UNIVERSITY OF EDUCATION, WINNEBA

USING PRACTICAL WORK TO IMPROVE STUDENTS' ATTITUDE AND PERFORMANCE IN INTEGRATED SCIENCE: A CASE STUDY OF LAWRA SENIOR HIGH SCHOOL

SEIDU ISSAH

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SEIDU ISSAH

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A DISSERTATION IN THE INSTITUTE OF EDUCATION AND EXTENSION, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF EDUCATION IN SCIENCE

DECEMBER, 2016

DECLARATION

Student's Declaration

I,SEIDU ISSAH, hereby declare that this submission is my own work towards the Masters of Education and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the university , except where due acknowledgement has been made in the text.

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 Dissertation laid down by the University of Education, Winneba.

SUPERVISOR'S NAME: DR ERNEST NGMAN-WARA

SIGNATURE: ……………………………

DATE: ……………………………………

ACKNOWLEDGEMENTS

I will first of all thank the Almighty Allah for giving me the wisdom and knowledge to carry out this project successfully. Also I would like to extend and express my sincere appreciation and gratitude to my Lecturer and supervisor Dr Ernest Ngman-wara for his unflinching support and suggestions that had helped me in completing this project.

I further wish to express my special thanks to all lecturers of the Department of Science Education, University of Education, Winneba for their invaluable enthusiasm, continued support giving me especially those who taught me in courses for this programme of study.

DEDICATION

This work is dedicated to my beloved wife Umar Memunata and my sweet mummy, Madam Asana Seidu, my sisters Madam Ajara and Rahinatu, my brothers Mr. Mohammed and Imoro Seidu, and all my friends for their enormous contributions towards this level of the educational ladder.

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ABSTRACT

The study sought to use practical work in the teaching of Integrated Science to improve students' attitude and their performance in the subject. In respect of this, the action research approach was used as the research methodology. A sample of 150 Form 2 Arts individuals who demonstrated poor attitude and poor performance in class were used for the study. Three main instruments were used to collect data namely questionnaire, practical test and interview schedule. The questionnaire was first administered to 150 students to assess the use of practical work to teach Integrated Science. After the intervention, a similar test was conducted in order to compare scores of students before the intervention. The study found that practical work had a positive effect on students' performance in Integrated Science. Before the intervention the test scores results indicated that majority (67%) of the students scored below the pass mark of 30. However, after the intervention, the results showed significant improvement over the pre-test results as little over 90% of the students passed the test paper. Further statistical analyses showed that there was a significant improvement in post-test scores (M= 46.47, SD = 17.43) over pre-test score (M= 28.83, SD = 12.16) with condition: $t(29) = 4.54$, $p = 0.00$. This notwithstanding, the teaching of Integrated Science in the School has some challenges as there is limited time allocated for its teaching; no specific periods allocation for the teaching of practical work; inadequate TLMs and negative attitude of students towards studying the subject. The study therefore recommends that for students' performance to be improved and sustained in the subject, these challenges must be adequately addressed by the school authority in collaboration with the Ghana Education Service (GES).

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter presents background to the study, statement of the problem, purpose of the study, hypotheses guiding the study and significance of the study. The chapter also discusses the limitations and delimitation of the study. It concludes with the organization of the study.

1.1 Background to the Study

According to the Ministry of Education (2010) development in the current world is based on science and technology. People gain knowledge faster through the use of science and technology. More knowledge helps nations to advance faster on the road to increased development and progress. For the country to develop faster, it is important for students to be trained in the processes of seeking answers to problems through scientific investigations and experimentation. The Integrated Science which was hitherto Core Science was therefore introduced by the Ghana Education Service in 1999 in collaboration with the Ministry of Education in Senior High Schools to raise the level of scientific literacy of all students and equip them with the relevant basic scientific knowledge needed for their own living as well as make valuable contributions to production in the country. The subject also aimed at providing excellent opportunities for the development of positive attitudes and values in students.

The syllabus therefore was designed to help the students:

- Solve basic problems within his/her immediate environment through analysis and experimentation;
- keep a proper balance of the diversity of the living and non-living things based on their interconnectedness and repeated patterns of change;
- Adopt sustainable habits for managing the natural environment for humankind and society;
- Use appliances and gadgets effectively with clear understanding of their basic principles and underlying operations;
- Explore, conserve and optimize the use of energy as an important resource for the living world;
- Adopt a scientific way of life based on pragmatic observation and investigation of phenomena and
- Search for solutions to the problems of life recognizing the interaction of science, technology and other disciplines.

The content of the syllabus in this regard covers the basic sciences and includes topics in Health, Agriculture and Industry. The basic focus is to enable students to appreciate the links between seemingly different scientific topics and hence help them to be able to integrate ideas from various scientific sources. This covered five themes namely Diversity of matter, Cycles, Systems, Energy and Interactions. Hence, the teacher is expected to make a conscious effort to demonstrate the relationship between themes whenever possible for students to understand such relationship through practical works.

1.2 Statement of the Problem

Statistics showed that results of Integrated Science in the WASSCE over the years have not been impressive. The general performance by candidates fell below average (50%) attributable largely to very low scores obtained by candidates in the practical test (WAEC, 2015). In 2012 the percentage passed (i.e. those who obtained grades A1-C6) was 42.10%. This sharply declined to 28.7%. Though there seems to be a rise (39.19%) in the percentage pass in 2014 this still fell below average and further declined to 23.63% in 2015 and rose slightly to 32.20% in 2016 (WAEC, 2012, 2013, 2014, 2015, 2016). These statistics generally reflect the results and for that matter the performance of students in Integrated Science in the Senior High School.

Following from this perspective, various scholars including Adedeji and Owoeye (2002), and Adesemowo (2005) raised questions about the teaching and learning of Integrated Science in Ghanaian Senior High Schools. They indicated that teaching and learning of the subject is mostly theory based with very little attention on the practicable aspects. According to Miller (2004) teachers who even use practical work normally depend on textbooks and teach experiments theoretically. More so, some teachers also rely on pamphlets in their practical work which portray wrong concepts in practical work especially in drawings. Such approaches lead to learners' persistent lack of experimental skills thereby resulting in poor performance of students in the subject (Mji & Magkato, 2006). Agbenatoe (2011) also enumerated fundamental reasons inhibiting effective teaching and learning of Integrated Science which includes inadequate laboratories and science equipment, attitude of students to learning, lack of teaching skills and competence by science teachers, and lack of opportunities for professional development for science teachers. Siaw (2009) added that shortage of funds for equipment and materials for fruitful practical work; especially in view of large class size in most schools is also affecting practical work of students.

As noted by Aladejana and Aderibigbe (2007) achievements and skills improved when students are taught science using practical work; suggesting that if results of students in Integrated Science would have to be improved, emphasises should be placed on the practical aspect of the subject. Supporting this view, Giles, Pitre and Womack (2003) recognised and emphasised the need for practical oriented approach in teaching and learning of Integrated Science in all facets of our educational ladder including Senior High School. They therefore recommended that it is incumbent upon the policy makers to provide the necessary tools and equipment needed for the practical work. This forms the basis of the study to investigate the extent to which the use of practical approach to the teaching of Integrated Science can change students attitude and improve their performance in the subject.

1.3 Purpose of the Study

The study sought to explain how the use of practical works in the teaching of Integrated Science can change students attitude towards the subject and improve their performance with the view of making recommendations to improve its teaching and learning in Senior High Schools.

1.4 Research Objectives

The following research objectives were used to achieve the purpose of the study. These use to;

1. assess the use of practical work in the teaching and learning of Integrated Science;

2. determine the effect of practical work on students attitudes towards Integrated Science
3. examine the effect of practical work on students performance in Integrated Science.

1.5 Research Questions

The study is guided by the following research questions:

1. What is the extent of use of practical work in teaching and learning of integrated science in Lawra Senior High School?
2. What is the effect of practical work on students' attitudes towards Integrated Science in Lawra Senior High School?
3. What is the effect of practical work on students' performance in Integrated Science in Lawra Senior High School?

1.6 Hypothesis

To sufficiently establish the case that practical work has an effect on students' performance, a hypothesis is formulated to ascertain this claim. Thus:

H_0: There is no difference between the mean score of pre-test and post-test.

H_1: Post-test score is higher than pre-test scores.

1.7 Significance of the Study

The study is an assessment of practical work approach to improve students' attitudes and performance in Integrated Science. The findings of the study could be used to improve teaching and learning of the subject in Lawra district and beyond. Largely, the contribution of this study will influence the fields of Integrated Science in order to raise standard in performance. It will also contribute to knowledge in the field of academic research in the teaching of Integrated Science in both first and second cycle institutions in the country.

1.8 Delimitation

The scope of the study geographically is restricted to the Lawra Senior High School in the Upper West Region, and this could affect the generalisability of the findings. This is because the case study is just a little fraction of the country Ghana. In context, the study is limited in examining practical work approach to improving Senior High School students' attitudes and performance in Integrated Science. This equally has the potential to increase and ensure that valid conclusions and recommendations are made to improve the performance of students in the subject.

1.9 Limitation of the study

There is no research work without limitations. These limitations may in one way or the other affect the researcher's ability to smoothly complete the study as well as the overall outcome of the study. First and foremost, the availability of the relevant and appropriate apparatus needed to carry out the intervention became an issue. Secondly, getting the students to respond to the questionnaire was quite problematic because of the congested nature of the class time table. More so, the study covered only in one school in Lawra District in the Upper West Region of Ghana, and this made it difficult to generalise the findings to other districts and the country at large. as such, while the findings from this research may be used to guide future researchers, it cannot be applied to other settings. Despite the above limitations the district under study will benefit from its findings.

1.10 Organisation of the Study

The report of the study was organized in five chapters. Chapter one contained the introductory aspects which captured the background to the study, problem statement, purpose of the study, research objectives, questions and hypothesis. This chapter also spelt out significance of the study and its delimitations. Chapter two reviewed related literatures that are relevant to the study. It captures conceptual definitions and frame work of the study as well as empirical studies on the topic under investigation. Chapter three outlined the methodology employed to collect and analyse data. This constituted the research design, population, sample and sampling procedure, instrumentation- validity, reliability and method of collecting data and its analysis. Chapter four dealt with data results and discussion of field data, and finally, the fifth chapter covered summary of the major findings, conclusions, recommendations and suggestions for future study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter of the study reviews critical literature on the subject matter under investigation. It touches on the conceptual and empirical frameworks on the key variables of the study namely practical work, attitude and performance of students in Science. The chapter ends with a summary of the review that further guides the study.

2.2 Practical Work

The term practical work is variously defined. Lunetta, Hoffstein and Clough (2007) define Practical work as "…learning experiences in which students interact with materials or with secondary sources of data to observe and understand the natural world" (p.393). Ramnarain (2011) refers practical work as: 'experimental work; scientific investigations 'practical and investigative activities whilst Woodley (2009) defines as practical work as 'laboratory investigations. The broad perspective of 'learning experiences' will be understood to include the wide range of practical skills, thought processes that constitute doing science as what scientists do (Benner, 2011). Some authors in science education such as Vilaythong (2011) contends that practical work in science has many purposes such as providing students with critical thinking and problem solving skills. Also students handling equipment and materials in science practical lesson enhances their understanding of the real concepts and helps them to conceptualise scientific principles.

Driver (1983) suggested that instead of learners dealing with already known answers, such as determining known constants, they need to investigate novel problems. In this way practical work supports development of scientific skills, thinking skills and how scientists work. However, other researchers found out that the inquiry approach in practical work requires much time and a session of one hour is never enough (Abraham & Millar, 2008). Practical work also caters for learning in different ways such as experiential, independent, team and peer dialogue (Zimbardi *et al* 2013).

Practical work is necessary for school science education. In Science, learners do practical work to expand their knowledge in an attempt to understand the world around them (Kolucki & Lemish, 2011). It develops learners' understanding of ideas, theories and models (Millar & Abrahams, 2008). Thus, teaching science involves learners experiencing the basic and integrated processes of science (NARST, 1990; Millar et al. 1999).

Another purpose for practical work is the understanding of errors and how to design practical procedures in order to improve precision and accuracy. Students acquire skills for safety; risk and precaution against hazards in the laboratory (SCORE, 2008). Practical work also provides learners with evidence to support their understanding and to concretise scientific principles (Jormanainen, 2006). Thus, learners are exposed to basic processes of science through practical work. Practical work has traditionally been a 'recipe-like' activity that had minimal cognitive engagement and did not inspire originality in students (Bigelow, 2012). Research by The National Research Council ([NRC], 2003) and (National Academy of Sciences ([NAS], 2010) have recommended that during practical work learners should be investigative, design their own experiments, record and analyse as well as find their own answers. Driver (1983) suggested that instead of learners dealing with already known answers, such as determining known constants, they need to investigate novel problems. In this way practical work supports development of scientific skills, thinking skills and how scientists work.

However, other researchers found that the inquiry approach in practical work requires much time and a session of one hour is never enough (Abraham & Millar, 2008). They further added that different learning styles have the pedagogic benefit of enabling correct concept development. They underscore the empirical nature of science, measurement, repeatability of experiment and learners may enquire as real scientists do. While these pedagogic benefits have yielded encouraging results in science classrooms elsewhere, this has not been the case in South Africa (Buthelezi, 2012, Mji & Makgato 2006). According to Onwu and Stoffels (2005: 79) using mixed methods research with 53 practicing teachers in Venda, Limpopo established that most teachers had 'little experience, meager training, and operated in large and poorly resourced science classrooms". Consequently teachers resort to chalk-and-talk, lecturing and demonstrations when teaching Physical Sciences. Many weaknesses are inherent in the South African science teacher education enterprise. Bradley and Smith (1994) reported that teachers themselves emerged from an education system that did not groom them to do experiments or practical work. The lecturers in pre-service training lacked the knowledge and experiences in conducting practical work. Schools were also found to lack equipment and laboratories (Onwu & Stoffels, 2005) as well as laboratory technicians to support teachers. Muwanga-Zake (2008) further established that even headmasters kept science.

2.3 Attitude

Osborne (2003) defines Attitude as "feelings, beliefs and values held about the enterprise of school science, school science and the impact of the science on society" (p.1050). Newhouse (1990) views attitude as positive or negative feelings about a person, an object or an issue. In this regard Klopfer (1976) proposed six dimensions regarding 'attitudes toward science' namely; the manifestation of favorable attitudes to science and scientists; acceptance of scientific inquiry as a way of thought; adaptation of scientific attitudes; enjoyment of science learning experiences; development of interest in science and science related activities; and the development of interest in pursuing a career in science.

For several decades school students' attitudes toward science have been discussed within different research contexts. One of the purposes of science education is to develop a positive attitude toward science regardless of individual differences (Arisoy, 2007; Azizoglu & Cetin, 2009). Newhouse (1990) emphasizes that attitude is a very important factor in influencing human behavior. Attitude is affected by personal opinion, and these opinions can be formed through personal life experiences and education. Studies concerning the science learning environment show that there is a relationship between this environment and students' attitude toward science (Riah & Fraser, 1997; Aldigre & Fraser, 2000; den Brok, Fisher & Rickards, 2004; Rakıcı, 2004; Puacharearn & Fisher, 2004; Wahyudi & David, 2004; Telli, Çakıroglu & den Brok, 2006). Attitudes toward science involves the students' affective behaviours; for example preference, acceptance, appreciation and commitment.

Oh and Yager (2004) stated that while students' negative attitudes toward science are related to a traditional approach in science instruction, their positive feelings are associated with constructivist science classrooms. The authors also commented that if students are provided with too much scientific information, they will have a more negative attitude. Thus, the authors suggested that the learning environment should be designed in such a way as to allow students to attain scientific knowledge and gain a more positive attitude toward science. Several studies have indicated that the classroom learning environment is a strong factor in determining and predicting students' attitudes toward science (Lawrenz, 1976; Simpson & Oliver, 1990; Riah & Fraser, 1997; Aldolphe, Fraser & Aldridge, 2003). In other words, the classroom environment generally shows a positive correlation with attitude. The current science and technology curriculum and textbooks in use across the world emphasize the importance of nature of science (NOS). The current curriculum in Turkey contains some important features. The scientific method in the current curriculum includes observation, stating hypotheses, collecting data, testing hypotheses, rejecting or accepting hypotheses, and interpreting data. Imagination, creativity, objectivity, inquiry, and being open to new ideas are all important in scientific processes.

In science and technology education students should learn the way of attaining knowledge. When students learn new things through discovery, they can reconstruct their knowledge. Also in the curriculum it is emphasized that scientific knowledge is not constant but the information given is the best that is currently known. Moreover, the current curriculum aims to develop awareness about scientific methods in addition to scientific literacy per se. When these features are considered, this science and technology curriculum embraces a "constructivist approach". In the science and technology curriculum most subjects are repeated at all grades at different levels of difficulty from simple to complex. In this way students are encouraged to recall these subjects fairly frequently and thus reinforce their learning. Individual differences play an important role in student learning (Koran & Koran, 1984). In addition to academic success, individual differences related to other factors such as learning approaches, motivation, cognition, and anxiety have been studied (Debacker & Nelson, 2000;

Garcia & Pintrich, 1992; Lin & McKeachie, 1999; Qian, 1995; Koran & Koran, 1984; Zhang, 2000).

Since the teaching-learning process also concerns itself with the promotion of desirable behaviour, education must draw some of its principles from psychology. This entails having a good grasp of all theories that influence the teaching and learning process. Attitudes associated with science appear to affect students' participation in science subjects and impacts in science (Linn, 1992). Further research on psychological effects has found that students' self concept of ability to perform in science positively correlates with achievement. It has been observed that many students fear Chemistry. Such fear is characterized by mass disenchantment among the students towards the subject. The end product has been the declining popularity of the subject over the years. According to Keeves and Morgenstern (1992), students' anxiety towards the learning of Chemistry makes them lose interest in sciences.

On the other hand, Deboer (1987) points out that students' achievement is influenced by favourable attitudes towards oneself (positive self-concept) as well as the subject. A student with positive self-concept of ability in a subject has a higher probability of developing favourable attitudes towards that subject, and as a result spends more time and energy in the subject thus gaining mastery of the subject resulting in success. Deboer (1987) further argues that as a result of this success, the student is reinforced further to continue performing well in the subject possibly developing stronger favourable attitudes, towards the subject, resulting in a vicious cycle.

Mwamwenda (1995) argues that a person's self concept is a guide to their personality in terms of his or her own feelings, attitudes, psychological health and the way he or she is likely to interact with others in and outside his or her environment.

Mwamwenda (ibid.) further points out that a pupil with a positive self-concept stands a better chance of performing better than a pupil with negative self-concept of ability. Thus it can be argued that enhancement of positive self-concept of ability of a student in science will possibly enhance the students performance by fostering development of favourable attitudes towards Chemistry. However, care should be taken when interpreting results of a relationship between achievement and attitudes. This is because low achievement does not necessarily mean the students have unfavourable attitudes, towards science or any other subject for that matter

2.4 Performance

There are various definitions and perspectives of the term "performance". However, for the purpose of this study, Lassier (1995) definition of the term is more preferred. According to him performance is the outcome of education, the extent to which a student, teacher or institution has achieved their educational goals. He added that academic achievement is commonly measured by examinations or continuous assessment but there is no general agreement on how it is best tested or which aspects are most important, procedural knowledge such as skills or declarative knowledge such as facts. Conceptually performance in this study is defined to mean the outcome of a written examination on a specific subject of study (i.e. Integrated Science) by students of which these outcomes are graded according to the students' level of appreciation and understanding of the subject matter they are being tested on. Therefore students are graded from A1-F9 depending on the mark scored by the student.

2.5 Conceptual Framework

The study is guided by three key variables as defined and explained above. These are practical work, attitude and performance as illustrated in Figure 2.1

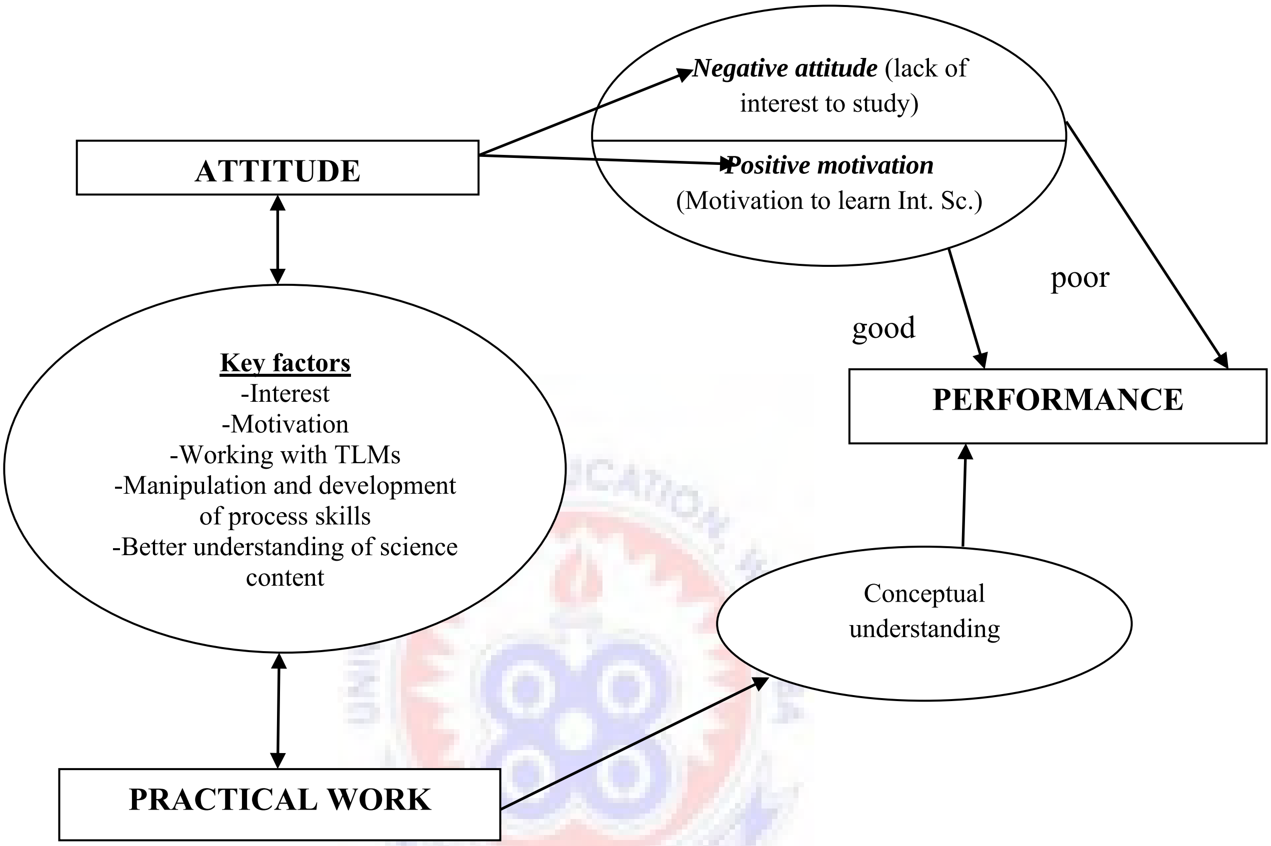

Figure 2.1: Conceptual Framework

From Figure 2.1, the arrows indicate the directions of the behaviours of attitude and performance on practical work, and also performance of students in Integrated Science is hinged on practical work and students own attitude towards learning the subject. Therefore, for students to develop the right attitudes and motivation to learn, they should have access to the required teaching and learning materials (TLMs) and put these materials into learning action by manipulating them in order to develop the requisite practical skills that make them understand how certain things work. By so doing it enhances their understanding and would be able to apply this in the real sense when they are faced with a similar challenge in an examination.

The practical work will increase their ability to perform better in the practical test examinations since they have the first-hand experience through learning-by-doing. On the other hand, if students have negative attitude towards practical work in integrated science and are not well motivated coupled with lack of the required TLMs, they would not have the interest to learn it and this will definitely affect their performance in the subject.

2.6 Empirical Studies

This section of the study reviews related literature on empirical studies that have been carried out by scholars on improving students' performance through practical work in science. This is done according to the key variables namely practical work, attitude and performance.

2.7 Practical work and Performance

Research has established that achievement and skills improved when students are taught science using practical work (Kerr, 1963; Turpin & Cage, 2004; Aladejana & Aderibigbe, 2007; Watts, 2013). However, as observed, practical work is not done in some schools in the country due to inadequate resources, lack of practical science skills and large classes in science (pers. Obs) and (Onwu & Stoffel, 2005; Ramnarain, 2014). To ensure equal treatment in different schools, curricula prescribe the levels and the amount of practical work as well as subsequent assessments. The Curriculum Assessment Policy Statement (CAPS) guides teachers on what content to teach, describes the number of practical sessions and the complexity of practical work for Grades 10-12 in South African schools (CAPS, 2012). Surprisingly, teachers' attitudes towards practical work is poor, consequently they do it to satisfy the minimum requirements of the syllabus (Kibirige & Teffo, 2014). In addition, a study was conducted with a random sample of 266 Grade 10 students from across South African schools to test the general quality of practical skills, and the results show that learners' argumentations were of low quality (Lubben, Sadeck, Scholtz & Braund, 2010). While practical work is assumed to be necessary for all learners, some studies show that boys and girls differ in the reception of the practical approach (Gardner, 1975; Anderson, Sjoberg & Mikalsen, 2006; Trumper, 2006).

Learners benefit through engagement with concepts in practical work through "interactions, hands-on activities, and application in science" (Hampden-Thompson & Bennett 2013: 1340). Without withstanding such benefits, Gardner (1975) shows that sex may determine pupils' attitudes towards science. This is further confirmed by research in Ghana (Anderson, Sjoberg & Mikalsen, 2006), England (Jenkins, 2006), Israel (Trumper, 2006) and Finland (Lavonen, Byman, Uitto, Juuti, Meisalo, 2008) where boys and girls of the same age tend to have different attitudes to similar teaching styles. On the other hand, a study by Kibirige and Tsamago (2013) show that the attitudes of boys and girls towards science are not different when using similar methods. Thus, due to differing views, this study will also analyse if there is gender differences in performance when learners are taught using practical work.

Practicals entail application of theoretical concepts by performing experiments. Having interest in something drives an individual towards working hard to achieving it. In this regard, Mukhwana (2013) conducted a study on the role of student-related factors of Biology subject in Secondary schools in Kenya. The study sought to establish whether student having interest in practical influences performance in Biology. The findings showed that 81.5% (students) and 84% (teachers) indicated that student interest in practical influences performance in Biology. Student's willingness to participate in practical activities, especially when in groups improves the performance in Biology (SMASSE INSET, 2004). Through participation, scientific skills for hands on/practical skills are developed. Moreover, Biology practicals supplement good marks to those students who are weak in theory (KNEC, 2007), hence influencing the performance. One student respondent in an interview said*: "Biology practical is my saviour, I love it since I am weak in the theory section".* However, 11% of student and 8% of teacher respondents disagreed that students having interest in practicals influence performance in Biology because to them once a student is familiar with the theory section then doing the practicals are very easy since practicals is just theory in practice. From the findings, the respondents recognize that other than an interest in the subject, an interest in the practicals greatly influences performance in Biology.

A study conducted by Ackon (2014) on challenges associated with science practical lessons organizations in Senior High Schools in Takoradi-Sekondi shows the following results. The research findings showed that both teachers and students from the selected SHS considered practical lessons as one of the effective means of teaching and learning science. However, the time allocated to practical lessons varied from one school to another. It also came out that, most of the schools have science laboratories that are not adequately equipped with equipment and materials. Again, the study also found out that, student' participation in science practical lessons is through the demonstration instead of the activity-oriented strategy to enhance students' understanding and experience. To ensure efficiency in the teaching of the practical aspect of science in the studied SHS, the study recommends that government and all stake holders in education must supply laboratories in the studied Senior High Schools with the necessary equipment, materials and chemicals to enable students and teachers to develop the necessary skills, attitudes and interest in science.

Another study by Mensah (2014) on Integrated Science Approaches in Selected Public and Private Senior High Schools in Gamoa East District 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 and this is a very common case with the teaching of Integrated Science in Public schools. Based on the findings of the study it was recommended that as much as practicable, teachers should place emphasizes on the practical aspects of teaching the subject so as to enhance students understanding of the subject.

2.8 Attitude and Performance

Research has shown that there is a positive correlation between attitudes and achievement; however, neither attitudes nor achievement is dependent on the other; rather they interact with each other in a complex and unpredictable way (Ajzen & Fishbein,1975). Factors that influence students' attitudes towards a subject vary from one place to another. Furthermore, there are also other stronger predictor variables outside the school, which influence students' attitude towards a subject. These include parental influence and beliefs from ones culture (Muya, 2000). As such, the area pertaining to the attitudes towards sciences needs more research because the performance in Mathematics and Sciences is still low. This lends more weight to the study conducted by Garrahy (2001), on three third-grade teachers' gender-related beliefs and behaviours, who found out that teacher's attitudes towards the subject significantly, correlate with students' achievement. Thuo (1984) has investigated the relationship between teacher's attitudes towards Mathematics and sciences and students achievement in Kiambu District Kenya. The findings of this study showed a positive correlation between teachers' attitudes towards Mathematics and Sciences and students achievement. These results were strengthened by the observation that the students who were taught by those teachers with negative attitudes had low achievement.

Another study by Kiragu (1988), on factors affecting achievement in Mathematics at secondary school level in Kenya, has established that teachers' qualification, quality of textbooks, frequency of marking and interest among students are significant. However, a critique by Kiragu (1988) on a similar study conducted earlier by Kathuri and Pals (1993) asserts that the significant relationship between students' attitudes towards a subject and academic achievement is a function of their personal attitudes rather than external factors, which may influence them. As such, the conclusions on the above studies were not sufficiently adequate as they were only based on teachers influence on students' attitudes towards mathematics. Similarly, it is also difficult to go by Kiragu's (ibid.) critique when handling similar findings from research settings conducted in other study areas. This is because factors which influence teachers' attitudes towards a subject vary from one place to another.

Furthermore, there are also stronger predictor variables outside the school, which influence students' attitudes towards a subject. These include parental influence and beliefs from ones culture. Hence the area pertaining to attitudes towards Mathematics and Sciences needs more research since students' achievement is still low. In other instances, there has been controversies as to why girls and boys perform differently in Mathematics and Sciences (Dawrey & Watson, 1995) and (Watson, 1995). An important issue is the relationship between students' attitudes and the instructional contexts. Do different instructional contexts influence students' attitudes and do different attitudes result in different opportunities of learning and achievement? Research from different countries with different educational systems and curricula will provide an opportunity to identify the relationship between students' attitudes and instructional contexts of these countries. The majority of the existing studies concern attitudes towards science in general. Only few studies attitudes toward a particular discipline like Biology and Physics and only two towards Chemistry have been conducted (Menis, 1989).

Ramsden (1998) has pointed out the use of "Science" as an umbrella term to encompass Biology, Physics and Chemistry. It has been suggested that the research of students' attitudes must focus on separate disciplines within science rather than on Science, because students (girls in particular) respond more to Biological sciences than Physical sciences. Menis (1989) further argues that the assessment of students' attitude towards Chemistry and Sciences should be concerned with at least three distinct referents. He identifies these three referents as an attitude towards the importance of Chemistry and Science, an attitude towards Science as a career, and an attitude towards Chemistry and Science in school curriculum. Their attitudes regarding the difficulty of Chemistry lessons are related to concepts, symbols and problem solving. It seems that students find the use and application of Chemistry concepts and symbols more difficult than their understanding. The application of Chemistry concepts and symbols depend on the ability of the students to transfer from macroscopic level to symbolic level and vice versa (Dori & Hameiri, 2003). Chemistry teachers can transfer rapidly from one level to another, but students cannot do the same. In addition to the difficulties that students have in understanding and applying chemical concepts, such as atoms, molecules, mass, volume, and mole, they also have difficulties in solving chemical problems requiring Mathematical skills.

Thus, they consider difficult to record and apply mathematical methods to Chemistry problems.

The students' attitudes regarding the interest of Chemistry course are also neutral. The content of Chemistry curriculum, the Chemistry lessons time, the methods of teaching Chemistry, and lack of laboratory experiments might be some of the reasons that form such attitudes. This is supported by Freedman (1997) who says that a positive attitude towards Science is related to the laboratory programme. Chemistry in most schools is taught theoretically without hands on activities and thus lack of practice decreases students' interest for Chemistry lessons. The majority of the students recognize that Chemistry knowledge is useful to interpret aspects of their everyday life.

In relation to science subjects, Halladyna and Shaughnessy (1982) concluded that a number of factors have been identified as related to students' attitude. Such factors include; teaching methods, teacher's attitude, influence of parents, gender, age, cognitive styles of pupils, career interest, societal view of science and scientists, social implications of science and achievement. Empirical studies have revealed the influence of methods of instruction on students' attitude towards science. Kempa and Dube (1974) worked on the influence of science instruction; the result was that attitude becomes more positive after instruction. Long (1981) also concluded that diagnostic-prescriptive treatment promotes positive attitude. Hough and Peter (1982) further found out that groups of learners who scored significantly high in science achievement test also scored significantly high in attitude test. Gibbons, Kimmel and O'Shea (1997) opined that students' attitudes about the value of learning science may be considered as both an input and outcome variable because their attitudes towards the subject can be related to educational achievement in ways that reinforce higher or lower performance. This means that those students who do well in a subject generally have more positive attitudes towards that subject and those who have more positive attitudes towards a subject tend to perform better in the subject (Olatunde, 2009). Akinmade (1992), confirmed that students' attitude toward science are the basis for higher achievement in science. Students' beliefs and attitudes have the potential to either facilitate or inhibit learning. Burstein (1992) in a comparative study of factors influencing mathematics achievement found out that there is a direct link between students' attitudes towards mathematics and student outcomes. Studies carried out have also shown that the teachers' method of teaching mathematics and his personality greatly accounted for the students' positive attitude towards mathematics and that, without interest and personal effort in learning mathematics by the students, they can hardly perform well in the subject (Olatunde, 2009). Students' attitude toward the learning of chemistry is a factor that has long attracted the attention of researchers. Ojo (1989) and Adesokan (2002) asserted that in spite of realization of the recognition given to chemistry among the science subjects, it is evident that students still show negative attitude towards the subject, thereby leading to poor performance and low enrolment. According to Bassey, Umoren and Udida (2008), students' academic performance in chemistry is a function of their attitude. Papanastasiou (2001) reported that those who have positive attitude toward science tend to perform better in the subject. The affective behaviours in the classroom are strongly related to achievement, and science attitudes are learned (George & Kaplan, 1998).

Mukhwana (2013) also conducted a study on the role of student-related factors of Biology subject in Secondary schools in Kenya. The key variables are interest and attitudes of students towards practical. Regarding the interest of students learning the subject the study found that majority (92%) of the respondents agreed that students' interest influences performance in Biology. This is so because having interest in Biology cultivates students' positive attitude towards the subject, hence enabling the student to work hard. Respondents mentioned doing self studies on the subject, asking for assistance from teachers in areas of difficulty, forming discussion groups, high scores in the subject, dedicating more revision time for the subject, having a personal time table which guides students' private studies, and working under less supervision, as some of the attributes that trigger improved performance in Biology. The study established that an interest in Biology influences performance because it provides the drive within students to participate in the learning process. On the other hand, only 6% (students) and 12% (teachers) disagreed with student interest as affecting performance in Biology. They argued that revising of Biology notes and Biology text books is what determines Biology performance. On students attitude Mukhwana (2013) once again explains that attitude is the inner feelings of an individual towards something or somebody. Positive attitudes in students help to improve performance. Thus, the study sought to establish whether students' attitude towards Biology influences performance in the subject. It was found that majority (89.5%) of student and (92%) teacher respondents were of the opinion that student's attitude affects performance in Biology. He affirmed that Owiti (2001) believes that attitude affects achievement and achievement affects attitude. Attitude influences one's thought which in the end affects understanding of the individual. Positive attitude activates the thinking, feeling and reacting components on an individual, hence influences the performance. On the other hand, negative attitude contributes to lack of motivation in learners hence hindering them from performing well. Positive attitude cultivates students' ambitions and morale of what they want to be in future hence, working hard under minimum supervision. One of the respondents said that their Biology teacher was the one who made the subject to be difficult as she always used complicated terms without clear explanation. This made the respondent to hate the subject because he did not understand the key concepts in the subject, thus affecting the performance in the subject. Attitude also affects performance in Biology. The problem, the author notes, lies in the attitude type; positive or negative that the learner possesses, if positive it influences good performance and if negative it influences poor performance.

2.9 Summary

The literature review shows that there is a positive relationship among practical work, students' attitude towards practical work and performance. As indicated, practical work is a learning experience in which students interact with materials or with secondary sources of data to observe and understand the natural world. Practical work in science has many purposes such as providing students with critical thinking and problem solving skills. Also students handling equipment and materials in science practical lesson enhances their understanding of the real concepts and helps them to conceptualise scientific principles. However, practical work cannot have any impact on students learning out comes if they do not develop the right attitudes towards practical work. In this case, attitude defines the feelings, beliefs and values held by students in learning the practical aspects of the subject they are studying. Thus using the practical work in the teaching of Integrated Science coupled with students developing positive attitude towards learning the subject will improve performance. Performance herein is defined to mean the result of activity either in qualitative or quantitative terms. Following from this conceptual view, empirical studies showed that achievement and skills improved when students are taught science using practical work. However, as observed, practical work is not done in some schools in the country due to inadequate resources, lack of practical science skills and large classes in science. Learners benefit through engagement with concepts in practical work through "interactions, hands-on activities, and application in science. Studies in other jurisdictions including Ghana established that students performance in science improve when the practical aspects of the subject is properly taught. However, most of these studies did not demonstrate how using practical work can improve the performance of students in Integrated Science and as such the basis of further research on this subject matter in the Lawra Senior High School. In using the practical approach, the attitude of the students would be also evaluated since attitude is an important attribute of performance.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter covers the methodology employed to gather relevant data for the study. The methodology focuses mainly on the research design, study population, sampling design, instrumentation, intervention and data collection as well as methods of data analysis.

3.2 Research Design

A research design refers to the plan and schedule of work which leads to creating an empirical evidence to test and support or reject a knowledge claim Saunders, Lewis, and Thornhill, (2011). In line with this, the study used an action research design to collect and analyse data and arrive at conclusions of the study. According to Ferrance (2000) action research specifically refers to a disciplined inquiry done by a teacher with the intent that the research will inform and change his or her practices in the future. This research is carried out within the context of the teacher's environment—that is, with the students and at the school in which the teacher works—on questions that deal with educational matters (such as the teaching of Integrated Science) at hand. For the purpose of this study, Calhoun (1994) gives a more comprehensive explanation to what an action research is. He stated that action research involves teachers identifying a school-based topic or problem to study; collecting and analyzing data to solve or understand a teaching problem or helping teachers understand aspects of their practice. Following from this perspective, the action research design gave the researcher a better and in-depth understanding of the extent to which practical approach to the teaching of Integrated Science can improve the performance of students. By so doing a pre-test and post-test scenarios were used to ascertain performance of students in the subject.

3.3 Population

According to Zikimund (2003) one of the challenges of any type of research is the definition of the sample population from which the respondents are selected. In this case, the population of the study refers to the entire set of relevant units that fit into a certain specification (Oteng-Abayie, 2011). The target population in this case consisted of second year Art students of Lawra Senior High School. This category of respondents was targeted because they often do not have interest in the subject and as such show negative attitude towards its learning. Besides, Arts students often perceived the subject to very difficult because of its practical nature and in effect normally perform poorly both in the school examination and the West African Senior School Certificate Examinations (WASSCE). Besides, this category of respondents is also directly involved and concerned about the teaching and learning of the subject.

3.4 Sampling Techniques

3.4.1 Sample size

Purposive sampling technique was used in selecting Form 2 Arts Students. The sample size for study was 150. These respondents were selected due to their demonstration of poor attitude and poor performance exhibited in class. They exhibited poor attitude because of their irregular attendance in science lessons and also poor performance due to their low scores in both terminal examination and class test. The sample size for the male students were100 and that of female was 50. It is also important to note that the female students constituted about 33% of the student population in the Form.

3.5 Instrumentation

The researcher used structured questionnaire, practical test and interview guide to collect data for the study.

3.5.1 Questionnaire

According to Dawson (2002) a questionnaire consists of a set of questions presented to a respondent for answers. The respondents read the questions, interpret what is expected and then write down the answers themselves. It is called an Interview Schedule when the researcher asks the questions (and if necessary, explains them) and records the respondent's reply on the interview schedule. Because there are many ways to ask questions, the questionnaire is very flexible (ibid, 2002). The questionnaire allows the respondent to give answers to the question raised which facilitate the easy collection of the data. According to (ibid 2002) there are three basic types of questionnaire: closed-ended, open-ended and combination of both.

In line with this, the questionnaire for this study consisted of both open and closed ended items. To ensure that the research objectives were properly addressed in the questionnaire, it was divided into two sections namely, Sections A and B as in Appendix I. Section **A** sought the background information of the respondents. These were: sex and age cohorts. The second section, Section B, contained questions on the use of practical approach in the teaching of the subject. This covered the number of times allotted to practical work in a week vis-à-vis the theoretical aspects of the subject, number of times they actually do practical works, methods of teaching/instruction of practical work ability of students to understand what is being thought and students own attitude towards teaching the subject prior to an the intervention.

3.5.2 Interview

Interviews involve interviewing a select group or individuals who are likely to provide needed information, ideas, and insights on a particular subject (Saunders *et al*, 2009). In this light, only a small number of informants are interviewed. Such informants are selected because they possess information or ideas that can be solicited by the investigator. Depending on the nature and scope of an inquiry, the investigator identifies appropriate groups from which the key informants are drawn and then selects a few individuals from each group. Interviews are essentially qualitative in nature. They are conducted using interview guides that list the topics and issues to be covered during a session. The interviewer frames the actual questions in the course of interviews. The atmosphere in these interviews is informal, resembling a conversation among acquaintances. The interviewer subtly probes informants to elicit more information and takes elaborate notes, which were developed later. If all the relevant items are not covered in a session, the interviewer goes back to the key informant.

From this perspective, the researcher used an interview schedule to gather in-depth data on objective 2: To determine the effect of practical work on students' attitude in Integrated Science. In this case, checklist of questions were developed to evaluate students attitude after they had been taken through practical activities of developing an electromagnet as in Appendix II

3.5.3 Practical test guide

To effectively measure objective 3 and draw valid conclusions on the effect of pratical work on students' performance in Integrated Science, practical test guide consisting of activities and question items were developed to pre-test students' level of performance before an intervention and post-test students after an intervention (Appendix III). The test items contained the process of making a magnet using electricity. The test had two major sections with series of activities for students to perform. The first section contained written instructions of the activity and the expected outcome of the activity. The second section comprised questions to test students understanding of the activities undertaken by them.

3.6 Validity and Reliability of Instruments

To achieve face and content validity of the instruments, the specific objectives were measured by three sets of instruments namely questionnaire, practical test guide and, interview schedule. In this case, the questionnaire was used to measure the first objective of the study, interview schedule was used to measure objective 2 and practical test guide were used to measure objective 3 and these were given to the supervisor for his inputs and approval before the field work commenced.

Also, Improper wording of questions and errors in framing questions were detected and corrected before the full study was conducted.

To ascertain the reliability of the questionnaire, it was pre-tested at Eremon Senior High/ Technical School, Lawra. This was because the students of the school share similar characteristics with students of Lawra Senior High School. The geographical location of the Eremon Senior High School coupled with their culture and the environment influence students' interaction which is the same as that of Lawra Senior High School which makes the choice appropriate. The questionnaires were distributed to 50 students in Form 2 Arts Class in the school. The answered questionnaires were analysed using the SPSS and a reliability test was run using the Cronbach's Alpha reliability test to determine consistency in the scores that will be produced by the instrument. The Cronbach alpha reliability coefficient value obtained 0.783, which demonstrated good internal consistency of the questionnaire and could produce the same or similar results when used to collect the actual data in the study school.

3.7 Data Collection Procedure

Data collection was carried out at three levels namely questionnaire administration, practical tests activities and interviews. Firstly, the researcher personally administered the questionnaire to the students in their various classes. This approach gave the researcher the opportunity to fully understand and appreciate the extent to which practical works were being used to Integrated Science in the school. For purposes of clarity and understanding of what the study intended, students were properly briefed about the nature of the study before interviews started. In order not to interfere with lessons of students, the questionnaire administration was done during breaks and after when lessons for the day had ended. Each interview lasted about 15 minutes. The questionnaire administration took about a month.

The second phase of the data collection involved the practical activities and test. This activity was carried out in three stages which were pre-intervention stage, intervention stage and post-intervention stage as further explained in the following sub-sections.

Stage 1: Pre- Intervention:

At this stage, practical test questions (Appendix III) were distributed to 150 students which constituted the sample size to answer. The purpose of this was to establish a baseline score for the purpose of measuring progress or otherwise after the intervention stage so that conclusion can be drawn on the basis of the test. That is, whether the practical test approach has indeed improved the performance of students in the subject.

In this exercise, students were grouped and put in to two classes and test question papers were distributed to them to answer within 45 minutes. At the end of the 45 minutes, the researcher collected the test papers, marked and recorded the marks. After this, the researcher then went ahead to initiate an intervention based on the test questions guide as explain in the next sub-section.

Stage 2: Intervention:

At this stage of the study, 150 students were divided into 15 groups with each group comprising 10 members. This was done because of inadequate equipments. Each group was given a copper wire, battery, iron core, connecting wire, key, paper clip, plotting compass, a small piece of magnetic material (paper clip or small nails) and a work sheet. The researcher asked the students to first observe him while practical was being performed and through the process, a magnet was formed by the process of electromagnetism. The students were then asked to follow the worksheet to make a magnet by the electrical method: Wind a copper coil for about 25 turns around the iron core to form a solenoid. The magnetic material was placed inside a solenoid with large number of turns. The end of the coil was then connected in series with 12V battery and a switch.

With the magnetic material in the solenoid, the current was switched on for a short while and switched off. The bar was then removed and this was found to be magnetised. The end of the bar where the current flowed in a clockwise direction became the South-Pole whilst the end of the bar where the current flowed in an anti-clockwise direction became the North-Pole.

It is essential to note that this intervention is one of the numerous practical activities demonstrated that were undertaken by the students with the researcher in order to ensure that students acquaint themselves with the practical work.

Stage 3: Post-Intervention:

At the post- intervention stage, the researcher again gave the same practical test to the respondents to answer after the intervention at the same condition. Scores were collated and analyzed compared with the pre-intervention scores base on frequencies and percentages. The significance of the evaluation was to determine the level of impact in view of changes resulting from the interventions.

Lastly, interviews were conducted with students to ascertain the effect of students' attitude towards practical work in Integrated Science. The interviews were held with five (5) students who took part in the practical test activities of making an electromagnet.

3.8 Data Analysis

Karma (1999) views data analysis as the computation of certain measures along with searching for pattern of relationship that exists among data-groups. Questionnaire data was analysed using the Statistical Product and Service Solutions (SPSS) software, version 20. In In this regard, the variables of the questionnaire were first coded into the software to produce a code book. The code book was properly scanned through to ensure that variables were properly captured. This was followed by data entering. After the data entering, the researcher edited and cleaned data of missing values. This was to ensure that one did not have missing values when the data was generated. The next important thing after data coding and entering was to generate the data into statistical tables and charts for analysis and discussion.

Furthermore, the Spread Sheet (Excel) was used to analyse test scores obtained by students from the pre-test and post-test exercises. Data was processed into descriptive statistics and inferential statistics. The descriptive statistics entailed Mean scores and Standard Deviations. The inferential statistics used the sample t-test to test the hypothesis that there was no significant difference between the mean score of pre-test and post-test scores. Added to this, qualitative data from the interviews were analysed and describing how students felt their attitude after they were taken through practical work of electromagnetism.

3.9 Ethical Considerations

Ethical considerations were considered as follows; A letter was first written to the Lawra Senior High School administration for their support and permission before the commencement of the research. Consent was also obtained from respondents before administering the questionnaire, as well exploring sensitive issues after good relationship had been established with the respondents. In order to guarantee confidentiality of the data obtained; names and addresses were omitted from the questionnaire because of sensitive issue. On the part of obtaining samples, recruitment was done in such a way that all respondents had being creditably selected.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter presents results and discussion of field data. Data is analysed according to the research questions which were: the extent of the use of practical work in the teaching of Integrated Science; the effects of practical work on students' attitude towards Integrated Science and the effect of practical work on students' performance in integrated science. The analyses were interspersed with pre-test and post test results of the practical activities conducted with students. Additionally, results of the bio data of respondents are also presented and described.

4.2 Bio-data of Respondents

This section of the study presents bio-data of respondents namely sex and age cohorts.

4.2.1 Sex

Sex of the respondents gives a fair idea about male and female students who participated in the study as presented in Table 4.1.

Table 4.1: Sex of respondents

Sex	Frequency (N)	Percentage (%)
Male	100	67
Female	50	33
Total	**150**	**100**

From Table 4.1, greater percentage (67%) of the respondents were males whilst the female constituted only 33%. This clearly shows that the intention of achieving parity in male and female education in our educational institutions such as Senior High Schools is farfetched. The male student population still dominates. This could be attributed to the fact that many of the female students are unable to gain admission into Senior High Schools due to their inability to pass the Basic Education Certificate Examination (BECE).

4.2.2 Age cohorts

The age cohorts also give a fair idea about ages of students in the school as presented in Table 4.2

Table 4.2: Age Cohorts

Age	Frequency (N)	Percentage (%)
≤15	18	12
16-20	112	75
21+	20	13
Total	**150**	**100**

Table 4.2 shows that students had varied ages ranging from 15 years of age to over 21 years. Greater majority of respondents 75% were between 16-20 years of age. It is also interesting to note that some students were over aged (21+) since at age 21 one should have completed Senior High School if one had gone to school at the specified age of 6. This could affect their ability to assimilate what is being taught faster especially practical work which involves cognitive, affective and psychomotor activities. This is because much younger students are more likely to understand practical activities faster than their older counterparts.

4.3: Research Question 1: What is the extent of use of practical work in the teaching and learning of Integrated Science?

This section of the study presents and analyses results on the first research question of the study which seeks to assess the use of practical work in teaching and learning of Integrated Science in Lawra Senior High School. It captures critical issues which are the number of times students are supposed to have Integrated Science a week; number of times allotted for practical work; ability of students to do the required number of periods and the number of times the teacher holds practical work with students within the specified period. The rest are: place where the teacher holds practical work with students; methods of instructions by the teacher; students' ability to understand and a broader perspective of students' attitude towards learning in integrated science. These items were used to gather the data. The collated data of the responses were organized into frequency counts and converted in to percentages and discussed in the following sub-sections.

4.3.1 Time allotted for the teaching of Integrated Science a week

Considering the broad nature of the subject, the number of times allotted for its teaching is very crucial to the completion of the syllabus and consequently improving the performance of students in the subject. In this regard, the study intended to find out from respondents the number of times the subject was taught in a week as the results are presented in Table 4.3.

Table 4.3: Time allotted for the teaching of Integrated Science a week

Number of times	Frequency (N)	Percentage (%)
Twice	113	75
Three times	26	17
Four times	11	8
Total	**150**	**100**

It is clear from Table 4.3 that the maximum number of times allotted for the teaching of Integrated Science is twice a week and this was further confirmed from the school's Time Table. Taking into the consideration the broad nature of the subject; which comprises Biology, Chemistry, Physics and Agricultural Science, the time allotted for the subject is insignificant. This is because the subject has two major components namely theory and practical, and for any effective teaching to be done, the least number of times allocated for its teaching should be thrice a week. This clearly gives the indication that teachers in most instances are unable to cover the syllabus with the students before students write the WASSCE and this could negatively affect their performance in the subject. This notwithstanding, 17% of the respondents were of view that the subject was taught three times a week. Added to this 8% of the respondents also indicated the subject appears four times on the Time Table. It is however interesting to note that this proportion of students who indicated that science lessons were held twice/thrice a week did not even know their Time Table very well since the school's Time Table confirmed that students were supposed to have lessons twice a week. This creates the impression that this group of students do not take interest in the subject since they were unable to tell the exact number of times a week they are supposed to have Integrated Science.

4.3.2 Number of periods allocated for practical lessons in a week

As noted by Millar and Abrahams (2008), and Kolucki and Lemish (2011) practical work is necessary for school science education. In Science, learners do practical work to expand their knowledge in an attempt to understand the world around them. It develops learners' understanding of ideas, theories and models. Thus, teaching science involves learners experiencing the basic and integrated processes of science and therefore requires a specific time period devoted for this practical work. In this regard, the study intended to find out the number of periods specifically allocated on the Time Table for teaching practical work. The results of these are presented in Table 4.4.

Table 4.4: Periods allocated for practical lessons in a week

Number of times	Frequency (N)	Percentage (%)
None	98	65
One	36	24
two	12	8
three	4	3
Total	**150**	**100**

As in Table 4.4, it is very obvious that very little time is allocated for the teaching of practical lessons in the school. More than 60% of the respondents indicated that no specific allocations were made on the Time Table for the teaching of practical. This meant that the teacher used his/her own discretion to allocate time for the teaching practical work and this implies that in most instances the practical aspect of the subject was given the attention it deserves. This also goes to suggest that very little prominence is given to the teaching of practical work in the school and could have serious ramifications on the performance of students in the subject. On the other hand, 24% of the respondents indicated that practical work on the Time Table is once a week. This is followed by 8% of them who indicated practical appeared twice on the Time Table. However, a personal check on the school Time Table showed that there was not specific allocation for Integrated Science practical. This means that very little attention is given to the teaching of Science practical in the school and this could be the most reason why the performance of students in the subject is poor over the years since the practical test in the WASSCE carries about 60% of the entire mark of the Integrated Science Paper. According to Ghana Education Service Syllabus recommended that six periods a week for the integrated science lessons and out of these two periods for practical lessons.

4.3.3 Actual number of practical lessons in a week

Though there are no specific periods allocated for the teaching of the subject, it is still very relevant to establish the actual number of practical lessons held with students by the teacher in a week. Following from this, the results of the field data is presented in Table 4.5.

Table 4.5: Actual number of practical lessons in a week

Number of times	Frequency (N)	Percentage (%)
Not at all	76	51
Once	45	30
Twice	20	13
thrice	9	6
Total	**150**	**100**

As evident in Table 4.5, a little over half (51%) of the respondents indicated that no practical lessons were held with them by the teacher. This implies that teachers mostly teach the theoretical aspects of the subject leaving out the practical aspects of the subject. Further enquires showed that it is not the case that teachers do not have the requisite qualifications to teach the subject but rather TLMs are woefully inadequate to effectively carry out practical works with students.

Notwithstanding the fact that half of the respondents indicated no practical lessons were held with them, there is an indication that in one way or the other, practical lessons were held with them by the teacher. In this regard, 30% of the respondents indicated practical lessons were held once a week with them. Thirteen (13%) of the respondents also indicated that practical lessons were held twice a week. The least is 6% of them who indicated that practical lessons were held thrice a week.

4.3.4 Venue of practical work

As indicated by Jormanainen (2006) practical work provides learners with evidence to support their understanding and to concretise scientific principles. Thus, learners are properly exposed to these basic processes of science in the science laboratory. This section therefore seeks to find out where practical lessons were usually held with students; either in the classroom or science laboratory. The results are therefore presented in Figure 4.1

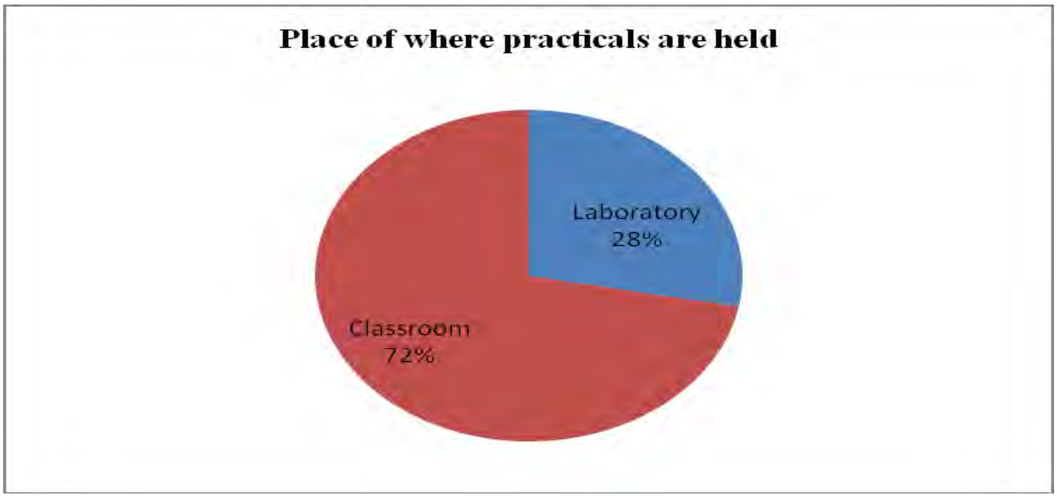

Figure 4.1: Venue of practical work

As shown in Figure 4.1, greater (72%) proportion of the respondents indicated that practical lessons were held with them in the classroom. This implies that most practical lessons were textbook and chalkboard illustrations and this could not in way enhance students understanding of the practical aspects of the subject and therefore could have negative consequences on their performance in the WASSCE. This is because effective practical lessons are supposed to be held in the laboratory where students can have the opportunity to interact physically with equipment; know their uses and on this basis develop a better understanding of certain abstract concepts. Therefore, the inability of students to have the practical feel of the subject in the laboratory could negatively affect their performance in the WASSCE. Contrary to this, a small proportion (28%) of the respondents indicated that practical lessons were held in the science laboratory. This suggests that it is on few occasions students get the opportunity to do practical work at the right place. This therefore limits their ability to appreciate scientific principles and their application and as such could affect their performance when it comes to the practical test examination in the WASSCE. As supported by Millar and Abrahams (2008), and Kolucki and Lemish (2011) practical work is necessary for school science education. In Science, learners expand their knowledge better in science laboratories in an attempt to understand the world around them. It develops learners' understanding of ideas, theories and models. Thus, teaching science involves learners experiencing the basic and integrated processes of science in its appropriate settings; i.e. in the science laboratory.

4.3.5 Methods of teaching Integrated Science

As stated by Mji and Makgato (2006) and Buthelezi (2012) different pedagogic styles enable correct concept development of students. They underscore the empirical nature of science and therefore indicated that different teaching methods increase the chances of students understanding of practical aspects since science involves measurement, repeatability of experiment and its application in the real world. Following from this understanding, the study intended to establish the various instructional methods that Integrated Science teachers used in teaching the practical aspects of the subject. The results are presented in Table 4.6.

Table 4.6: Methods of teaching Integrated Science

Instructional methods	Frequency (N)	Percentage (%)
Text book/chalkboard illustration	89	59
Demonstrations using TLMs	35	23
Strategies/ technique	26	18
Total	**150**	**100**

It is clear from Table 4.6 that teachers mostly used textbook/chalkboard illustrations in the teaching of the subject as closed to 60% of the respondents indicated this. In this regard, students are far removed from the real world of scientific knowledge where knowledge is gained through the application of scientific principles in order to appreciate why certain things behave the way they behave. This method therefore does not bring the practical aspects of the subject to bear in the instructional processes and therefore could limit students' ability to perform very well in the practical test examination in the WASSCE. About 35% of the respondents however indicated that the teacher demonstrates practical work by using Teaching and Learning Materials (TLMs) in the teaching of the practical aspect of the subject. These include wall charts, apparatus (i.e. beakers, conical flasks, test tubes, funnels, volumetric flasks, pipettes, burettes, etc), multimedia simulation gadgets, data logging and interactive whiteboards (IWBs). The use of these TLMs ensure that students are able to appreciate images in their text books in their real form and creates printable imagery of these TLMs in their minds such that when they see similar things in their practical test examination they are able to easily re-call and appropriately answer the questions.

Furthermore, the mixed-methods of teaching the subject is much more suitable given its broad and complex nature. In this regard, 18% of the respondents stated that science teachers used mixed teaching techniques in teaching the subject; implying that they used both teacher centred approach and child centred approach in teaching.

4.3.6 Understanding practical lessons

The study further intended to find out whether students understood the few practical lessons that they had. The result of this is displayed in Figure 4.2.

Figure 4.2: Understanding practical lessons

Figure 4.2, the results shows that majority of the respondents 68% did not understand the practical lessons that were taught them. This could easily be attributed to the fact that most of the practical lessons were theory based which in most cases were textbook and chalk board illustrations. This may make it difficult for students to comprehend and assimilate what is taught since the lessons were merely abstraction of a reality. In this case, students are more likely not to do well in the practical test paper of the subject and this could affect their overall performances since they may not be able to practically apply the knowledge and skills acquired in the practical work simply because they have not understood what is taught.

Despite the fact that greater percentage of the respondents indicated that they did not understand what was taught in the practical work, about a third (32%) of them indicated that they understood what was taught. This suggests that this proportion of students in one way or the other may be able to do well in the practical test paper and as such improve their performance in the subject.

4.3.7 Putting into practice practical lessons

Ajzen and Fishbein (1975) indicated that there is a positive correlation between attitudes and achievement; however, neither attitudes nor achievement is dependent on the other; rather they interact with each other in a complex and unpredictable way. In order to do proper diagnoses of the situation prior to an intervention, it was relevant to examine students own attitude towards practical work of the subject. Field results in this regard are illustrated in Figure 4.3.

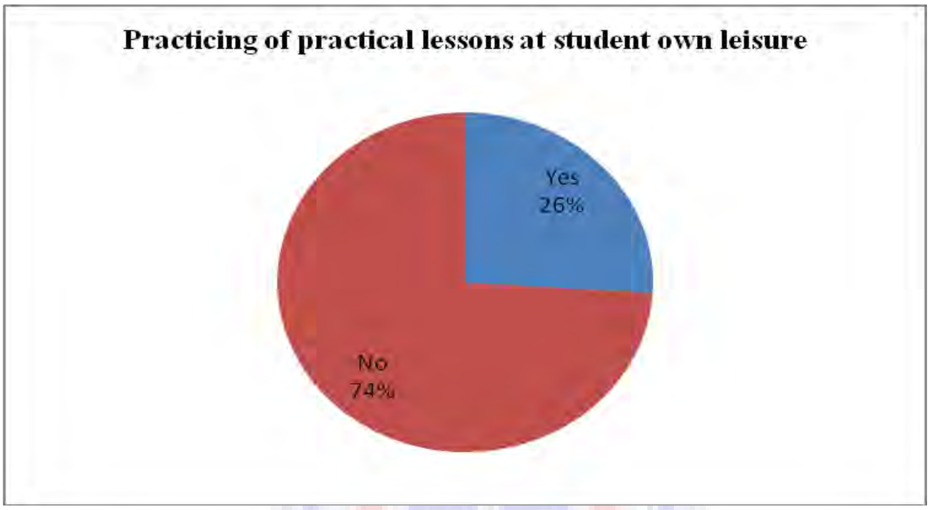

Figure 4.3: Putting into practice practical lessons

As shown in Figure 4.3, greater percentage (74%) of the respondents did not put into practice the few practical lessons that they went through. This clearly demonstrates a lethargic attitude of students towards studying the subject. As the saying goes, "practice makes men perfect" and since students do not put into practice what is taught, they are most likely to forget easily the principles and procedures of carrying out a particular experiment. In this case, once they meet a similar case in the examination they are more likely not to sufficiently answer the question and this could negatively affect their ability to score higher marks. Interestingly, various reasons were assigned by respondents as to why they were unable to put what was taught into practice. Principal amongst them was students' dislike for the subject due to its broad, complex and difficult nature. This finding contravenes the findings of Mukhwana (2013). In his study he found that overwhelming majority (92%) of students had positive attitude studying science practical. According to him respondents mentioned doing self study on the subject, asking for assistance from teachers in areas of difficulty, forming discussion groups, high scores in the subject, dedicating more revision time for the subject, having a personal time table which guides students' private studies, and working under less supervision, as some of the attributes that trigger improved performance in the subject. The study further established that an interest in the subject influenced performance because it provided the drive within students to participate in the learning process.

In a similar vein, less than 30% of the respondents in the study indicated they spent some time to put into practice what was taught. This implies that very few students take interest in learning the subject. This explains why few students are able to get the required passes (A1-C6) in the school.

4.4: Research question 2: What is the effect of practical work on students attitudes towards Integrated Science

This section seeks to analyse results based on the study which sought to determine the effect of practical work on students' attitudes towards Integrated Science. This happened after students were taken through series of practical activities, but one of the practical activities demonstrated was on how to develop an electromagnet. The key variables in this regard are: perception and attitude. The six items in the interview schedule were used to gather data. The responses of students were described into percentages and the results are presented in pie charts as discussed in the following sub-sections.

4.4.1 Perception of students after practical activities

This section presents results and discussion on how respondents now perceived practical activities of Integrated Science. In this case, a question was posted dubbed "do you still find practical activities difficult?" and the results of this are illustrated on Figure 4.4.

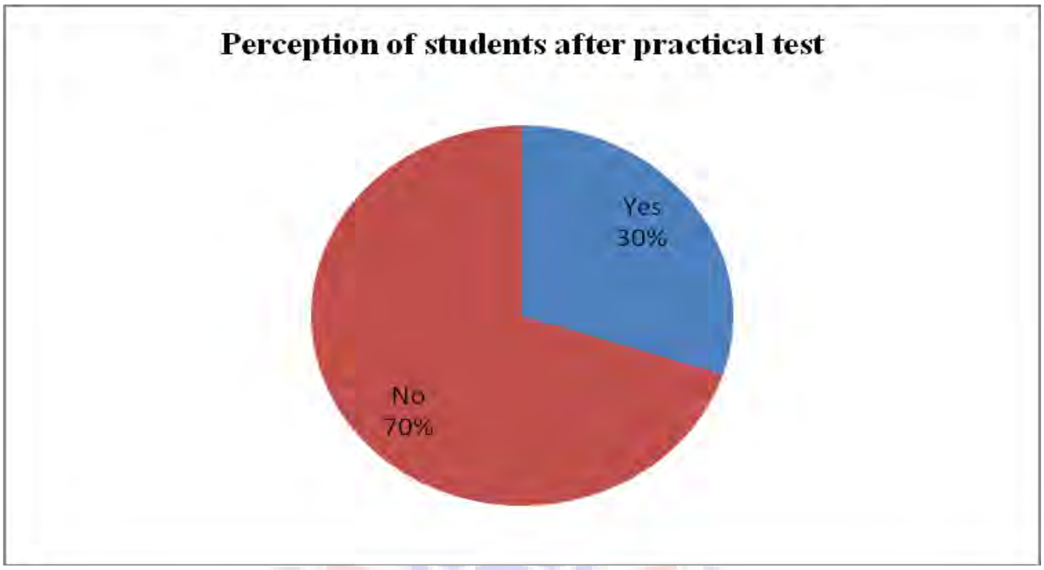

Figure 4.4: Perception of students after practical test

The data showed that greater percentage (70%) of the respondents indicated that they now have less difficulty in studying and understanding the practical aspect of the subject. As one of the participants stated in an interview:

> *"Initially we taught science practicals was something difficult. But after haven gone through the activities, we found it very interesting and now we do practicals without much problems. Now I think Integrated Science has taken much of my interest because of the practical aspects. It was very fascinating making electromagnet with copper wire, battery, a iron core, connecting wire, key, paper clip, plotting compass, a small piece of magnetic material (paper clip or small nails) and a work sheet. Because of this, I have allotted a day on my private time table for studying science practicals"*

This gives an indication that students' perception about the difficult nature of the subject has change and this is likely to improve their performance since they now developed positive attitude towards studying the subject particularly the practical aspect. Notwithstanding the fact that significant proportion of the respondents indicated that they now find the practical aspect much easier than before, about a third (30%) of them still perceived that the practical work is difficult; which suggests that this group of students who participated in the practical activities did not understand the simple procedure of making an electromagnet.

4.4.2 Ability of students to now carry out their own practical activities

This section also sought to find out whether students now work on practical activities on their own as a result of the practical activities the researcher took them through. Results of their responses are presented in Figure 4.5.

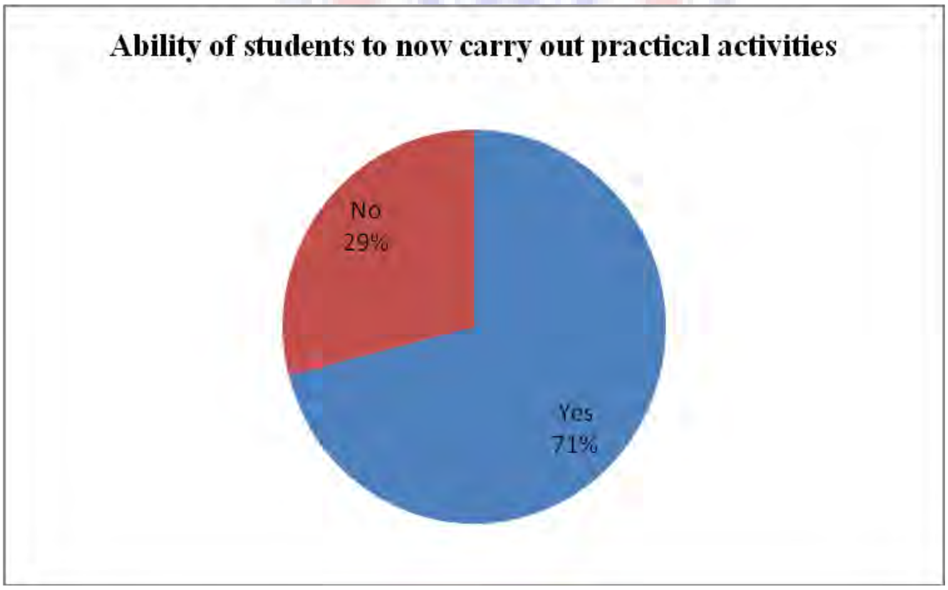

Figure 4.5: Ability of students to now carry out their own practical activities

Majority of the respondents (71%) indicated they now work out practical activities at their own leisure time. This interest and change of attitude emanates from the series of the practical work that they had undertaken earlier. If they are now able to voluntarily carry out certain practical activities or study science practicals means they are more likely to do better, unlike previously where they did not have the interest to study the subject. As one of the participating students stated during an interview:

> *"At my own free time, I try to follow certain practical activities in our science textbook and put them into practice. Sometimes it is very interesting and when I try to do it this way, I understand it better than trying to memorise word for word how the activity should be performed. I think now I am more committed to studying science practicals than before"*

The statement above therefore gives an indication that there is a significant change of students' attitude towards studying science practical work and for that matter Integrated Science. However, not all the students who participated in the practical activity put what they learnt into practice. Some of them still have negative attitude towards studying the subject and this could negatively affect their performance in the WASSCE.

4.5.0: Research question 3: What is the effect of practical work on students performance in Integrated Science

This section sought to find out the results which sought to examine the effect of practical work on students' performance in Integrated Science. In order to answer this question a work sheets were established with series of practical activities, but electromagnetism was used for the purpose of demonstration in the practical guide.

The pre-intervention scores and post-intervention scores were collated and analysed. Also hypothesis was formulated to establish a case that indeed practical work has an effect on the performance. The data were collated into frequencies, percentages, mean scores and standard deviations. The results of the practical work are presented in the Tables as showed below.

4.5.1 Pre-intervention test results

Having done a situational analysis of the practical aspects of teaching Integrated Science in the School, the researcher pre-tested 30 students with practical test questions in making an electromagnet in order to ascertain their level of performance in the practical work before the intervention. The test paper was marked over 60 as required by the WAEC and results from this exercise are presented in Table 4.7.

Table 4.7: Pre-intervention test results of respondents

Range of Marks	Frequency (N)	Percentage (%)
0-10	100	67
11-20	25	17
21-30	15	10
31-40	10	6
41-50	-	-
51-60	-	-
Total	**150**	**100**

It is obvious from the Table 4.7 that none of the respondents scored a mark between 41 and 60. Rather majority (67%) of them scored between 0 and 10. This clearly indicates that most students are very weak at the practical test which is more likely to affect the overall performance of the students. It is further fascinating to know that out of the 16 students who got between 0 and 10, 9 of them representing 30% scored zero which further demonstrates students' weakness in the practical aspect of the subject. Also, 17% of them scored between 11 and 20 also indicating a weak per performance. Though this range of scores seems average, 3 out of the 5 students scored between 11 and 13 which is below average. Only 2 of the students representing 6% scored above average, 31-40%.

4.5.2 Post-intervention results

The results of students on the test practical are presented in the Table 4.8.

Table 4.8: Post-intervention test results of respondents

Range of Marks	Frequency (N)	Percentage (%)
0-10	10	6.6
11-20	-	-
21-30	15	10
31-40	70	46.7
41-50	25	16.7
51-60	30	20
Total	**150**	**100**

From Table 4.8, the post-test results showed a significant improvement in the performance of students in the practical test over the pre-test results. A little over 90% of the students had the pass mark of 30 on the test paper. Following from this, a good number of respondents (46.7%) scored between 31 and 40 out of the 60 marks. This is followed by 30 students representing 20% who scored between 51 and 60 marks. It is worth noting that, out of the 30 students who scored between 51 and 60, 10 students scored all the marks. This demonstrates that after students had successfully gone through the practical test and understood the activities, they were able to apply the knowledge acquired to answering the test questions unlike previously where students had limited knowledge because they were not exposed to the practical work.

To sufficiently establish the case that practical work has an effect on students' performance, a hypothesis was formulated and tested. Thus:

H_0: There is no difference between the mean score of pre-test and post-test score.

H_1: Post-test score is higher than pre-test scores.

In this case, t- test was used to test the hypothesis at 95% confidence level. The results are summarised in Table 4.9.

Table 4.9: t-test analysis of pre and post tests intervention results

Test	N	MS	SD	t	p
Pre-test	150	28.3	12.2	4.54	0.00
Post-test	150	46.5	17.4		

The results showed that there was a significant improvement in post test scores (M= 46.47, SD = 17.425) over pre-test score (M= 28.83, SD = 12.160) and (t(29) = 4.54, p = 0.00.) Therefore the null hypothesis is rejected and the alternate hypothesis accepted and in this instance it is concluded that post- test scores is an improvement over the pre-test scores. On this note it can be concluded that the practical work has an effect on students' performance in Integrated Science.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONLUSION AND RECOMMENDATIONS

5.0 Overview

This chapter summarizes the findings of the study, concludes on the findings and gives recommendations to improve the teaching and learning of Integrated Science. The findings are based on the research questions as outlined in the following subsections.

5.1 Summary

The study sought to establish the extent to which the use of practical works in the teaching of Integrated Science can improve students' attitude and performance in the subject with the view of making recommendations to improve teaching and learning. In respect of this, the action research approach was used to collect data from a sample of 150 Form 2 Arts students who demonstrated poor attitude and poor performance in class. Three main instruments were used to collect data namely questionnaire, practical test guide and interview schedule. The questionnaire was closed and open ended and was used to collate quantitative data. These data were analysed into frequencies and percentages which were presented in Tables. Pre-test and post-test scenarios were also used in the case of the practical test guide. The interview schedules were also used to collate qualitative data which seeks to further explain more on the practical test after the intervention. Students were taken through practical test on electromagnetism before an intervention and after the intervention in order to compare scores of students before the intervention and after the intervention.

From the analyses the key findings are items according to the research questions in the following sub-section.

5.2 Main Findings

The following were the main findings of the study;

1. In terms of the periods allotted for the teaching of Integrated Science, the study found out that the maximum periods allotted for the teaching of Integrated Science was twice a week which is insignificant to cater for both theory and the practical aspect of the integrated science.
2. In terms of periods allocated for the sole purpose of teaching practical work, the study established that no specific periods were allocated on the Time Table for the sole purpose of teaching practicals aspects of the integrated science.
3. Further enquires showed that it is not the case that teachers did not have the requisite qualifications to teach the subject but rather TLMs were woefully inadequate to effectively carry out practical works with students.
4. The study showed that practical work has significantly improved students attitude towards Integrated Science. In this regard, greater percentage (70%) of respondents indicated they now have less difficulty in studying and understanding the practical aspect of the subject
5. The t-test data analysis showed that there was;

   Significant difference between the pre-intervention test scores and the post-interventions test scores. Therefore the practical work had a positive effect on the students' performance in integrated science.

5.3 Conclusion

The purpose of this study was to research on improving students' attitudes and performance in integrated science using practical work in Lawra Senior High School. This research concluded that the use of practical work in the teaching of Integrated Science arouse the interest of students and improves the performance of students. Prior to the intervention, scores obtained by students in the practical test was very low arising from the fact that they did not have any practical experience on the test that was given them. This was due to the fact that very limited time was allotted for the teaching of the subject coupled with no specific period allocation for the teaching of the practical aspect. Additionally, students had negative attitude towards studying the subject due to its broad and complex nature. More so, the school did not have adequate relevant and appropriate TLMs to effectively teach the practical aspects of the subject. On the other hand, when students were taken through the practical activities and similar test questions were given them, the marks scored showed a remarkable improvement over the pre-test scores.

5.4 Recommendations

Based on the findings and conclusion of the study, the following recommendations are proposed to improve the teaching of Integrated Science in the School.

Firstly, in the case of inadequate periods allocated for the teaching of the subject, it is recommended that the specified periods recommended by Ghana Education Service should be allocated by the school authority to the teaching of the subject. Due to its broad nature, six periods (i.e. three meetings) a week allocation would enable teachers cover the syllabus with students before they write the WASSCE. Additionally, since there are no specific period allocations on the school

Time Table for practical work, it is recommended that out of the six periods for the week, half of this should be devoted to the teaching of practical work since the practical aspect of the subject carries major portion of the total examination mark. With this allocation, students would have the opportunity to do practical work every week.

Secondly, teachers in Lawra Senior High School should be encouraged to use more of activity base approach in the teaching of the subject than the conventional lecture method or textbook or chalkboard illustrations in teaching the subject as the conventional lecture method does give students the opportunity to have first-hand experience on practical activities prior to the practical test examination by the WAEC. If this approach is well adopted it help change the negative attitude of students towards the subject since they would find the subject interesting than the theory base approach. .

Finally, the Lawra District Education directorate in collaboration with the Lawra District Assembly should make a specific allocation of their yearly budgets to the provision of TLMs to facilitate the teaching and learning of Integrated Science in Senior High Schools in the district.

5.5 Suggestions for Further Study

The study was conducted only in Lawra Senior High School, in the Lawra District of the Upper West Region. The following areas are suggested for further study:

- It is being suggested that a similar study be carried out in all Senior High Schools in the country so that a comprehensive assessment could be made.

- Moreover, a follow up survey should be conducted annually to check the changes in the factors influencing students' performance in the Lawra Senior High, in view of practical work to teaching integrated science.

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APPEDIX I

QUESTIONNAIRE

UNIVERSITY OF EDUCATION- WINNEBA

GRADUATE SCHOOL

MASTER OF EDUCATION

TOPIC: USING PRACTICAL WORK TO IMPROVE STUDENTS ATTITUDE AND PERFORMANCE IN INTEGRATED SCIENCE: A CASE STUDY OF LAWRA SENIOR HIGH SCHOOL

Dear Respondent,

I am a M ED. Student of the University OF Education- Winneba undertaking a study on: Using Practical work to Improve Students Attitude and Performance in Integrated Science: A case Study of Lawra Senior High School. The study is for educational purpose and your readiness to respond appropriately will make its outcome beneficial to community peace building initiatives. I wish to assure you that your identity and whatever information you provide will not be disclosed to anyone.

Thank you for your cooperation and assistance.

Section A: Bio data of respondent

1. Sex

Male [ ] Female [ ]

2. Age category

Under 10 - 15 [ ] 16 -20 [ ] 21+ [ ]

Section B: The extent of the use of the practical work in teaching and learning of integrated science

3. Per your time table, how many times do you have integrated science in a week?

Thrice [ ] Four times [ ] Five times [ ] Six time [ ]

4. Out of this number, how many times is allotted for practical work?

None [ ] One [ ] Two [ ] Three [ ] Four [ ]

5. Are you able to do the number of times allocated for the practical work as required by the time table?

Yes [ ] No [ ]

6. If No, why?

Our teacher does not have time at all [ ] We have a very smaller space in the Lab. [ ] Our Lab. does not have the required equipment space [ ] We do not just have the interest during practical time

7. How many times does your teacher hold practical work with you in a week?

Not at all [ ] Once [ ] Twice [ ] Thrice [ ]

8. Where do you hold the practical work?

Laboratory [ ] Classroom [ ]

9. What teaching strategy does your teacher use to teach practical work?

Chalk board illustrations [ ] Test book illustrations [ ] TLMs [ ]

10. Are you able to understand these practical lessons?

Yes [ ] No [ ]

10. If No, why?

The methods used are difficult [ ] The processes involved are complex [ ] I do not just have the interest in learning [ ] The teacher is not conversant with the subject [ ]

11. Do you put into practice what is being taught at your own leisure time?

Yes [ ] No [ ]

12. If No, why?

I do not have access to the apparatus at my own leisure to practice [ ] I do not just like the subject at all [ ]

APPENDIX II

INTERVIEW SCHEDULE

UNIVERSITY OF EDUCATION- WINNEBA

GRADUATE SCHOOL

MASTER OF EDUCATION

TOPIC: USING PRACTICAL WORK TO IMPROVE STUDENTS ATTITUDE AND PERFORMANCE IN INTEGRATED SCIENCE: A CASE STUDY OF LAWRA SENIOR HIGH SCHOOL

Dear Respondent,

I am a M ED. Student of the University OF Education- Winneba undertaking a study on: Using Practical work to Improve Students Attitude and Performance in Integrated Science: A case Study of Lawra Senior High School. The study is for educational purpose and your readiness to respond appropriately will make its outcome beneficial to community peace building initiatives. I wish to assure you that your identity and whatever information you provide will not be disclosed to anyone.

Thank you for your cooperation and assistance.

The effect of practical work on students attitudes towards Integrated Science

1. Having gone through the practical activities of making an electromagnet, do you still find science practicals test difficult? Yes [ ] No [ ]

2. If Yes/No, why

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3. Are able to now try other practical activities at your own will? Yes [ ] No [ ]

4. If yes, How?

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5. Will you say that the practical activities that you have gone through have increased your interest in learning the subject? Yes [ ] No [ ]

6. If yes, indicate how?

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Thank you!!!

APPEDIX III

PRACTICAL TEST GUIDE

UNIVERSITY OF EDUCATION- WINNEBA

GRADUATE SCHOOL

MASTER OF EDUCATION

TOPIC: USING PRACTICAL WORK TO IMPROVE STUDENTS ATTITUDE AND PERFORMANCE IN INTEGRATED SCIENCE: A CASE STUDY OF LAWRA SENIOR HIGH SCHOOL

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PRACTICAL WORK

Activity: Making an electromagnet

Steps

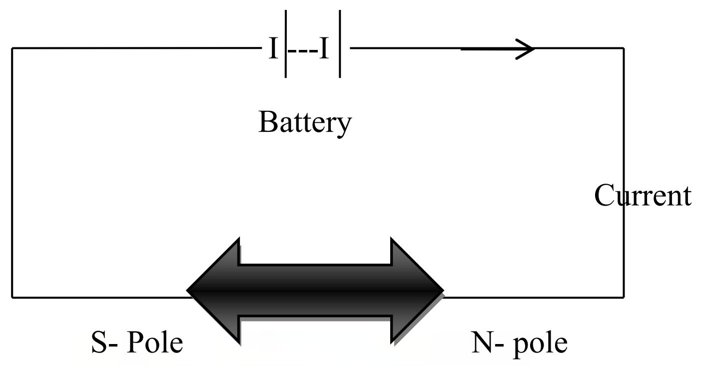
1. Obtain a long wire, a battery, a piece of iron, some plotting compass and a small piece of magnetic material (paper clip or small nails)
2. Wrap the wire around the piece of iron as many times as possible in all directions
3. Connect the two ends of the wire to a suitable direction

4. With the current flowing, test the piece of the iron whether is a magnet.

5. Explain your observation if the battery is disconnected.

6. Find out which end of the electromagnetic is the North Pole

7. Present your result



Questions;

1. Why wouldn't the current flow if the battery is disconnected?

2. State three (3) usefulness of electromagnetism?

3. State your observations

THANK YOU!!!