during science lessons? ……

27. Is the science teacher always present during science periods? ……..….

28. Are you really interested in science? Yes ☐ No ☐

29. If yes why ……...

30. If no why ……...

APPENDIX C

INTERVIEW SCHEDULE

STRUCTURED INTERVIEW ITEMS FOR TEACHERS

1. What is the average size class?
2. How long have you been teaching?
3. What is your qualification?
4. Do you have enough textbooks to cater for the students?
5. Are there enough teaching and learning materials for teaching?
6. Is the teaching learning materials provided by the school or improvised?
7. What language is used as a medium of communication?
8. What is the attendance of the students?
9. What is the student attitude and responses towards science?
10. Are in-service trainings organized for the teachers in the district?

APPENDIX D

STRUCTURED INTERVIEW ITEMS FOR STUDENTS

1. Do you have integrated science on your timetable?
2. Do you find science as a difficult subject?
3. Is the science teacher regular in class?
4. Are students allowed to ask questions during science lessons?
5. What is the teacher's confidence level when teaching science?
6. Does the teacher teach directly from the textbook?
7. Do you like studying science?
8. Do you understand the science language?
9. Do you see science as an interesting subject?
10. Do you want to study integrated science to the highest level?