UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF SCIENCE EDUCATION

USING ACTIVITY-BASED INSTRUCTION TO IMPART COLLEGE OF EDUCATION TRAINEES' ATTITUDE TOWARDS THE STUDY OF SCIENCE

BY

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DECLARATION

STUDENT'S DECLARATION

I, Isaac Ofori, hereby solemnly declare that, with exception of some quotations and references which have been duly acknowledged, is entirely my own original work and that it has not been presented, either in part or whole, for the award of a degree in this institution or elsewhere.

Name: Isaac Ofori

Candidate‟s Signature……..

Date……..

SUPERVISOR'S DECLARATION

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

Name: Professor K. D. Taale

Signature……..

Date…….

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Glory be to the Omnipotent God, it is by His grace and loving kindness that have brought me this far. My sincere and profound gratitude goes to my supervisor, Professor K. D. Taale of the Department of Science Education, for his unflinching and tender-hearted support and encouragement towards the completion of this work. A thousand thanks go to him. God richly bless him. I equally acknowledge most heartily the tremendous support and commitment exhibited by Dr. Anderson of the Department of Science Education towards the completion of this work. I am greatly indebted to you.

DEDICATION

This work is solely dedicated to my late father, Mr. S.Y Ofori, whose inspiration and support have brought me this far. May his soul rest in perfect peace.

ABSTRACT

The study investigated the attitude of teacher trainees towards the study of science in the Colleges of Education. The study sought to look at students‟ attitude from four (4) significant perspectives namely; interest to do science, motivation to do science, level of students‟ involvement in science lessons and the type of interpersonal relationship between science teachers and students. The study also considered the effect of practical activities on students‟ performance as well as teachers‟ pedagogical strategies and students‟ attitude towards science as other issues worth investigating. In all fifty (50) students each from three Colleges was selected using stratified and purposive sampling techniques. The techniques helped to gather data on a large and diverse group of trainees. A twenty nine (29)-item questionnaire on a five (5) likert-scale for students was used to collect data on students‟ attitude towards science. An instructional intervention activity was also carried out. The information gathered was analyzed under the four (4) main perspectives of attitude and under the two related issues considered using descriptive statistics. The study showed that students‟ attitude towards the study of science was not encouraging, per the perspectives considered. Some of the students were of the view that instructional method has no influence on students‟ attitude to study science whilst most of them were in the affirmative. There was also an indication that science teachers‟ instructional methods did not suit students learning style and as such influenced their disinterest in science, hence their poor attitude towards the subject. It is recommended that science teachers, especially those in the colleges of education, adopted Activity-based instructional approach in the teaching and learning of science. Again, stakeholders in education in the country are requested to periodically organize in-service training courses to improve teachers‟ self-esteem, self-confidence and self-efficacy. Arguments supporting the need for better science education in elementary schools have been based on the desire to

develop in today's students the knowledge, reasoning, and problem-solving skills required for the rapidly changing and technology based society (Plourde, 2002).

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CHAPTER ONE

INTRODUCTION

Overview

This chapter examines the background to the study, statement of the problem, purpose of the study. Objectives of the study, research questions, significance of the study, delimitation, limitation, definition of terms and organization of the study.

Background to the study

Learning is an activity or a system of activities that lead to changes in the way individuals who engage in these learning activities conduct themselves. The activities that constitute learning are called learning experiences and could be engaged in consciously or unconsciously. Those who engage in these activities are the learners who could be in groups or individual learners.

Science"s relevance in the society is even far more reaching than its vast influence on human affairs of the past (Atkin, Landerman, Ogawa, Prime & Rennie , 1998). Again, in their publications concerning the report of International Council of Scientific Union (ICSU) programme on capacity building in science stated that "Science and science-based knowledge and technology are the driving engines for changes in the modern society "(Atkins, 1998. p.71)." Also, Atkin (1998, p.92), in his comments on the same ICSU programme on capacity building in science quoted, "we live in a world whose questionable future is absolutely dependent on the advancement of science and its wise application." Once again, Atkin et al (1998), in their published edited version of the ICSU document on capacity building in science, wrote, "we have arrived at a point in our history where there must be a major increase in the capability of all persons to cope with the scientific and technological culture that is shaping their lives

and the lives of their children. (Atkins, 1998. P. 98).” They added that we must acknowledge that we live in a world dominated by science and science-based technology, and to be scientifically illiterate is a terrifying and unacceptable situation. This is true because no country can achieve an industrialized status without much attention to science and technology.

Developing countries have peculiar need with respect to both science education and technology education, as relatively little science or technology-based knowledge is generated in such countries. It has become the plan of every government especially those in the developed countries to make science and technology a major objective of their national educational policy and make every effort to achieve it.

In an effort to address such peculiar needs in order to improve upon the quality of science and technology in Ghana, the government in his national educational document „Vision 2020“, laid much emphasis on science education. One of the basic objectives of Vision 2020 is to develop adequate science and technology capabilities and to provide infrastructure which will enable industries and other sectors of the economy to provide the basic needs of the society. In line with this objective, the Ministry of Education, Youth and Sports (2004), decided to re-orient all levels of the country“s educational system in the teaching of science and technology. This means that, science and technology is to start from the primary schools. The decision to start with primary education is appropriate since intervention at this level has the widest rippling effect throughout the education system (Wallberg, 1996). Arguments supporting the need for better science education in the basic schools have been based on the desire to develop in today's student the knowledge, reasoning, and problem-

solving skills required for the rapidly changing and technology based society (Plourde, 2002).

Yet, this laudable proposal cannot be achieved without addressing its possible setbacks for a developing country like Ghana. It is science education that is being proposed as the means of equipping people with the capacity to understand, use, control, absorb and create technologies (Wallberg, 1996.). However, there is no doubt that achieving these calls for resourceful, knowledgeable and competent science teachers to make this a reality. These qualities of a science teacher, which make him/her able to use resources and facilities which are provided by government, stakeholders of education, philanthropists and any other concerned individuals and organizations (to enhance science education), are acquired through the teacher‟s training. One of the key determinants for the acquisition of such qualities, in order for one to become such a teacher, is positive attitude towards science. Developing a positive attitude towards science, implies abusing one‟s mind of the perceptions such as: science is a difficult subject; science is for some people not everybody, science is not real, science is for men not women, etc. Abusing students‟ minds of these misconceptions could be effective only when teachers make good instructional decisions which could provide relevant experiences to support students‟ learning. Hence, the responsibility of the teacher is to be creative and innovative in selecting and using instructional technique (s) and materials that will motivate students to learn, be appropriate to variety of learning styles and be usable within the context of the learning environment (Erinosho, 2008). There is a wide range of instructional techniques for science teaching and learning. It includes teacher-centered and learner-centred approaches. The learner-centred resources are those that make learning meaningful and help students connect ideas (McCombs & Whistler, 1997).

Shuell (1996), also believe that the hallmark of good teaching is quality learning among students. Underlying the process of science teaching is fundamental assumptions about the uniqueness of learners, differences in individuals‟ patterns of development and the active nature of student learning. These assumptions influence instructional procedure and outcomes, selection of instructional materials and method of assessment. Effective teaching of science requires sound pedagogical skills, mastery of the subject matter and the classroom practices to support the learning process among all categories of students. Some of the ways by which a teacher can induce quality learning in the science classroom are as follows: making science learning active and student-centered, knowing the students background experience, being accountable for the learning of all students and emphasizing on sound pedagogical strategies. Other ways by which quality learning can be induced include, developing the capability to create and manage an assortment of learning tasks and activities, adopting quality classroom management techniques that foster positive behaviour among learners, providing conducive and productive learning tasks and activities, providing conducive and productive learning environment as well as providing equal opportunities for all students to learn.

According to Ogawa (1998), teaching about ethical issues has a positive influence on school children‟s attitude toward science, especially in terms of their interest and perception of the practicality of the scientific knowledge. Humanism also believes that positive self- esteem is worthwhile and important, because those students with strong self-esteem are likely to be motivated to teach (Maslow, 1968). These clearly show that teachers have a pivotal role to play to develop positive attitude in students towards science. In teachers‟ interaction with students during teaching and learning process, the kind of attitude they show towards the subject, with respect to their

interest and perception, and the kind of interpersonal relationship between the teacher and the students is a potential factor for either motivating or demotivating the students to learn. Freedman (1997), has observed that active participation of pupils in teaching and learning depends a lot more on the encouragement they receive from their teachers.

It is obvious that if teachers act as role models for students, they learn much in the classroom by observing how their teachers behave. Students whose teachers have been trained in modeling techniques perform better academically than students whose teachers have not received such training (Lightbody & Durndell, 1996). By observing teachers, students learn not only academic skills, such as how to solve algebraic equations or how to pronounce words in a foreign language, but also much importance is given to non- academic behaviour (Crowl, Kaminsky, and Podell (1997), further expressed that students may learn interpersonal skills by observing how teachers interact with students and with other teachers. They may also adopt teachers‟ attitudes towards a variety of topics, ranging from those related to education and schooling to those extending well beyond the classroom. Students may even imitate mannerisms their teacher‟s exhibit. Good teachers are not only effective models, they also constantly keep in mind that their behaviour, both intentional and unintentional, can profoundly affect what students learn. Above all, good teachers know how to motivate students to learn. A teacher‟s responsibility goes beyond just on student‟s attitudes, beliefs and behaviour.

Science teachers must therefore develop a positive attitude towards science and maintain a cordial relationship in both inside and outside the classroom with students. This will help raise the fallen standards of scientific literacy in Ghana.

In this modern era, science has become the backbone for the prosperity in each and every field of life. Historically, the early path of science instruction followed the philosophy of exercising students‟ mind through rote memorization of information. During the 1960‟s however, research done by Jean Piaget and Jerome Bruner, as well as others, began to change this approach of thinking about science instruction. These newly developed philosophies of learning style and learning environments supported the assumption that "learners actively construct individual world view based on personal observation and experiences, and that learners respond to formal instruction in terms of pre-existing intuitive perspectives" (Cole & Beuhner-Brent, 1991).

Learning to a great extent, depends on how learners show interest in class. Studies also indicate that engaging students in hands-on activities gains them knowledge, skills and first-hand experience of phenomena talked about in theory (Kirschner, 1992; Arce & Bentacourt, 1997).

Haladyna, Oslen and Shaughnessy (1982), have also found that certain factors including achievement are related to some extent, to attitude. For example, social psychologists have long postulated that attitudes can be used as predictors of achievement. The colleges of Education have therefore been upgraded to tertiary status with modern facilities and infrastructure to meet the demands of tertiary education. Some of these include establishment of modern science laboratories, well-stocked with modern equipment to enhance teaching and learning of science. This means that all the instructional materials which enhance the use of learner-centered instructional approach, which could provide relevant experiences to support trainee students‟ learning, have been made available to ensure quality education in science. Again, some of the colleges have been designated to train teachers in science and

some science-related subjects such as mathematics and technology. These subjects are handled in their respective areas of specialization.

It is however, very sad to note that, despite all the effort being put in place by the government and stakeholders in education to provide students in Colleges of Education in Ghana with the modern infrastructure and sophisticated material/equipment, both male and female college students do not show interest (enjoyment) in science, motivation (encouragement) to learn, active participation in science lessons as well as healthy interpersonal relationship with their science teachers. This study therefore, aims to find out teacher trainee students‟ attitude towards the study of science.

Statement of the Problem

Science as a subject deals with many concepts, theories, principles, laws and other established facts which may be new to those who aspire to learn it. However, learning of science requires the use and manipulation of many varied equipment and resource materials which needs an expert to effect their proper handling to teach the subject effectively. And the early path of instructions which followed rote memorization of facts created in learners the perception that science is difficult hence their disinterest and poor attitude towards the subject. It is therefore the interest of this study to introduce the use of Activity-Based method of teaching as an intervention to impart DBE 2 trainees of Offinso College of Education‟s attitude towards the study of science.

Purpose of the study

Teacher trainee‟s attitude towards the study of science is a crucial factor for improving science education and science as a whole in Ghana. This is due to the fact

that they are trained to teach science at the basic schools. Their attitude towards the subject will determine the corresponding attitude of the pupils towards science and how they perceive it as a subject to be learnt. The purpose of this study therefore was to find out the kind of attitudes which students of Colleges of Education in Ghana exhibit towards the study of science.

Objectives of the study

The objectives of this study were to:

1. Find out whether Activity-Based Teaching can help learners to apply knowledge and skills in different situations.
2. Find out if science teacher‟s instructional approaches have any effect on students‟ interest or attitude towards science.
3. Find out whether students achieve higher learning outcomes if they are actively involved in the teaching and learning process.

Research questions

The following research questions guided the study.

1. To what extent does Activity-Based Method of teaching science impact on DBE2 students‟ attitude to science?
2. Do science teachers‟ instructional approaches motivate or demotivate students to learn science?
3. Does the activity method used as an intervention have any change in teacher-learner interaction?
4. Is students‟ passive involvement in science lessons responsible for their poor performance in science?

Significance of the study

Since attitude students have towards science are influential in ensuring its improvement, this study hopes to develop in students a positive attitude towards science.

Also, the study hoped to:

- Bring improvement in the instructional strategies used by science teachers especially those in the colleges of education
- Recommend appropriate resource materials for science teaching and learning which will help develop in students such informed attitude towards science.
- Expose teachers to classroom environment that is conducive for teaching and learning of science.

Delimitation

This study is limited to only the second year students of Offinso, Akrokerri and foso Colleges of Education. This level was so chosen because the researcher has been a science teacher there for past eight years. As an action research the researcher identifies the problem faced by his class and devices an intervention which will help solve the problem. The second year students were used instead of the first or the third years because it was assumed they, unlike the third years had no examination pressure on them. They had also got settled in the system unlike the first years that also completed their SHS recently.

Limitation

It was extremely difficult to get the needed literature to do a comprehensive analysis of what other scholars and researchers have expressed about the topic under study. This saw the researcher moving from one library to the other trying to gather

information from different sources to review the various scholarly works on the topic. The researcher found it difficult getting the full representation of the sampled students during the designated periods for the intervention. Again, combining teaching, studying and doing research work concurrently was one of the setbacks.

Organization of the study

This study is organized into five chapters. The first chapter is introduction to the study which comprises of background to the study, the statement of the problem, the purpose of the study, the objectives of the study, the research questions, significance, delimitations and limitations of the study.

Chapter two deals with the conceptual framework and the review of related literature of the study. Chapter three talks about the methodology used in the study and it includes research design, research population, sample and sampling technique, research instrument, validity and reliability of the instrument, date collection procedure and method of data analysis. Chapter four present results and discussion and chapter five provides the summary, recommendations, suggestions and conclusion for the study.

CHAPTER TWO

LITERATURE REVIEW

Overview

This chapter reviews literature about some situations which could be potential factors that can influence students‟ attitude and behaviour towards science, especially in their classroom. In this regard, it talks about people‟s view about what an attitude towards science is, students‟ attitude towards science and classroom environment for science teaching and learning. The chapter also examines some literature on teachers‟ interpersonal relationship with students, instructional techniques in the science classroom and science learning.

Meaning of attitude towards science

According to Osborne, Simon and Collins (2003), a careful examination of the research documents reveals that one of the most prominent aspects of the literature is that 30 years of research into the topic; “ Attitude of students towards science” (page 56-67) has been bedeviled by a lack of clarity about this issue under investigation. They added that, an early notable contribution towards the elaboration of this topic was made by Klopfer (1971), who categorized a set of affective behaviour in science education as: (a) the manifestation of favourable attitude towards science and scientists, (b) the acceptance of scientific enquiry as a way of thought, (c) the adoption of scientific attitude, (d) enjoyment of scientific learning experiences, (e) development of interests in science and science-related activities and (f) the development of interest in pursuing a career in science or science related work.

Gardner (1975), made further clarification by drawing fundamental and basic distinction between “attitudes towards science” and “scientific attitudes”. The latter is

a complex mixture of longing to know and understand, a questioning approach to all statements, a search for data and their meaning, a demand for verification, a respect for logic, a consideration of premises and a consideration of consequences as has been explored into some depth in a seminal review by Gauld and Hukins (1980). However, Osborne, Simon and Collins (2003) advocate for a clear distinction between these attributes and the affective attitudes towards science, which are feelings, beliefs and values held about an object that may be the enterprise of science, school science, the impact of science on society or scientists themselves. It is this notion that constitutes the majority of Klopfer‟s attitude components.

Breakwell and Beardsell (1992), Brown (1976), Crawley and Black (1992), Gardner (1975), Haladyna, Olsen and Shaughnessy (1982), Koballa Jr. (1995), Oliver and Simpson (1988), Ormerod and Duckworth (1975), Piburn (1993), Talton and Simpson (1985; 1986; 1987) and Woolnough (1995) have also defined science to include factors or components like; the perception of the science teacher, the attitude towards science, self-esteem at science, motivation towards science, enjoyment of science, attitude of peers and friends towards science, attitude of parents towards science, the nature of the classroom environment, achievement in science and fear of failure in the course. Students‟ attitude towards science can also be explained in terms of traits or dimensions such as their motivation (encouragement) to learn science, their interest (enjoyment) in science, their involvement (participation) in science and their interpersonal relationship (rapport) with their science teachers.

According to Osborne, Simon and Collins (2003), once again, the first stumbling block for research into attitudes towards science is that, such attitudes do not consist of a single unitary construct in varying proportions towards an individual‟s attitude

towards science. The stumbling block towards assessing the significance and importance of attitude is that they are essentially a measure of the subject‟s expressed preference and feeling towards an object. They further observed that, it is behaviour rather than attitude that had become the focus of interest and that had led researchers to explore models developed from studies in social psychology. In particular, Ajzen and Fashion‟s (1980), theory of reasoned action which is concerned fundamentally with predicting behaviour. The theory focuses on the distinction between attitudes towards some object and attitudes towards some specific action to be performed towards that object (e.g. between attitudes towards science and attitudes of doing school science). They believe that some doubt is cast on what is being measured by the many instruments that have been devised to assess attitude. Potter and Wetherel (1987), supported this idea with a qualitative data on attitudes towards race to show that, attitude instruments measure only one aspect of individual‟s views. In essence, what Potter and Wetherel‟s (1987), work points to is that many attitude instruments only measure what is the tip of the iceberg- the most obvious and evidently displayed attitudes towards an object.

Students' attitude towards science

Whitefield (1980), and Ormerod (1971), opined that some measure of attitudes towards school science can be obtained by asking pupils to rank their liking for school subjects. Whitefield‟s (1980), analysis of data on English students about their preferences for science show that physics and chemistry were two of the least popular subjects and that these were distanced in pupils‟ mind from biology. Whitefield is of the view that rejection of science by students is as a result of their perception that it is a difficult subject. Perhaps surprisingly, Whitefield‟s type of study by Lightbody and Durndell (1996), in one school, using slightly more sophisticated preference ranking

system, has shown that boys were far more likely to report liking science than girls, a finding giving additional salience to the work of Jovanovic and King (1998), which suggest that one of the major factors in girls‟ antipathy towards science is their perception that they are better at other subjects. Preference ranking is simple to use and the rest of such research are easily presented and interpreted. Its fundamental problem is that it is a relative scale. Hence, it is possible for a student with an extremely positive attitude to all school subjects to still rank science as the least popular, yet still have a much more favourable attitude than another student who has a strong dislike for all subjects and ranks science first. Neither is it suitable for the measurement of attitude to other subjects may change as its blunt nature may not expose changes in attitude as a student‟s attitude to subjects may change as well (Osborne, Simon & Collins, 2003).

Teachers' beliefs and attitudes regarding the teaching of science were often firmly set prior to entry into teaching as a result of their science-related experiences in elementary and high school (Crawley & Koballa, 1994). In that same research done by Stevens and Wenner (2010), it was noted that one might reasonably expect to find a positive relationship between higher levels of subject matter knowledge and expressed willingness to teach science, and a negative relationship between lower level of science subject-matter knowledge and a decreased confidence in ability to teach science. The research found out that this was not always the case. Also discovered through research, a lack of background knowledge in science often reduces the capacity to exercise judgment in handling the unexpected behaviours of children when using hands-on materials (Spickler & Hernandez-Azarraga, 1997). It seems clear that discomfort with science content can lead to discomfort with inquiry teaching. Teachers need to know both science content and science pedagogy to teach

science well. It is not enough to have good general teaching skills when it comes to the subject of science. Good science teaching requires its own teaching strategies hence teachers' science content knowledge, as well as their pedagogical competence are both issues of concern" (Vaidya, 2011, p.63). When teachers begin to better understand science content, student learning outcomes will probably change for the better. And through in-service and retraining programs, teachers have found that they enjoy learning science using the hands-on methods and have become more comfortable with the inquiry approach itself.

Regarding teachers' attitudes towards science teaching, a survey showed that over half of all elementary school teachers found the teaching of science very threatening and ranked science at or near the bottom of subjects they preferred to teach. Interview responses analyzed by Harvard (1996), during his research on teacher attitude found that the descriptions used by his study participants to describe their feelings about teaching science were overwhelmingly negative. Further, these negative feelings towards science negatively affected teachers" self-efficacy even for those participants who had experienced earlier high achievement in science.

Classroom environment for science teaching and learning

Teachers typically believe that low-achieving students exert little effort and lack motivation; they rarely explain low achievement in terms of teacher behaviour or classroom variables (Tollefson, Mevin & Thippavajjala, 1990). According to Crowl, Kaminsky and Podell (1997), teachers most frequently blame poor academic performance on low student motivation and poor family attitudes. Tollefson, Melvin and Thippavajjala (1990), again, have a view that when teachers interact with low achieving students both may attempt to protect their self –esteem. They continued by

saying, teachers blame low-achieving students on their poor academic performance rather than on their own teaching efforts.

Teachers expect students to behave in certain ways in the classroom to stay seated for hours at a time, respond to questions posed by the teacher, refrain from fidgeting with irrelevant materials unrelated the topic under study, to participate actively in class discussions, to speak only when called upon, to conform academically to the norms of their level and to find the topics of instruction interesting (Crowl, Kaminsky & Podell, 1997). If a student does not meet these expectations, teachers often blame the student and regard the student as immature, emotionally disturbed, learning disabled or simply unmanageable (Crowl, Kaminsky, & Podell, 1997). Some educationalists are therefore of the view that schools themselves contribute to the students‟ disruptive behaviours. Tombaugh (1986, p.8), for instance says, "We have to face the fact that the condition of difficult students is partially generated by the school". The problems these kids bring to school are exacerbated by the way they are treated by the discipline system and the ways teachers interact with them. These is also a substantial detrimental effect caused by the lack of interesting and engaging experiences to which they will be able to respond.

From Crowl, Kamisnky and Podell (1997), many psychologists believe that failure of school to meet students‟ basic needs result in mush misbehaviour in the classroom. Dreikurs. Grunwald and Papper (1982), contend that students misbehave to get attention, power, and revenge and again to cover up their sense of inadequacy. They went ahead by saying that students who fail to get the teacher‟s attention sometimes engage in disruptive behaviour to validate their social status, if teachers fail to respond effectively to such attention-getting behaviours, students seek power. If the

teacher frustrates their efforts to obtain power, students become discouraged and seek revenge. According to Maslow (1968), physiological needs (e.g food, air, water etc) precede all other human needs. This implies that, if students are hungry or physically uncomfortable, they will not be able to participate in classroom activities. Even though these basic needs are beyond teachers‟ control it is still important for teachers to recognize and understand that lack of these needs by students, could be a contributing factor to students‟ poor attitude, misbehaviour and low academic performance in science classrooms.

This blame-game must cease and rather look up to and focus on classroom environment in order to overcome low achievement and disruptive behaviour of students in science class. In other words, it is time for teachers themselves to change their own behaviours and attitude to help students perform better. Teachers who attribute low achievement to unstable variables, such as teacher effort or classroom climate, believe that student performance can improve in the future by altering the factors affecting classroom achievement (Crowl, Kaminsky, & Podell, 1997). They added that teachers, who are aware that the classroom environment can influence students learning, create optimal learning environment.

A productive classroom environment that promotes learning and makes students feel welcome, comfortable, safe and challenged can be created. Crowl, Kamnisky, and Podell (1997), once again, were of the view that all teachers can create a positive classroom environment that promotes students‟ learning, but establishing such an environment does not occur automatically.

One has to learn the characteristics of well-managed classroom. Emmer, Evertson, Clements and Worsham (1994), suggest how various classroom environments affect

students‟ behaviour. Creating and maintaining such a positive classroom environment involves minimizing disruptive behaviours, developing a healthy student- teacher relationship, maintaining student focus, maintaining a "business like" atmosphere, communicating effectively with students as well as motivating (rewarding desirable behaviours) students.

Crowl, Kaminsky and Podell (1997), believe that how a teacher responds to disruptive behaviours also influences its future occurrence. Kounin (1977), notes that threats, anger or physically handling the students do not decrease the likelihood that other students will demonstrate the same behavior again. Kounin (1977), however expressed that the likelihood is decrease when teachers explain why some behaviors are inappropriate. Kounin (1977), has therefore suggested some guidelines for handling disruptive behaviour in class as follows:

- Deal with the present, not the past: Deal with problem as soon as they arise. Address only the current problem; don‟t remind students of past misbehaviours.
- Talk to students, not about them: Address students directly concerning inappropriate behaviour. Complaining to other teachers or student about a descriptive student will further alienate the student. Speak directly with the student to ensure that he or0 she is aware of your feelings.
- Don‟t allow yourself to be provoked: Some students may be disruptive to try to antagonize or annoy you. Stay calm and address the issue in a firm manner. You are the adult so always maintain yours self-control while helping students re-establish theirs.

- Be aware of non-verbal message, such as eye contact and body language. This pertains to your own non- verbal messages as well as that of the students. In some situations you may choose to ignore slight disruptive behaviours or use eye contact to convey that you are aware of the student‟s behaviour. Also, attending to non-verbal messages help you detect disruptive behaviour before it happens.
- Diffuse student hostility by responding with concern. If a student expresses hostility, a confrontational approach is likely only to make the situation worse. Instead, move close to the student and speak calmly and in soothing tones. In this way, you convey that you are aware of the student‟s anger and concerned. Acknowledging students‟ feelings often reduces students‟ rage.
- Use "I" statements to indicate your needs. "I" statements are an effective way to communicate to student, rather than saying "interrupting me is unacceptable‟, you would say "when you interrupt me, I am unable to get across my thought to the class"
- One way of maintaining a smoothly running science classroom is to develop a healthy relationship with your students. Some teacher-student relationships are defined by narrow interpretations of the two roles: I am the teacher, you are the student; you must follow my rules (Crowl, Kaminsky & Podell, 1997). Crowl, Kaminsky, and Podell (1997), continued that, a healthier relationship develops when both teachers and students acknowledge their respective roles and their responsibilities associated with these roles. In addition, they acknowledge that, you can develop an effective teacher-student relationship by maintaining honest dialogue with students; sharing some of your personal feelings with them and encouraging them to share theirs with you and with

each other. Again they stressed that, expressing concern for an interest in students enhances the trust and a sense of attachment that students feel toward you. And understanding of a student‟s interest allows you to better understand the students‟ needs. Keeping students actively engaged in learning is also one of the best ways of ensuring a positive classroom environment that could influence students to have positive attitude or opinion towards science. Keeping student on-task, particularly when they are working in groups, pairs or independently, is often difficult (Frick, 1990). Kounin (1977), has however, suggested some teacher characteristics that promote on-task behavior. He also emphasizes some techniques for maintaining student focus in classroom as:

Use strategies to maintain group focuses on a specific topic; Do not let a class discussion become a dialogue between you and one or two students, try to engage actively those who are slow learners. Ask open-ended questions that are on the appropriate level and attempt to draw out individual students in a non-threatening way.

Provide students with ongoing feedback; Feedback serves multiple functions: it allows students to know how they are doing, and it reduces boredom. Students tend to be happy when they are receiving information about their own competence.

Keep lessons challenging and vary your teaching approaches; Students who are challenged and motivated are more likely to stay on-task and less likely to drift away from the activity and behave disruptively.

- Cangelosi (1986), suggests that teachers must create a “businesslike” atmosphere in the classroom that student would understand that they and the

teacher have a shared goal in accomplishing activities that promote learning. He recommends the five steps below for creating a businesslike atmosphere in the classroom.

Set the stage for co-operation at the beginning of a new school year; Take advantage of students‟ initial uncertainty about you as a teacher to establish efficient on-task co-operative behaviour patterns. Plan for a favourable beginning of the school year and visualize what you want to happen in the classroom. Anticipate the obstacles you may encounter. Execute learning activities in the first day that satisfy students so that they leave with a feeling of achievement and purpose.

Be prepared and well organized; Plan your lessons when appropriate, consult with more experienced teachers. Have the materials you need at hand. If you model preparedness, students will themselves become better prepared and organized.

Minimize transition time; Develop efficient ways to carry out administrative duties, distribute materials and give directions. One way is to establish cues for routines. He recommends that, you first have to teach what the cue refers to, put detailed instructions on a wall chart for students to refer to and student should know what they should be doing next. As Cangelosi (1986), notes , students waiting for a lesson to start tend to relieve their boredom by day dreaming and being disruptive.

- Crate a comfortable, nonthreatening atmosphere; Students can‟t learn efficiently if they are scared. Cangelosi explains the Yerkes-Dodson law or arousal theory which describes the relationship between arousal (one‟s degree of excitement) and performance. As arousal increases, so does performance.

Cangelosi believes however, that too much arousal is counterproductive and decreases performance.

- Establish clear expectations for conduct; Make sure students know what you expect of them and why. Also ensure that they know the outcomes of deviations from these expectations.

Making it known to students your interest and concern, is another crucial factor for creating and maintaining a conducive atmosphere in science class. This can be communicated to students both verbally and nonverbally. According to Crowl, Kaminsky and Podell (1997), eye contact, gestures, and facial expressions reveal how interested you are in students and how you are interpreting their behaviour. Although continuous direct eye contact tends to make people nervous, effective teachers monitor students by frequently looking around the room and making direct (although brief) eye contact with them. Make eye contact with all of your students, not just with the bright or disruptive ones (Crowl, Kaminskly & Podell, 1997). Communicate your expectations to all students that you are confident they can learn. Physical proximity is another nonverbal form of communication (Crowl, Kaminisky & Podell, 1997). Teachers therefore have to design their classroom in such a way that they have ample space and opportunity to roam around to get physically close to all the students in the class. Verbal communication and subtle differences in language usage also have a powerful influence on students (Crowl, Kaminsky & Podell, 1997). Haim and Ginott in 1960s and 1970s also wrote on how parents and teachers could communicate more effectively with children. Ginott (1972), noted the detrimental effect of labeling. He noted that when teachers label students as "smart, dumb, lazy or sneaky" etc., it influences students‟ expectations of themselves as well as their self-esteem. Such labels may also affect teachers‟ behavior toward students and may impact negatively

on their performance. Ginott therefore, recommends that teachers should rather „describe" and not „characterize". That is they should address the behaviors and not the character of the student.

Crowl, Kaminisky and Podell (1997), have observed that, one effective way to get student"s attention is to use positive reinforcement. In supporting their observation, said that, praising students who are paying attention may motivate other students to also pay attention. This means that, to maintain students" attention, you need to provide them with sufficient incentive to attend to. There is no simple way to describe what constitutes a sufficient incentive. Different students are motivated by different incentives.

Most studies have also found significant relationship between factors pertaining to science classroom and students attitude towards science. Although Breakwell and Beardshell"s (1992), study found out that social class of learners has an effect on their attitude towards school science. Studies by Haladyna, Oslen and Shaughnessy (1982), Myers and Fouts (1992), Talton and Simpson (1985), have also pointed to the influence of classroom environment as a significant determinant of attitude. Classroom environment is generally measured using an instrument devised by Walberg (1969), and developed by Fraser (1986). This shows a positive correlation with attitude. Detailed studies by Myers and Fouts (1992), with 699 students from 27 high schools found out that the most positive attitudes were associated with a high level of involvement, very high level of personal support, strong positive relationships with classmates and the use of a variety of teaching strategies. Simpson and Oliver (1990), from their extensive and major longitudinal study conducted in North

Carolina have confirmed that schools, particularly classroom variables, are the strongest influence on attitude toward science.

Teachers' interpersonal relationship with students.

Wubbels (1993), found out that students‟ perception of teachers interpersonal behaviour accounts for 70% of the variability in the students‟ achievement and 55% for attitude outcome. In complement to Wubbels‟ findings, Combs (1982), and Brekelmans (1989), have realized that many researchers have produced results giving strong indication of the relationship between students‟ perception and teachers‟ classroom interaction. These simply suggest to teachers that their interpersonal relationship with students has a great influence on students‟ attitude towards a course of study and their achievement as well.

Studies have shown that pupils‟ attitude towards science learning and the amount of learning that takes place in pupils greatly influenced the relationship between them and their teacher. For example, in a study conducted by Wiggins (1997), showed that pupils‟ attitude towards science are significantly influenced by the way they perceive their science teacher and to a lesser extent by the science curriculum.

Similarly, Fisher and Richards (1996), in a study to validate the use of Questionnaires on Teacher Interaction (QTI) on the perception of interpersonal teacher behavior in science classroom noted that the best teachers according to students are stronger leaders, more friendly and understanding and less uncertain, dissatisfied and admonishing than teachers on the average.

Many factors including emotional, cultural, interpersonal and environmental issues influence the teacher, the student and what occurs in class (Shuell, 1996). This means that Interpersonal teacher behaviour is one of the important components of the

learning environment Science teachers must therefore maintain good interpersonal relationship with students so as to help them have informed attitude towards science.

Instructional techniques in science classroom

Amount of learning that takes place in a student greatly depends on whether the instructional technique (s) is/are compatible with the student learning styles or not. Studies indicate that if the learner‟s learning styles are compatible with teacher‟s teaching styles, he/she is likely to retain information longer, apply it more effectively, and is also inclined to have a more positive attitude towards the subject than anyone who experiences learning mismatch (Felder, 1993). This implies that, a teacher can inculcate in student positive attitude towards science subject, minimize their disruptive behaviour in class as well as their low achievement by adopting teaching pedagogies that match students‟ learning styles. A teacher must recognize the diversity in learning styles among students in a class and therefore adopt strategies that are effective and suited to them (Erinosho, 2008). She further pointed out that, a good teacher is expected to apply a active learning approaches that incorporate problem-solving, reading, discussion, experiment, group work and other broad-base strategies that can accommodate the differences and similarities in learning styles. Erinosho (2008), again, is of the view that a single lesson may be taught using a combination of techniques, which will engage students‟ practical work (kinesthetic cue), demonstration (visual cue), hands-on or group work (kinesthetic and active cue), discussion and questioning (verbal, aural active cue) and drilling exercises (sequential cue).

Three teaching styles are identified by Woods (1995), as discipline-centred, teacher-centred and student centred. Discipline-centred style focuses more on the subject

matter than on what the teacher does. The aim is to teach content as prescribed in the syllabus or textbook regardless of whether it meets the needs of students or not. In teacher centred style, the teacher is the focus, acting as the authoritative expert, the main source of knowledge, and the focal point of all activity (Erinosho, 2008). In such teaching environment, the students are passive learners and they merely regurgitate content (Erinosho, 2008). The two most common teachers-centred approaches of teaching are lecture and demonstration. Lecture method is a traditional technique of teaching. It adopts discipline and teacher-centred style (Erinosho, 2002).

Research evidence suggests that a lecture method of teaching contributes minimally to conceptual understanding of school science (McDermott, 1997; Birke & Foster, 1993) and also short-changes the sensing, visual, active, inductive, and sequential learning (Erinosho, 2008). However, it is useful for introducing a lesson or summarizing the main points in a lesson or providing factual knowledge to students as a group. Demonstration method on the other hand, could be the teacher showing student a procedure or the students showing a procedure to one another. Though classified as teacher centered, it could be made an active learning procedure if in providing vicarious experiences, the students are also engaged through questioning or doing a part of the procedure (Erinosho, 2008). Erinosho added that there are many reasons why a teacher might want to adopt demonstration techniques, such as when materials are not available to students or because the skill of safety involved is complex or when the concept might appear difficult for students to grasp or when the operation involved is risky if the teacher wants to save time. Using a demonstration requires planning, details of which must address basic elements (O‟ Brien, 1991), such as concept or procedure to illustrate prior knowledge that students need before demonstration, materials that will be combined, the steps or procedure to be carried

out ahead of time, questions to be used directing students‟ processes and stretching exercises to be used to extend students understanding of the concept (Erinosho, 2008). Classroom activities, instructional content, and teaching methods are selected to facilitate active learning, encourage independent thoughts and critical thanking, stimulate interest and promote positive attitude towards science (Erinosho, 2008).

Student-centred style allows for a dynamic classroom environment, and is most effective for teaching the "process than product." It focuses on students‟ cognitive abilities and their interests. The teacher focuses on how to make the students responsible for their own learning by making them take an active role in the teaching and learning process, making them conduct their own investigation, develop their ideas and share the ideas with others through discussion or collaborative work. There is range of teaching techniques for creating a student-centred and active classroom atmosphere Erinosho (2008), such as questioning, case study, discussion, simulation, concept mapping, collaborative learning, co-operative learning, inquiry method etc.

Studies however indicate that, student-centred style which offers opportunity for hands-on activities such as practical work and inquiry method is most effective for teaching science. Inquiry is defined as "the diverse ways in which students study natural world and propose explanations based on the evidence derived from their work" (Erinosho, 2008). It involves getting students to carry out investigations of natural phenomena through which meaningful problems are solved and new knowledge obtained (Erinosho, 2008).

Inquiry-based teaching approach provides useful platform for engaging students in practical hands-on science investigation that can bring them in interaction with the living and non-living aspects of the environment (Huber & Moore, 2001). It may be in

a structured form, guided inquiry or a less structured form of providing few instructions in unguided or open inquiry (Tinnesand & Chan, 1987; Domin, 1999). In the guided enquiry approach a teacher generate a problem and gives the step-by-step instruction which involve observation, hypothesis, experiment, communication of findings, measuring, recording, etc. Students have shown that the inquiry process is a three phase learning cycle which includes exploration, concept introduction and development and application and generalization. In unguided inquiry, the teacher only provides few instructions on the problem and give out materials, leaving the student to work out the procedure for the design and investigation "based upon cues that are provided on the problem to be solved" (Erinosho, 2008).

Open inquiry on the other hand, is similar to unguided inquiry. This is because students design the investigation, with the addition that they are free to formulate their own problem. This can be used after they have gained sufficient experience in observation and exploration as well as understanding of the content in order to be able to formulate problems and design investigation (Erinosho, 2008). Practical work in science like inquiry approach gives students the opportunity to directly use material, manipulates objects and materials, engaging in investigation and draw meaningful conclusions.

Research findings indicate that inquiry oriented instruction are effective to enhance students" performance (Anderson 2006), foster scientific literacy and understanding of scientific processes (Lindberg 1990), develop critical thinking and skills (Erinosho, 2008), and promote positive attitude towards science (Kyle, & Fults, 1985: Germann, 1991). Also, effective practical work provides students with varying opportunities and experiences (Hodson, 1990; Tobin, 1990; Huber & Moore, 2001).

Notwithstanding the effectiveness of student-centred instructional approach in science class, no single teaching technique is enough to fulfill all the needs of the students in a class. All styles can lead to better motivation for learning (Mckeachie, 1994) and an effective teacher is therefore able to adopt a simple approach to initiate quality science learning (Erinosho, 2008).

CHAPTER THREE

METHODOLOGY

Overview

This chapter deals with the research methodology that was employed in this study. It covers the research environment, the research design, research population, sample and sampling techniques, research instrument, research procedure, the method of data analysis and the intervention designed.

Research environment

The study was conducted in three colleges namely; Offinso College of Education, Akrokerri College of Education and Foso College of Education. Foso College of Education is located on a low land area of about one kilometre square. It is situated along the Kumasi Cape Coast-Kumasi highway at the southern outskirts of a town called Assin Foso in the Assin North Municipality in the Central Region of Ghana. This part of the region dominated by forest vegetation. Majority of the people in this area are predominantly traders and the remaining others are farmers.

Offinso College of Education is also located in the Ashanti Region. It is located along the Kumasi-Techiman road, about a kilometer away from the said road. The school is situated in the Offinso town in the Offinso Municipality in the Offinso North constituency. The predominant occupations of the people in this community are farming and trading.

Akrokerri College of Education is also situated in the Ashanti Region of Ghana. The school is located on the left, fifty metres away from the Kumasi-Obuasi road. The community is characterized mainly by farmers. It has tropical rainforest vegetation

and the occupants are commercial and cash crop farmers. This college is located on a high land area of about one half (1.5) kilometers on the eastern outskirt of a town called Akrokerri in the Adansi North District. All these colleges have modern facilities and infrastructure. These include science laboratories, well stocked with modern science equipment which creates conductive environment for science teaching and learning.

Research design

In the context of this of this research work, study a quantitative survey research design using the questionnaire method was employed. The survey is useful and beneficial because it enables collection of data on a large and diverse group of teacher trainees. Again, an activity method of teaching was used to find out whether the instructional methods have any effect on students‟ attitude to science. In this research, two instructional approaches were used. These were, teacher- centered approach where learners‟ involvement in lesson was highly limited and no teaching learning Materials (TLMs) were used and learner-centered approach where learners were actively involved in the lesson and manipulated Teaching and Learning Materials (TLMs).The sampled students from each of the three colleges were all subjected to the same treatment. They were first of all taken through a lesson (verifying the law of Refraction) using the teacher- centred instructional approach. Then after, the research questionnaires were given to the selected students to respond to. Also, the same numbers of selected students were taught the same topic again in two (2) days later. However, this time, there was a change in the instructional approach from the teacher-cantered to learner-centred approach where a set of laboratory questionnaire was re-administered to the students. Data obtained from students through the use of the questionnaire was analyzed using descriptive statistics (mean score). Based on the

outcome of the statistical analysis of the data obtained when the teacher-centred instructional approach was used, an intervention (the use of the learner-centred instructional approach) was designed to help improve upon students‟ attitude towards the study of science in colleges of education. Responses concerning the benefit of students‟ active involvement in lessons was however analyzed using the same statistical approach (mean score).

Research population

The target population is all the second year students of Colleges of Education in the country. However, the actual population is the second year students from the three colleges of education from the southern part of Ghana; namely Foso College of Education in the Central Region and Offinso College of Education and Akrokerri College of Education all in the Ashanti Region.

Sample and sampling techniques

Fifty (50) students, consisting of 30 males and 20 females, were selected from each of the three colleges using stratified random sampling and purposive sampling techniques. This number of respondents was chosen to be reflective of the two hundred (200) male and hundred (100) female students admitted every year in Offinso College of Education. The stratified random sampling was used to select student respondents from two categories of students. The categories of students are non–elective (Integrated Science) and elective science students from both the first and second year groups. For fair representation quite a sizeable number of females were purposively selected as respondents. In totality one hundred and fifty respondents consisting of ninety (90) males and sixty (60) females were used and they were all subjected to the same treatment.

The research instrument

The instrument for this study is named Attitude of Students towards Science (ASTS) – Questionnaire. It is a restructured form of that of Anderson (2006) mathematics and science attitude test. In their study of students‟ attitude towards science in early 1970s, a forty – eight (48) item questionnaire from four subscales namely, a usefulness scale, a confidence scale, science as a male domain scale and a teacher perception scale was used.

This instrument (ASTS) however, consisted of twenty–nine (29) items. The items were constructed in line with the students‟ attitudinal dimension scale: students‟ interest/enjoyment in science, their motivation / encouragement to do science, their involvement in science lessons and their interpersonal relationship with science teachers. Each of these dimensions consists of both positive and negative items.

Also, the instrument is structured to contain some items to measure whether the kind of attitude students exhibit is based on or can be related to the type of instructional strategies used by science teachers in lessons delivery and as well as their ways of involving students actively in the teaching and learning process during science lessons. Like the items which measure students‟ attitude, these also consist of both positive and negative items.

Each of the 29 – item questionnaire is scored on a five – point likert scale with every item scored one (1) for “Strongly Disagree”“and five (5) for Strongly Agree”. There are also intermediate score of 2 which represents “Disagree”, 3 which mean “Not certain” and 4 meaning “Agree”. A respondent can select from these intermediate scores depending upon one‟s degree of agreement or disagreement or with a

particularly question item or statement. Appendix "A" shows the structure of the research instrument designed.

Validity of instrument

The questionnaire was sent to Science Education Department and with the assistance of two senior members, the items were moderated to ensure content and face validity.

Reliability of the instrument

In determining the quality and consistency of the instrument (ASTS) for this study, it was pilot tested with twenty (20) students at Wesley College of Education (Kumasi), and reliability analysis was done using the Cronbach"s alpha coefficient. The alpha coefficient was determined for the four components of students" attitudinal scale namely motivation/ encouragement to learn science, participation / involvement in science lessons, interpersonal relationship with science teachers and interest in science. Analysis of responses from the participants on each of the students" attitudinal dimensions recorded a mean score of less than 3.0 (i.e. less than 50%) at the pre-intervention stage, and a mean score of more than 3.0 (i.e. more than 50%0 at the post intervention stage.

Also, similar analysis was performed on items constructed to determine the relationship between students" attitude and gender issues in science classroom as well as relationship between students" attitudes and teachers" instructional strategies in science. The result obtained indicated that, the instrument was reliable and consistent.

Data collection procedure

Visits were made to the selected colleges on different days. Permission was sought from the authorities of the colleges (Principals and Heads of Department) to administer the questionnaire. Each subject sampled was given questionnaire to

complete independently and return it. The items were answered under the researcher‟s personal supervision with the help of some of the science tutors in the departments of the selected schools. Subjects were given enough time to answer the questionnaire according to their levels of agreement or disagreement to each of the items.

Method of data analysis

The attitude of students towards science was determined based on four main dimensions or traits of student‟s attitude; student‟s motivation or encouragement to do science, and their interest or enjoyment in science, students‟ involvement or participation in science and their interpersonal relationship with their science teachers. These traits or dimension of student‟s attitude were represented by the research questions 1, 3, 4 and 2 respectively. The attitude of students was determined by descriptive analysis by calculating the average (mean) score (X/N) for each dimension (i.e, sum of dimension score (X) divided by the total number of responded items (N) for dimension). Also, percentage for average response for each dimension was calculated (i.e, mean value for each dimension divided by 5 and multiplied by 100).

Similar method was used to obtain data on the effect of students‟ participation in the teaching and learning process on their performance to find out whether it has any effect on students‟ attitude towards science. However, in this one, the respective items (i.e.13, 25, 24 and 27) constructed from such research question (i.e. research question 4) were what the researcher analyzed. That is, the average (mean) response for each item as well as their corresponding percentages was determined.

Also, how science teachers‟ instructional strategies affect students‟ learning style and hence their attitude toward science was determined for each item constructed under

the research question two (2) which caters for this situation. Average (mean) score (X/N) for each items was calculated by dividing the total (sum) score for each item (X) by the total number of responded items (N) and the corresponding percentage for mean response for each item was also calculated.

All the attitude dimensions or traits with the mean score greater than or equal to 3.0 (i.e., percentage average response greater than or equal to 60%) implies that, students show such type of attitude towards the study of science and those with mean score less than 3.0 (i.e. percentage average response less than 60%) is also an indication that students don‟t exhibit such traits of attitude towards the study of science.

For the items or statements on the other hand, those which recorded mean score values less than or equal to 3.0 (i.e. percentage average response less than or equal to 60%) indicates that respondents agreed to that particular item statement.

Intervention designed

This refers the strategy adopted by the researcher to help improve upon college students‟ attitude towards the study of science. In this, all the one hundred and fifty students were subjected to this intervention designed.

The studies‟ intervention was designed into three stages; pre–intervention, Intervention and post - intervention stages.

Pre-Intervention Stage

At this stage, students were taught “Investigating the Laws of Refraction” under the topic, “Refraction of Light”. This was done abstractly through the use of lecture method (i.e., teacher-centered instructional approach) where little chance was given for learners‟ active involvement in the lesson.

Then after, the 29-item questionnaire was administered to the subjects to respond to the items according to their degree of agreement or disagreement to each item.

Intervention Stage

At this stage, the set of one hundred and fifty (150) students who were taken through the pre-intervention activities were taken through a comprehensive and concise laboratory (practical) lesson to see if the use of materials through learner-centered instructional approach could bring a desirable change in students‟ attitude towards the study of science. The activity was still on "Investigating the Laws of Refraction" In carrying out this intervention activity, experimental set- ups with each consisting of plain sheet of paper (A4), four optical pins, rectangular glass prism, pencil, eraser, ruler, protractor, fastening material or clips and drawing board were provided.

Prior to the students‟ activity, a detailed demonstration activity was carried out by the researcher as the students carefully observed and ask questions. Afterwards, students were assigned to work in groups with clear and straightforward guidelines or steps to follow (see Appendix. B).

Post – Intervention Stage

After the implementation of the intervention, the same instrument was also administered to the one hundred and fifty (150) subjects who were involved in the pre-intervention and the intervention activities to respond to the items. This was to help check and compare students‟ responses to the question items before the intervention was carried out. The outcomes for both pre-intervention and post-intervention activities are presented in tables in Chapter four.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This chapter deals with analysis of the data obtained from the subjects to determine the actual attitude that college students exhibit towards the study of science.

Attitude of students toward the study of science

Four main traits or dimensions of attitude, „students" motivation to do science, students" interest in science, students participation in science and students" interpersonal relationship with science teachers", were considered to help find out the type of attitude teacher trainee students exhibit towards the study of science. In line with this, the questions set to determine these traits of attitude of the students were: "Do students in colleges of education show interest (enjoyment) in science lessons?", "Do science teachers discourage (demotivate) students in colleges of education from learning science or encourage (motivate) to learn? What type of interpersonal relationship exists between the science teachers and their students?"

"Do science teachers' instructional methods involve students in the teaching and learning process?"

The descriptive statistics (Table 1) and graphical representation (Figure1) of the disposition of the subjects on the four dimensions or traits of teacher trainees" attitudes towards the study of science are represented below:

Table 1: Teacher trainee students' response about their attitude towards the study of science

(a) Pre-Intervention Result

Attitude Dimension	Sum of Dimension Score (X)	No. of Responded item (N)	Average (mean) response per item (X/N)	% for average response
Students" motivation (encouragement) to do science	3864	7 x 50 = 1050	3.68	73.6
Students" interest (enjoyment) in science	2901	5 x 150 = 750	3.87	77.4
Students" involvement (participation) in science	2332	4 x 150 = 600	3.89	77.0
Students" interpersonal relationship with science teachers	1783	4 x 150 = 600	2.97	59.4

(b) Post-Intervention Result

Attitude Dimension	Sum of Dimension Score (X)	No. of Responded items (N)	Average (mean) response per item (X/N)	% for average response
20. I like my Science teachers instructional method	605	150	4.03	80.7
16. I dislike My science teachers instructional method	320	150	2.13	42.7
12. My Science teachers make Science lesson abstract	294	450	1.96	39.2
11. I do Understand when my Science teachers Teach	635	150	4.23	84.7
21. My Science teachers make science practical	683	150	4.55	91.1

NB:

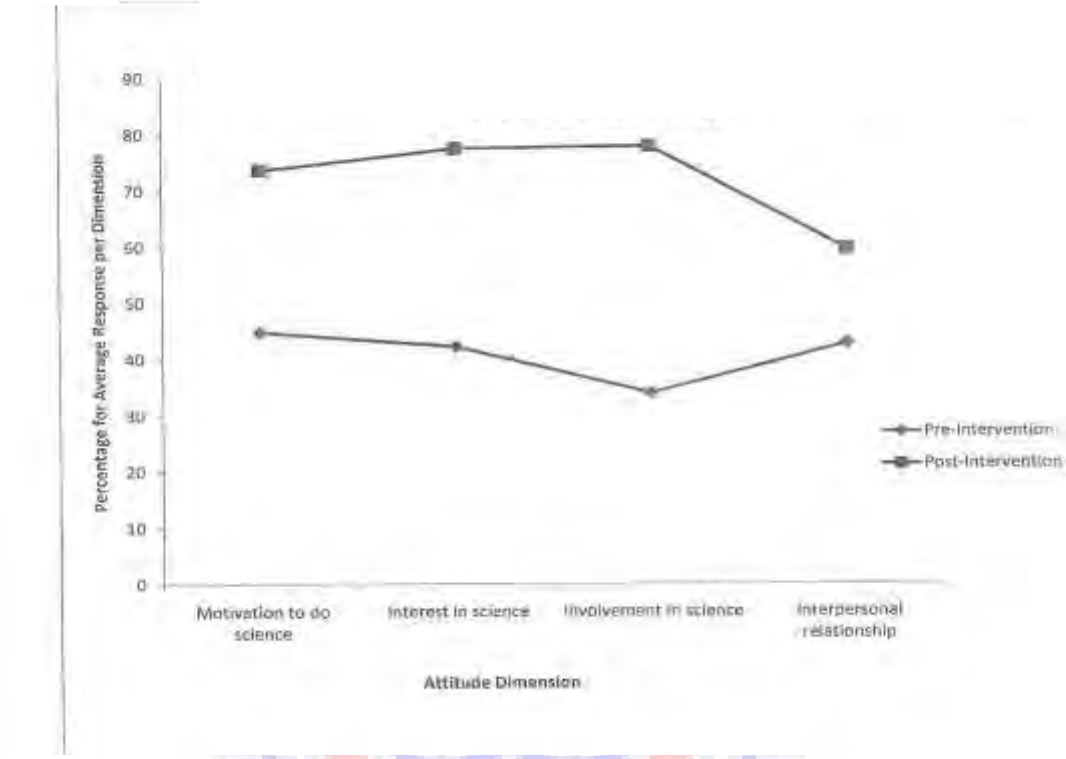
1. Maximum value for scale of agreement or disagreement to question item is 5

2. Total number of respondents for dimension = 150

3. Total number of items for each dimension is given below:

Dimension	**Number of items**
Motivation to do Science	7
Interest / enjoyment in Science	5
Participation / involvement in Science	4
Interpersonal relationship	4

Fig 1: Comparison of Students' Responses about Their Attitude towards the Study of Science for Pre and Post-Intervention Stages



From Table 1(a), students are not motivated by their teachers to do science (i.e. mean score of 2.24) which represents 44.8%. Also, students do not have interest or enjoyment in science lesson; an average (mean) value of 2.11 which corresponds to percentage of 42.2. Their involvement or participation in science is nothing to write home about i.e. average value of 1.69 and a percentage of 33.8. Again, they do not show any cordial interpersonal relationship with their science teachers as this trait of students attitude produced an average value of 2.13 which also represents 42.6%. Table 1(b) however, shows a sharp improvement over the results obtained in Table 1(a). Here, students" disposition showed that they were motivated (encouraged) to do science as the average figure of 3.68 and a percentage of 73.6 recorded, reflected their stand. Their interest (enjoyment) and involvement in science have also seen

improvement over that of table 1(a). Average values of 3.87 and 3.89 against percentages of 77.4 and 77.7 respectively, were recorded.

Trainee students‟ interpersonal relationship with their science teachers has also improved with mean value of 2.97 and percentage of 59.4.

The statistics in Table 1(a) gives an indication that none of the dimensions of students‟ attitude towards the study of science exceeded or amounted to an average (mean) value of 3.0. This means, the students are of the view that they are not motivated enough by their science teachers to pursue science (i.e. mean 2.24). According to Kelly (1988), motivated learners are those who tend to pursue subject with eagerness and persistence. Students showed once again that, they do not actively participate in science lessons (i.e. mean 1.69). For this, I believe that it might be due to the fact that they do not show interest in learning science because they are not encouraged (motivated) to do it or probably, the science teachers do not give them the chance to express their opinions.

Again, it can also be said that, the above characteristics which are expressed by teacher trainee students about their attitude towards science could be as a result of the unhealthy interpersonal relationship that exist between them and their science teachers (i.e. mean = 1.69). The sign of improvement in their attitude towards science as observed in Table 1(b) could be as the result of change in instructional strategies (learner-centered approach) by the researcher. I therefore strongly believe that it is of this reason why Felder (1993), said “if learner‟s learning styles are compatible with teacher‟s teaching styles, he or she is likely to retain information longer, apply it more effectively and is also inclined to have more positive attitude towards the subject than any one who experiences learning mismatch”.

However, if learner-centered learning environments are to be created, then science teachers must be made to feel confident in the handling of interpersonal behaviour and interest cordially with their students. Teachers can encourage students to learn science when they attempt to create and maintain favourable classroom learning environment through positive interpersonal relationship. Science teachers need to encourage and create a more enthusiastic and disciplined classroom through their interpersonal relationship so that many of their students will perceive them as teachers who are ready to lead them, teachers who are helpful and friendly and more understanding to them. By this way, their students will develop favourable attitude towards the study of science.

The Figure I give the summary and quick comparison of the students‟ response of their attitude towards science for pre-intervention and post- intervention activities.

The effect of students' involvement in science lessons on their attitude towards Science

One of the objectives of the study was to find out if active involvement of students in science lessons impacts positively or negatively on students‟ attitude towards science. Research on "students‟ involvement in science lessons as a factor of their attitude towards science" has indicated that, students preferred taking active role and responsibility in learning which is a major predictor of students‟ attitude towards the subject (Ebenezer & Zoller, 1993). The study also found out that, through learning how to learn, students become independent learners and cultivate their curiosity for lifelong and self-directed learning.

In order to find out if this perception influences students‟ attitudes towards science, the research question posed was: "To what extents do science teachers involve

students in science lessons" This question was answered using descriptive statistics by calculating the mean score for each of the four items framed from this question.

The outcome of the responses given by the respondents for both pre and post-intervention stages are reported in Table 2. The corresponding graphical representations of these outcomes from the students are shown in Figure 2 (a) and 2(b) respectively.

Table 2: Teacher trainee students' response about science teacher's instructional strategies and their learning style

(a) Pre-intervention Result

Item No./Item response	Sum Score per items (X)	Total No. of responded items (N)	Average (mean) response per (X/N)	% for average response
20. I like my science teacher instructional method	289	150	1.93	38.6
16. I dislike my science teacher"s instructional method	630	150	4.20	84
12. My science teachers make science lesson abstract	595	450	3.97	79.4
11. I do understand when my science teachers Teach	315	150	2.10	42.0
21. My science teachers make science practical	304	150	2.03	40.61

(b) Post-intervention Result

Item No./Item	Sum Score per items (X)	Total No. of responded items (N)	Average (mean) response per (X/N)	% for average response
20. I like my science teacher‟s instructional method	605	150	4.03	80.7
16. I dislike my science teachers instructional method	320	150	2.13	42.7
12. My science teachers make science lesson abstract	294	450	1.96	39.2
11. I do understand when my science teachers teach	635	150	4.23	84.7
21. My Science teachers make Science practical	683	150	4.55	91.1

In so doing, five (5) items were constructed under this research question. Out of these, some were positive, others were negative and the rests were neutral statements. During the pre-intervention stage, a positive question statement which reads, “I like my science teachers‟ instructional method,” recorded an average (mean) value of 1.93 which represented 38.6%. This is a perfect indication that before the administration of

the intervention activity, learners truly did not like their teachers‟ instructional methods(s) that is why this item recorded average response value less than 3.0 and a corresponding percentage of less than 60%. The corresponding post-intervention data obtained for this same question item saw a remarkable improvement. It recorded average (mean) value of 4.03 corresponding to 80.7% which was greater than the mean value of 3.0 and 60% respectively. This clearly indicates that after the intervention activity, students strongly agreed that they like their science teachers‟ instructional method(s). The second item under the research question is a negative aspect of the above item and it reads, "I dislike my science teachers‟ instructional method." The outcome of students‟ response to this item was totally opposite to the above item. Here the pre-intervention stage recorded an average of 4.20 representing 84.0% as against post-intervention score with an average value of 2.13 which represents 42.7%. This means that before the intervention activity respondents strongly accepted that they disliked their science teachers‟ instructional method of lesson delivery.

"My science teachers make science lessons abstract" which was the third question item considered to check whether science teachers‟ instructional strategies used matched students‟ learning styles. This item yielded an initial (pre-intervention) result with an average value of 3.97 with a percentage score of 79.4. This is in strong Materials (TLMS) and therefore lessons were always abstract. At the post – intervention stage majority of the respondents disagreed to the statement that science teachers taught in abstract terms. Students‟ disagreement to this statement after the intervention could be as a result of enough TLMs which were used during the administration of the intervention activity. The average (mean) score obtained was 1.96 with a percentage of 39.2.

Again, the statement, I do understand when my science teachers teach" recorded an average score of 2.10 and a percentage score of 42.0 at the pre-intervention stage. At the post -intervention stage however, average score of 4.23 representing 84.7% was recorded. This in short, revealed that because science teachers taught abstractly, students initially disagreed to this statement that they do understand when their science teachers taught them. After the intervention, they then accepted the statement that they do understand when science teachers teach them. Similarly, before the intervention activity, greater number of the respondents disagreed to the item statement "My science teachers make science practical" that is, pre-intervention stage recorded mean value of 2.03 with a percentage of 40.60% which is less than 3.0 and average percentage of 60. Immediately after the intervention there was an improvement in the post-intervention data; average (mean) score of 4.55 and a percentage response of 91.1 as against the 2.03 and 40.60% for the pre-intervention.

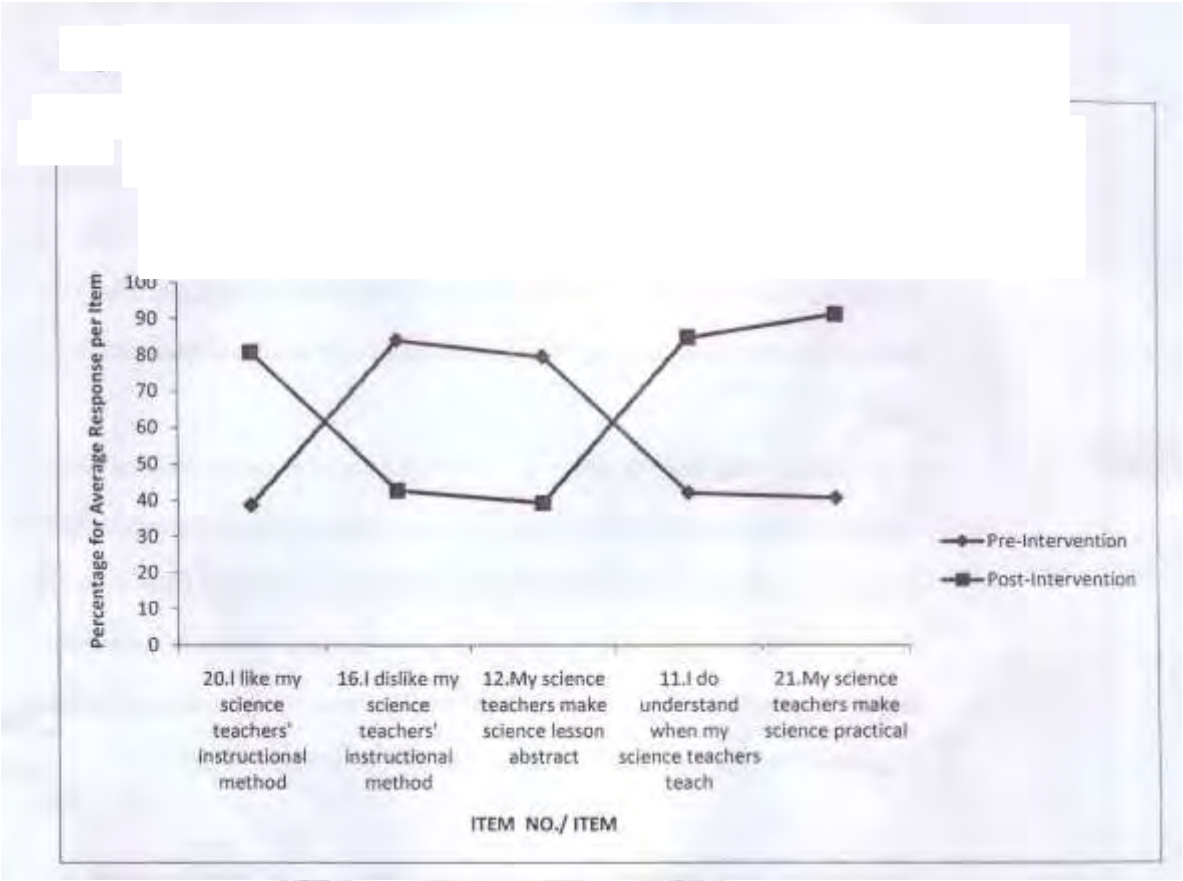
Research has shown that maintaining discipline continues to be one of the most problematic areas faced by teachers in the classroom (Tulley & Lian, 1995). Perhaps, this could be one of the reasons why most teachers prefer the teacher-centered approach in teaching to allow them to control the class better than collaborating learning situation that may lead to disruptive student behaviour. It must however, be noted that classroom activities, instructional content and teaching methods are selected to facilitate active learning, encourage independent thoughts and critical thinking, stimulate interest and promote positive attitude towards science (Erinosho, 2008. p.63). Therefore, instructional strategy which places more emphasis on cognitive understanding and scientific skills development must be used for teaching and learning of science.

And according to Mckeachie (1994), all styles can stimulate learning if used appropriately although student-centered styles leads to better retention, better problem solving, better application of knowledge and better motivation for learning. This makes it obvious that any instructional approach that emphasizes on learners‟ active participation is recommended one. For example concept maps, collaboration of cooperative learning, discussion, stimulation, project, questioning, demonstration, inquiry, practical work (i.e. manipulating objects and materials, observing or exploring the drawing meaningful conclusion) etc., all emphasize on activities.

All the above gives clear indication that the use of practical instructional approach, (activity lesson) with emphasis on the learners‟ active involvement, enhance understanding of science concepts that matches perfectly with students learning style.

The graph below gives summary of students‟ responses in the Pre-intervention and post intervention stages about their science teacher‟s instructional strategies and their learning style.

Fig 2. Chart Comparing Students' Responses about Science Teachers' Intrctional strategies and their learning style for pre-intervention and post-intervention



CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS.

Summary

This research was to find out the attitude of students towards the study of science in the colleges of education in Ghana. It was conducted in Offinso College of Education and Akrokerri College of Education all in the Ashanti Region and Fosu College of Education in the Central Region. The work focused on both non-elective (integrated science) and elective science students. This is because they were on campus and studying science content by then. A total of one hundred and fifty (150) respondents comprising of ninety (90) males and sixty (60) females were involved.

A questionnaire for students which is a modified form of Fennema–Sharman mathematics and science test was used to collect data on college students‟ attitude towards science. The questionnaire consisted of 29 items. The items were constructed under three (3) main categories; students‟ attitude dimensions, the perception of students about their science teachers‟ instructional strategies and their learning style and their perception of gender difference and students‟ attitude towards the study of science.

The findings were analyzed using descriptive statistics and also represented in graphic forms. Data collected provided valuable information on the three (3) categories. Students indicated that they are not motivated by their science teachers and therefore do not show any interest or enjoyment in science neither do they involve themselves or take active part in science when lessons are taught abstractly. They again, indicated that, their science teacher‟s interpersonal relationship with them is not cordial.

Data on students‟ perception of their science teachers‟ instructional approaches to their learning style also gave similar indication. i.e., their science teacher‟s instructional strategies do not match their learning style when they become teacher-centered rather than learner-centered. The study also found out that female students do believe that gender difference has influence on the kind of attitude that students exhibit towards the study of science.

The study has however, revealed that male students believe that student‟s attitude towards the study of science is independent on gender difference.

Conclusion

This work sought to provide a review of the many facets of research on students‟ attitude to science. Likewise, Wallace‟s (1996), detailed research on the views of pupils and its implications led to the conclusion that, engagement was raised by opportunities for pupils to take responsibility of their learning and greater pupils‟ autonomy. This suggests that students desire more opportunities in science for practical work, extended investigations and opportunities for discussion, all of which provide an enhanced role for personal autonomy.

The ever increasing attention on the topic “attitude towards science” shows that all is not well with school science and as such far more peoples are alienated by a subject that has ever increasing importance in man‟s life, both at a personal and societal level. Where then lays the solution to his problem? While the body of research conducted has been good at identifying a problem, it has had little to talk about how the problem might be eradicated.

This study as well, has shown that students‟ attitude towards science is significantly influenced by teacher‟s instructional strategies, interpersonal relationship

with students and motivation of students to learn. Student-centered instructional approach, regular motivation of students to learn science and maintaining cordial interpersonal relationship with students therefore evoke their interest and they actively participate in science lessons.

Recommendations

The research is based on students‟ attitude towards the study of science. In determining the kind of attitude students put towards science, attitude was considered under four dimensions or traits: students‟ motivation to do science, their level of involvement or participation in science, their interest or enjoyment in science and the interpersonal relationship that exist between them and their science teachers. How teachers‟ instructional strategies and use of teaching materials that affect student‟s attitude towards the study of science especially in the colleges of education in the country. The study also argues that the continuing decline in numbers choosing to study science at the point of choice requires research focus on students‟ attitude to science if the nature of the problem is to be understood and remediated.

Given the importance of the dimensions above, we argue that there is a greater need for research to identify those aspects of science teaching that make school science engaging for students. In particular, a growing body of research on motivation offers important pointers to the kind of classroom environment and activities that might raise learners‟ interest in studying school science and focus for future research. The following recommendations are therefore, made on the basis of the results obtained from the analysis of the data. The role of Activity-Based Method of Teaching (A-BMT) is well acknowledged to develop a sustained interest of students and enhance their performance in science. Yet still it is recommended that efforts be made for the

use of (A-BTM) in all levels of the Educational ladder. Again, all the Principals of Colleges of Education must be encouraged and supported by the Institute of Education to replicate this study in other Colleges of Education in Ghana to establish its authenticity.

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APPENDIX A

ATTITUDE OF STUDENTS TOWARDS SCIENCE (ASTS)-

QUESTIONNAIRE (FOR COLLEGE STUDENTS)

This is not an examination. Its purpose is to find out the attitude of students towards science in the Colleges of Education in Ghana, which ultimately influences students‟ performance and achievement in science. You are therefore requested to complete these questionnaires as frankly as possible; you are highly assured that your responses will be treated as confidential as possible.

SECTION A: Demographics

1. Gender: Male [ ] Female [ ]
2. Age: 10-15yrs [ ], 16-21yrs [ ], others (Specify)……
3. Name of College……
4. Level of Student……

SECTION B

Directions:

For each item, please circle a number from the scale 1-5 in the right side of the item to indicate your level of agreement or disagreement with the question item

NB: Strongly Disagree=1 Disagree=2, Not certain=3, Agree=4,Strongly Agree=5.

1.	I enjoy college science lessons	1	2	3	4	5
2.	My science teachers make me feel that I have the ability to do science	1	2	3	4	5
3.	Science teachers relate well with male student than female students	1	2	3	4	5
4.	Science teachers do not recognize me as part of teaching and learning processes.	1	2	3	4	5
5.	Science lessons are dominated by practical activities	1	2	3	4	5
6.	Teachers provide adequate and relevant materials for science lessons	1	2	3	4	5
7.	I dislike science teachers‟ methods of teaching	1	2	3	4	5
8.	My science teachers do not appreciate my efforts in science lessons	1	2	3	4	5
9.	Science teachers‟ teaching methods do not relate to students‟ learning style	1	2	3	4	5
10.	Science teachers allow me to take active part in science lessons	1	2	3	4	5
11.	I do understand when my science teachers teach	1	2	3	4	5
12.	My science teachers make science lessons abstract	1	2	3	4	5
1	Science teachers organize class discussion after every practical lesson	1	2	3	4	5
14.	Science teacher-student interpersonal relation is not cordial	1	2	3	4	5

15.	My science teachers make me feel that I am not the type of who can do well in science in class.	1	2	3	4	5
16.	I dislike my science teachers‟ instructional methods	1	2	3	4	5
17.	Captivating and arousing lessons delivery capture learners‟ attention	1	2	3	4	5
18.	Science is a difficult subject for me	1	2	3	4	5
19.	I know how useful science is	1	2	3	4	5
20.	I like my science teachers‟ instructional Methods	1	2	3	4	5
21.	My science teachers make science practical	1	2	3	4	5
22.	My science teachers are interested in my progress in science	1	2	3	4	5
23.	Equal attention is given to either male or female students	1	2	3	4	5
24.	Opportunities are provided for review of lessons through exercises	1	2	3	4	5
25.	My science teacher acts as co-learner, supervisor and facilitator	1	2	3	4	5
26.	Science teachers do not relate well with either male or female students	1	2	3	4	5
27.	Students are always involved in the collection and preparation of TLMs	1	2	3	4	5
28.	I don‟t enjoy college science lessons	1	2	3	4	5
29.	My science teacher‟s instructional approach involve all students in the lesson	1	2	3	4	5

APPENDIX B

INTERVENTION ACTIVITY TO IMPROVE COLLEGE STUDENTS' ATTITUDE TOWARDS THE STUDY OF SCIENCE

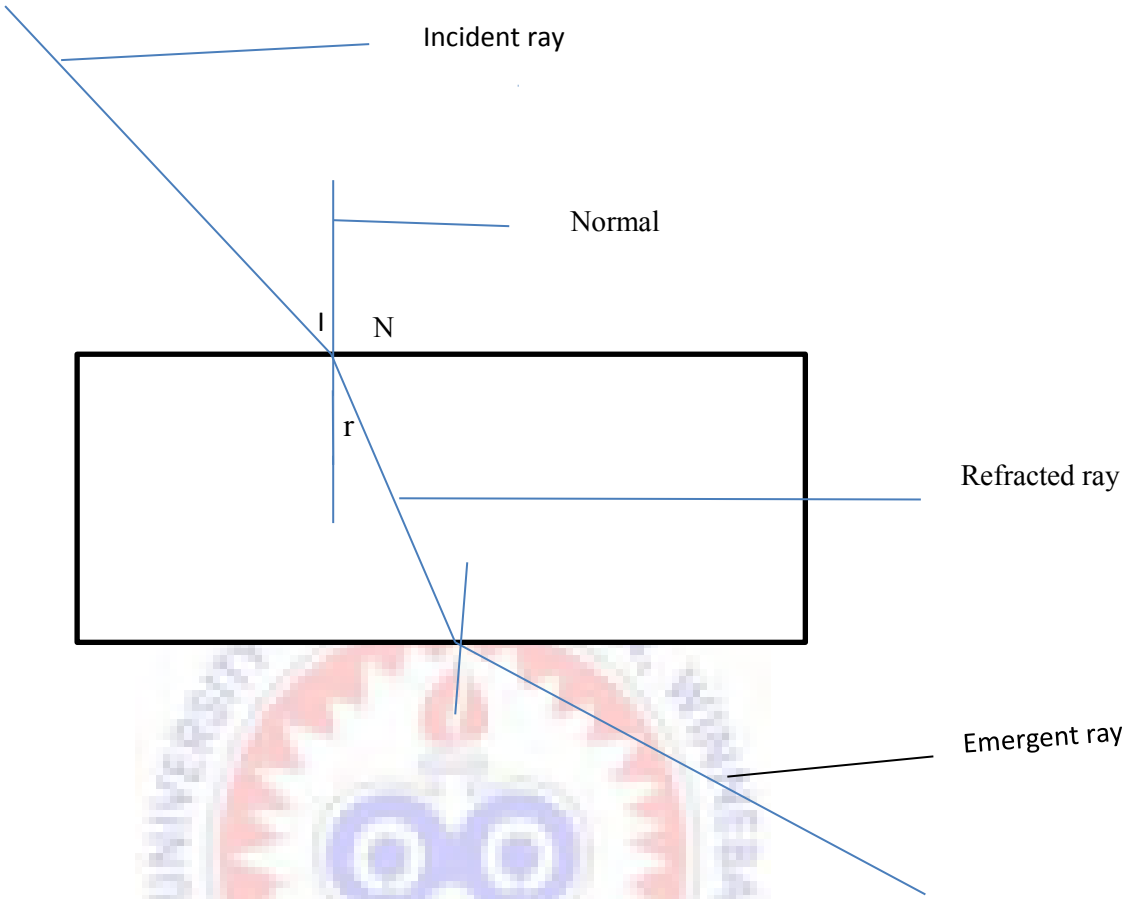
PRACTICAL WORK

TITLE/ACTIVITY: Verifying the Laws of Reflection

Steps to follow:

1. Fix a piece of paper to a drawing board.
2. Place a rectangular glass block of sides ABCD on the paper and trace it using pencil.
3. Remove the block and construct a perpendicular line to meet the side AB at N. tis line is called normal.
4. Measure an angle of incidence I = 20^0 and connect it using a straight line to the point N (Normal). This represents the incident ray.
5. Place two optical pins on the ray of incidence at points P and Q at intervals of about 5cm.

Look through the glass from the other side CD and place another two optical pins Rand S such that they appear clearly to be in with optical pins P and Q as shown below.



6. Repeat the experiment for i-25^0 and 30^0

7. Measure and record the angle of refraction r for each value i shown below:

i^0	r^0	Sin i	Sin r	Sin i/sin r
20 25 30				

Questions

1. Are the incident ray, the normal and the refracted rays in the same plane?
2. What conclusion can you draw about the ratio of sin i and sin r (sin i/sin r) for each pair of angles?