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Using Activity – Based Instructional Approach to Change Students' Attitude Towards the Study of Science in the Colleges of Education in Ashanti Region of Ghana

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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 gender and attitude of students towards science as well as teachers' pedagogical strategies and students' attitude towards science as other issues worth investigating. 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. (Mean score values).The study revealed that students' attitude towards the study of science was not encouraging, per the perspectives considered. The male students were of the view that gender has no influence on students' attitude to study science whilst the females' response was 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).
Keywords: ICSU, MESS, Attitude Motivation, Interest, Healthy interpersonal relationship, Classroom Environment, Performance, Optimal, Emotionally, Behavior, Minimizing, Elaborate, Regurgitate, Achievement.

Background to the study

Learning is an activity or a system of activities that lead(s) 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 they 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 etat, 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 change in modern society." 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." They added that we must acknowledge that we live in a world dominated by science and science-based technology, and to be scientifically novice is a terrifying and unacceptable situation. This is true because no country can achieve an industrialized status without much attention to science and technology. Technology is the principal way in which science impacts on society (Prime, 1998, P.116). Developing countries have a peculiar need with respect to both science education and technology education, as relatively little science or technology-based knowledge is generated in such countries (Prime, 1998). 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', has 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), reported to

re-orient all levels of the country's educational system to teaching of science and technology. This means that, it starts from primary schools. The decision to start with primary education is appropriate since intervention at this level has the widest rippling effect on the entire educational system (Prime, 1998, p.114). Yet, this laudable proposal cannot be achieved without addressing its possible setbacks in 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 (Prime, 1998.p.115). However, there is no doubt that achieving these calls for resourceful, knowledgeable and competent science teachers. 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 student's mind of these misconceptions could be effective only when teachers make good instructional decisions which could provide relevant experiences to support student's 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 student 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).

Hartman and Glasgow (2002), also believe that the hallmark of good teaching is quality leaning among students. Underlying the process of science teaching is fundamental assumptions about the uniqueness of learners, differences in individual's 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 that 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 behavior 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.

Choi and Cho (2002), 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. Tilger (1990) 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 (Swanson & Henderson, 1977). 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 behavior (Crowl, Kaminsky & Podell, 1997, p. 39). 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 behavior, 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 behavior. 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 standard of scientific literacy in Ghana.

Problem Diagnosis

This is explained in characteristics exhibited by most of the students in science classes in Offinso College of Education (Evidence and cause). The researcher ran a casual search on the listed characteristics and attitudes exhibited by some of the second year students (DBE2), it showed that the class had a large disinterest in science.

Description of students' characteristics

1. Truancy, on the part of students
2. Attention span of students on topic under discussion
3. Asking of questions for clarification to know more about a topic
4. Response to questions posed by teachers or colleague students
5. Frequency with which students ask permission to go out
6. Fidgeting with irrelevant materials unrelated to topic under study
7. Participation in class discussions
8. Submission of corrections made over marked assignment or exercises
9. Sleeping or dozing in class while lesson are in progress
10. Student-teacher interaction in class

The above is a method of assessing student engagement in class work by the use of summative rating scales to assess levels of student motivation and attitude towards science. This is an adoption of a rating instrument for student motivation scale found in a study conducted by Skinner, Wellborn, and Connell (1990), which focuses on students' perceptions and engagement in academic tasks. The instrument asks teachers to rate their students on willingness to participate in class activities and their emotional responses to these assignments. Included in the scale are items like; effort, attention, persistence, interest, and anxiety. Assessments such as these are advantageous in that, teachers may be more objective about students than students are about themselves as expressed in self-reports by Pintrich and Schunk (2002). Additionally, such ratings attempt to identify motivational processes that influence behaviours and provide data not easily obtainable through direct observations.

Evidence of the Problem

The researcher used the information gathered as a basis for the existing problems of lack of interest and poor attitude towards science by the second year students of Offinso College of Education on which the interventions were based.

Possible Causes of the problem

Through the use of observation and interview, the following root causes of the problem were established.

- Poor teaching methods used in delivering science lessons.
- Inadequate teaching and learning materials used for teaching and learning.
- Disinterest in class activities on the part of students.
- Student's poor attitude towards science.
- Lackadaisical attitude of most female students during science lessons.

Statement of the problem

Usually teachers are left on their own to decide on the type of activities in which the students are to be engaged. It is also true that many science teachers strive to create a conducive classroom environment that facilitate maximum student learning. However, it becomes a problem if both the experienced and inexperienced develop materials for teaching in the Colleges of Education. It is therefore the interest of this study to introduce and use activity-based methods of teaching as an intervention to change the poor attitude of year one (1) and two (2) students towards the study of science in the Colleges of education in Ghana.

Learning to a great extent, depends on how learners show interest in class. Studies also indicate that students who show interest in science lessons perform better than those who do not show interest. Moreover, students who willingly ask questions in class and also contribute in classroom discussions show interest in science, For instance, Aikens (1980), cited in Mogari (2003), indicates that pupils who show good attitude towards a subject tend to enjoy it and are also motivated to learn that subject. According to Aikens (1970), assessment of attitude would be of less concern if attitude were not thought to affect achievement in some way. Haladyna et al (1983), have also found that certain factors including achievement are related, to some extent, to attitude. For example, Mogari (2003), postulated that attitudes can be used as predictors of achievement.

In line with the above, the government of Ghana with the support from all stakeholders of education, philanthropists, non-government organizations and some development partners are making every effort to stimulate students' interest in science education in schools and colleges in the country. Improvements in science education begin early, that is in the primary schools (Atkin et al, 1998). Beginning science education in the

primary schools means that developmental projects must go on in the colleges of Education. This is because they train students to become competent teachers to ensure effective teaching and learning of science at the basic levels where science education begins. The colleges of Education have been therefore upgraded to tertiary status with modern facilities and infrastructure to meet the demands of tertiary institution. 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 student's 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 of 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 and perception towards the study of science.

Purpose of the study

Teacher trainee's attitude and perception towards the study of science are crucial factors for improving science education and science as a whole in Ghana. This is due to the fact that they are trained to teach science. 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 is to find out the kind of attitude which students of Colleges of Education in Ghana exhibit towards the study of science.

Objectives of the study

The objectives of this study are to:

1. Find out whether students of the College of education enjoy science lessons or not.
2. Find out whether science teachers in Colleges of education discourage (demotivate) students from learning science or encourage (motivate) them to learn.
3. Find out if science teacher's instructional strategies suit students' style of learning.
4. Identify the interpersonal relationship that exists between science teachers and students.
5. Find out if gender has any influence on students' attitude towards science.
6. Find out whether science teachers in colleges of education involve their students in science lessons or not.

Research questions

1. Do students of Colleges of education show interest (enjoyment) in science lessons or not?
2. Do science teachers discourage (demotivate) students of colleges of education from learning science or encourage (motivate) them to learn?
3. Do science teachers; instructional strategies suit students' learning styles?
4. What types of interpersonal relationship exists between the science teachers and their student?
5. Does gender difference influence students' attitude towards science?
6. Do science teachers involve students in science lessons or not?

Significance of the study

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

Also, the study hopes to:

- Bring improvement in the instructional strategies used by science teachers especially those in the college 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.

Again, this study will also serve as reference material for those who would wish to research on this same topic in future.

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" 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 behavior in science education as: (a) the manifestation of favourable attitude towards science and scientists, (b) the acceptance 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 (Education Policy Commission, 1992); and this aspect has been explored into some depth in a seminal review by Gauld and Hukins (1980). However, Osborne, Dimon 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 enterpriseof science, school science, the impact of science on society or scientists themselves. It is this letter 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 (1998), Ormerod and Duckworth (1975), Piburn (1993),Talton and Simpson (1985), (1986), (1987) and Woolnough (1994) 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 Fishbein'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.

Student's 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. Whitfield'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 pupil's mind from biology. Whitfield is of the view that rejection of science by student is as a result of their perception that it is a difficult subject. Perhaps surprisingly, Whitfield's type of study by Lightbody and Durndell (1996a), 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 favorable attitude than another student who has a strong dislike for all subject 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).

Research done and reported in 1985 by Plourde (2002), found that empowering elementary teachers to fulfill the daunting task of teaching science in the basic school cannot be accomplished through hit-or-miss in-service science workshops and basic high school and college-level courses. Jarrett (1998) explored the

relationships between the playful, fun qualities of hands-on inquiry experiences in an initial-certification science methods course and pre-service teachers' motivation to plan similar types of hands-on experiences for their classrooms. The results showed that the activities rated as fun, interesting and having a high potential for learning were the ones that the pre-service teachers indicated they would more likely implement in their own classrooms. Most of these activities were the hands-on experiences they had experienced in the initial-certification course. The activities ranked high by the pre-service teachers in Jarrett's research tended to be exploratory in nature, taught process skills in context, enabled the pre-service teachers to experience something new in a non-threatening way, and promoted social interactions (Jarrett, 1998). All of these are skills encouraged by the national science organizations in the country today.

Stevens and Wenner's (1996 p.11), research opined that "If the US is ever to assume a world position as first in the fields of science and mathematics, it would seem that meaningful changes need to occur in teacher education programme." Many eminent scientists, including Nobel Prize winners Albert Einstein and Richard Freedman, reported that "scientific play" was an important part of their childhood development, and continued playfulness marked their scientific process in their careers. Feynman, a physicist, credits his decision to "play with physics, whenever I want to, without worrying about any importance whatsoever" as leading him to the findings that won him a Nobel Prize (Freedman, 1995, p.157 cited in Jarrett, 1998). Play and science are often partners in research and invention. The fun and interest that come from playing around with phenomena can build positive attitudes toward future learning in all fields. (Stevens &Wenner, 1996, p.11).

Crawley and Koballa found that 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 research done by Stevens and Wenner (1996), 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 behaviors 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. As Vaidya stated in her research, “that teachers' science content knowledge, as well as their pedagogical competence are both issues of concern” (Vaidya, 1993, 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 (cited in Havard, 1996). Interview responses analyzed by Havard (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 behavior or classroom variables (Tollefson, Mevin & Thippavajjala, 1990). Accounting 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 student to behave in certain ways in the classroom to stay seated for hour at a time, 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 behaviors. 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. This 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 misbehavior 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 behavior 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 behavior 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 canimprove 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, Kamniskly, and Podell (1997), once again, were of the view that all teachers can create a positive classroom environment that promotes student's 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 and how various classroom environments affect students' behavior (Gottfredson & Hybl, 1993). 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 behaviors 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 behavior in class as follow:

- *Deal with the present, not the* past: Deal with problem as soon as they develop. Address only the current problem; don't remind students of past misbehaviors.
- *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 or she is aware of yours 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 behaviors or use eye contact to convey that you are aware of the student's behavior. Also, attending to non-verbal messages help you detect disruptive behavior 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 areworking 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 (1988), 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 behavior 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 (1996), 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. Crowl, Kaminsky and Podell (1997), eye contact, gestures, and facial expressions reveal how interested you are in students and how you are interpreting their behavior. 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 orsneaky" 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 constitute 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 et al (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), and it 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 behavior 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 by the relationship between them and their teacher. For example, in a study conducted in the United States by Wiggins (1979), 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 behavior 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 active learning approaches that incorporate problem-solving, reading, discussion, experiment, group work and otherbroad-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 contributes minimally to conceptual understanding in school science (McDermott, 1991; 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 of safety or when the concept might appear difficult for students to grasp or 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 student's 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, and inquiry method. 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" (NRC, 1996, p.23 cited in 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, and recording. 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 material, living 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 the gained sufficient experience in observation and exploration as well as understanding of the content in other 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 (Matthesis and Nakayama, 1988: Anderson and Helms, 2001 cited in Erinosho, 2008), foster scientific literacy and understanding of scientific processes Lindberg(1990), develop critical thinking and skills Erinosho (2008), and promote positive attitude towards science (Kyle, Bonnstetter, McCloskey, & 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 asimple approach to initiate quality science learning (Erinosho, 2008).

Some Activity Based Methods

Activity-Based Method

Schaefer (1979), argues that if the concepts taught at school are not related to students' everyday lives, they may fail to use them adequately outside the school. Thus, their knowledge may remain in the form of acquired isolated knowledge 'packages'. Effective learning requires students to apply newly acquired concepts or skills to different contexts (Schollum & Osborne, 1985; Wallberg, 1991; Gallagher, 2000). As a result, they can achieve higher learning outcomes and use their knowledge or skills to solve the problems in their everyday life. "For these reasons, teachers should create opportunities that allow students to apply their knowledge to real life situations." Gallagher (2000, p.313), suggests that teachers should:

"..Identify practical applications of concepts, use practical experiences and applications to make connections between concepts and 'real world' experiences in ways that enrich understanding of concepts, and show how knowledge of one set of concepts forms the foundation for learning about other concepts."

Teachers can employ various methods to help students to apply their knowledge, such as conducting practical work, field trips, simulations, writing activities and role-play. Following is a brief discussion of some of these methods drawn from the literature.

Gender Issues and Science

Research studies have identified a number of factors influencing attitude towards science in general. These can be broadly defined as gender, personality, structural variable and curriculum variables. Of these the most significance is gender according to Osborne, Simon and Collins (2003). Gardner (1975), said, "Sex is probably the most significant variable related towards pupils' attitude to science". This view is supported by Schibeci's (1984), extensive review of the literature, and more recent meta-analyses of a range research studies by Becker (1989), and Weinberg (1995), covering the literature between 1970 and 1991. Both the latter two papers summarize numerous research studies to show that boys have a consistently more positive attitude towards school science than girls, although this effect is stronger in physics than in biology. Interestingly, this effect is highest in "general science" and Edinburgh's work raises questions of whether the introduction of 'balance science" or integrated science courses during the past decade has had a similar effect in increasing the separation between boys' and girls' attitude to science.

Breakwell and Beardshell (1992), Ericson (1984), Harding (1983), Harvey and Edward (1980), Hendley et al (1996), Johnson (1987), Jovanic and king (1998), Kahle and Lakes (1983), Robertson (1987) and Smail and Kelly (1984), what is clear from an extensive literature on the subject, mainly as a result of a serious consideration and investigation of the problem in the 1980s, is that girl's attitudes to science are significantly less than boys. That notwithstanding, there is now some evidence beginning to appear that girls no longer hold such a stereotypical aversion to career in science and are confident of their ability to undertake science courses (Colley et al 1994; Harvard 1996;Lightbody &Durndell 1996b &Whitehead 1996). For example, Archer (1992), found out that girls between ages of 10 and 15 reported liking most strongly the three subjects labeled stereotypically "masculine" (mathematics science and games). Again, whitehead's (1996), work has found out that, although there are significant gender distinctions with pupils' perceptions of subject, these have no significant influence on subject choice. In her study, girls offering mainly feminine subjects described themselves as high on stereotypical masculine trait and were highly intrinsically motivated. On the other hand, boys offering mainly masculine subjects said they were extrinsically motivated for status recognition and highly paid job.

This has raised concern to give every student in the classroom an equal opportunity and unrestricted access to knowledge. Thus, teacher must recognize the individual difference of learners and adopt effective strategies that can make all the students to reach their optimal level of attainment (Erinosho, 2008). The underlying principles of equity or fairness in science is that, all students, regardless of gender, cultural or ethnic background, physical or learning disabilities should have the opportunity to attain high level of scientific literacy (NRC, 1996). According to Erinosho, (2008), gender equity should be guided by the desire to give an equal opportunity to boys and girls to actively participate and learn science in an enabling environment without any impediment. She continued to say that, gender equity is about encouraging boys and girls to study science in school with the aim of increasing their literacy level and or their securing career in science related fields. She stressed that, it is important to build up the capacity of female and male in science so as to:

- Bring the perspective, skills and ideas of both sexes into decisions having to do with technological advances.
- Equip them with skills that will increase access to the vistas of opportunities in science and also to function effectively in the labour market.
- Address the short fall in human resources that are needed for scientific progress and
- Empower all with the appropriate knowledge in science that is relevant for coping with everyday problem in health and nutrition, agriculture, environment and energy among others.

Broaden your horizons, girls can do anything, switch onto science, an electrifying career, don't get filtered out and science can take you beyond the experiment stage, are some of the puns and slogans which educators have developed in order to capture, in a memorable way, the issue associated with girl's problematic relationship with science as a school subject and an associated vocational choice (Gough & Kenway, 1998). Over the last three decades, there has been improvement in educational achievement and attainment with regard or reference to girls and women participation. Despite the improvement recorded over the years, educators' puns and slogans to capture girls' problems with science as a school subject, they still trail behind their male counterparts in their participation. This could be due to the traditional argument that females are incapable of acquiring the skills to learn science or are deficient in the analytical and visual spatial skills than are needed for abstract reasoning. Under representation of girls/women in science is well documented (Yoloye, 1998; Erinoshi, 2005). This claim is supported by Nigerian data indicating that girls formed 32% of Arts students, 28% of Social science students and mere 17% of Natural sciences in the Senior Secondary School Certificate Examination (SSSCE) in 1999-2004.

Prime emphasis on gender research in science education has been in documentation, reporting about differences between girls' and boys' participation, achievement and attitudes and / or their type of engagement with particular learning strategies in science education (Gouhg & Kenway, 1998). They added that the under-representation and participation of girls' science courses and careers has long been a major preoccupation of science educators. Girls and boys perform equally well in science if the instructional context is fair and conducive (Kahle, 1996a; Cambell, Jolly &Perlman, 2002). The need to move beyond this tendency has recently been argued by several writers (see, for example, the edited collections and reviews by Fraser and Tobin (1998), Kahleand Meece (1994), Parker, Rennie and Fraser (1996), Parker, Rennie and Hardings (1995), and the editorial by Krockover and Shephardson(1995). Gough and Kenway (1998), are of the view that, such writers suggest that the emphasis on gender differences in participation rates could perhaps make way for more pressing concerns. Gough and Kenway (1998), however, did not support the idea that gender differences in participation rate could make way for pressing concerns. They cited participation in Baker and Leary (1995), Greefield (1995) Solomon (1997), attitudes in Chambers and Andre (1997), Greefield (1996), Parons(1997), Weinburgh (1995), achievement in Catsambis (1995), and learning strategies in Alexopoulou and Driver (1997), Guzzetti and Williams (1996), Hazel, Lazel, Logan and Gallagher (1997), Lagoke, Jegede and Oyabanji (1997), Meece and Jones (1996), Roychoudhury, Tippins and Nichols (1995), of student as factors which cannot be overlooked when it comes to issues of science education.

Additionally, the gender differences in participation and pursuit of science by members of both sexes are being linked to socio-psychological factors at the level of individual, the home and school that contribute to different interests and attitudes (Oakes, 1991; Kahle, 1996b; Campbell et. al, 2002; Erinosho 1997b, 1997c, 1999). Some of the individual factors that are critical predictors of science choice and or achievement among females include: attitudes towards science (Oakes, 1991; Erinosho1999), confidence (Collins, 1991), social background (Erinosho 1997d) and anxiety (Fennerna, 1990; Campbell et. al, 2002). According to Krockover and Shephardson, (1995, P,223), in terms of issues of difference, there has been an emerging trend in some of this recent literature to acknowledge differences among girls and women, to recognize that gender equity research ought to transcend the boundaries of race, ethnicity, class and socio-economic identities. Thus, for example, there are now articles which still address colour Parsons (1997), ethnicity Greenfield (1996), and homelessness with respect to gender and science education.

Research design

This research is designed to investigate students' attitude towards the study of science. It is a quantitative survey research using the questionnaire method. The survey is useful and beneficial because it enables collection of data on a large and diverse group of teacher trainees. In this research, two instructional approaches were used. These were, teacher – centered (where learners' involvement in lesson was highly limited and no teaching learning Materials (TLMs) were used and learner-centered (where learners were actively involved in the lesson and manipulated Teaching Learning Materials (TLMs).The sampled students from each of the three colleges were all subjected to the same treatment. They were first of all taking 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 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.

The research instrument was purposively constructed to capture some items to help investigate whether gender issues influence students' perception and attitude towards the study of science. 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 used 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 gender issue was however, analyzed into responses of females and males using the same statistical approach (mean score)

Research population

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

Sample and sampling techniques

Fifty (50) students were selected from each of the three colleges using stratified random sampling and purposive sampling techniques. 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.

Research Instrument

The instrument for this study is named Attitude of Students Towards Science (ASTS) – Questionnaire. It is a restructured form of that of Fennema and Shermen (1976), 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 are 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 teacher in lessons delivery and as well as their ways of dealing with gender issues in science classroom. Like the items which measure student' attitude, these also consist of both positive and negative items.

Each of the 29 – items 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, University of Education, Winneba – Ghana for some senior science lecturers (professors and senior lectures) to do face validity of the items. They were of the view that double sentences should be avoided. For example, the sentence, "I do understand when my science teachers teach and therefore enjoy college science lessons" should rather be separated into, "I do understand when my science teacher teach, and "I enjoy college science lessons". They suggested also that, long and compound sentences such as "I dislike science because I do not understand when my science teachers teach and learning science therefore is a waste of time" should be avoided. Such item statements should be rather is short and simple statements such as "I dislike science," "I don't understand when my science teachers teach" and 'Learning science is a waste of time". Again, they verified whether negative items conveyed their intended meaning. In summary, they all agreed that the instrument was appropriate for the intended purpose.

Reliability of the instrument

In determining the quality and consistency of the instrument (ASTS) for this study, it was pilots tested with twenty (20) students at Offinso College of Education and reliability analysis was done using the Cronbach's alpha coefficient. The alpha coefficients were 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. 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 my 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 2, 1, 6 and 4 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 gender differences to see if it has influence on students' attitudes or not. However, in this one, the respective items (i.e.13, 25, 24 and 27) constructed from such research question (i.e. research question 5) 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 the science was determined for each item constructed under the research question three(3) 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).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 greater than equal to 3.0 (i.e. percentage average response less than or equal to 60%) indicates that respondents agreed to that particular item statement. The responses which have mean score less than 3.0(i.e., percentage average response less than 60%) also gives an indication that respondents don't agree to that particular question item.

Intervention Designed

This refers to 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 subjects' activity, a detailed demonstration activity was carried out by the researcher as the students carefully observed and ask questions. Afterwards, subjects 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' response to the question items before the intervention was carried out. The outcomes for both pre-intervention and post-intervention activities are presented in tables at the chapter four.

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 science. In line with this, the questions set to determine these traits of attitude of the students were: "Do students of college of education show interest (enjoyment) in science lessons or not?", "Do science teacher discourage (demotivate) students of colleges of education from learning science or encourage (motivate) to learn? "What type of interpersonal relationship exists between the science teachers and their students?" 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:

Pre-Intervention Result

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

Attitude Dimension	Sum of Dimension Score (X)	No. of responses items (N)	Average (Mean)Responses per item (X/N)	% average response
Students' motivation (encouragement) To do science	*2352*	*7x150=1050*	*2.24*	*44.8*
Students' interest (enjoyment) in Science	*1584*	*5x150=750*	*2.11*	*42.2*
Students' involvement (participation) in science	*1015*	*4x150=600*	*1.69*	*33.8*
Students' interpersonal relationship with science teachers	*1276*	*4x150=600*	*2.13*	*42.6*

Post-Intervention Result

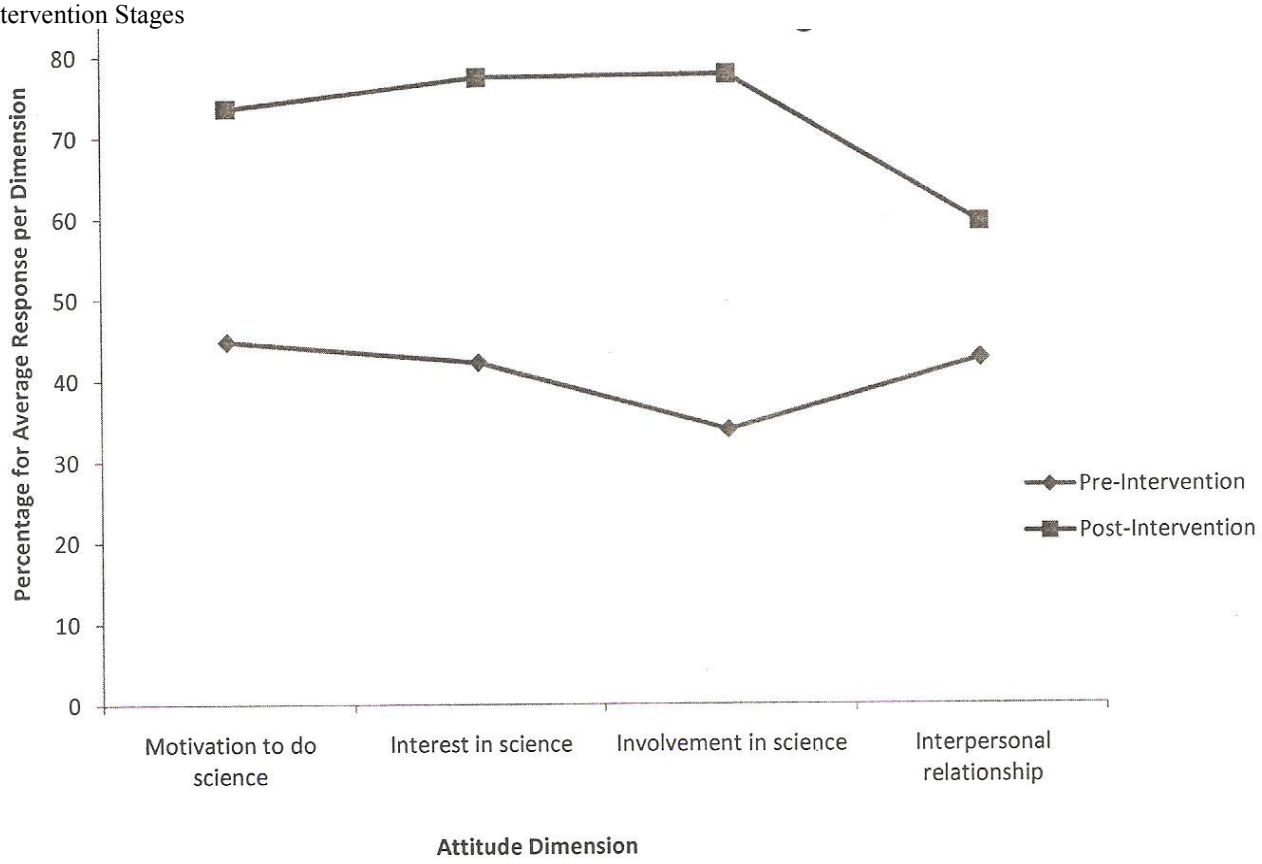
Attitude dimension	Sum of dimension score (X)	No. of responded item(N)	Average(mean)response per item(X/N)	% for average response
Students' motivation (encouragement) to do science	3864	7x150=1050	3.68	73.6
Students' interest (enjoyment) in science	2901	5x150=750	3.87	77.4
Students' involvement(participation) in science	2332	4x150=600	3.89	77.7
Students' Interpersonal relationship with science teachers	1783	4x150=600	2.97	59.4

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 item 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

Figure 1: Comparison of Students' Response about their attitude towards the Study of Science for Pre and Post Intervention Stages



From the Table 1(a), students are not motivated by their teachers to do science (i.e. mean 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 result obtained in table 1(a). Here, students showed motivated (encouragement) to do science as motivation as an attitude dimension recorded average figure of 3.68 and a percentage of 73.6. Their interest (enjoyment) and involvement in science have also seen improvement over that of table 1(a). They have recorded average values of 3.87 and 3.89 against percentages of 77.4 and 77.7 respectively. 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. mean2.24) and therefore don't have according to Megara (2003), motivated learners are those who tend to pursue subject with eagerness and persistence. Students showed once again that, they don't actively participate or involve in science lesson (i.e. mean 1.69). for this, I believe that it might be due to the fact that they don't show interest in learning science because they are not encouraged (motivated) to do it or probably is the science teachers who don't 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/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 – catered learning environments are to be created, and then science teachers must be made to feel confident in the handing of interpersonal behavior and interest cordially with their students.

Teachers can evoke in students to learn science when they attempt to create and maintain favorable classroom learning environment through positive interpersonal relationship. Science teachers need to encourage and create a more enthusiastic and discipline 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 above gives the summary and quick comparison of the students' response of their attitude towards science for pre- intervention and post- intervention activates.

Gender difference as a factor of students, attitude towards Science

One of the objectives of the study was set to find out if gender difference influences student's attitude towards science. Research on gender has indicated difference in the perceptions of males and females (Fisher & Waldrip, 1999; Khine & Fisher 2001). In order to find out if this difference in perception between males and females influences their attitudes towards science, the research question posed was: "Can gender difference influence students' attitude towards science?" 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 male and female students for both pre and post-intervention stages are reported in Table 2 below. The corresponding graphical representations of these outcomes for the female and male students are shown in Fighter 2 (a) and 2(b) respectively.

Table2: Response of teacher trainee students about gender difference and attitude towards the study of science

(a) Response of Female Students

Per-Intervention Result

Item No./Item	item(X) Sum score per	Total no. of responded items (N)	Average (mean) response per item (X/N)	% for Average response
13. My science teachers pay much attention to male students than females.	253	60	4.22	84.4
24. No special attention is given to either male or female students.	166	60	2.77	55.4
23. Equal Attention is given to both Male and Female students.	35	60	2.25	45.5
25. Much attention is given to female students than male students	113	60	1.88	37.6

Post-Intervention Result

Item No./Item	Sum score Per item(X)	Total no. of responded items (N)	Average (mean) response per item (X/N)	% for Average response
13. My science teachers pay much attention to male students than females.	253	60	4.22	84.4
24. No special attention is given to either male or female students.	170	60	2.83	56.6
23. Equal Attention is given to both Male and Female students.	130	60	2.17	43.4
25. Much attention is given to female students than male students	112	60	1.87	37.4

b. Response of male Students

Pre-Intervention Result

Item No./Item	Sum score Per item(X)	Total no. of responded items (N)	Average (mean) response per item (X/N)	% for Average response
13. My science teachers pay much attention to male students than females.	148	90	1.64	32.8
24. No special attention is given to either male or female students.	375	90	4.17	83.4
23. Equal Attention is given to both Male and Female students.	380	90	4.22	84.4
25. Much attention is given to female students than male students	147	90	1.63	32.6

Post-Intervention Result

Item No./Item	item(X) Sum score Per	Total no. of responded items (N)	Average (mean) response per item (X/N)	% for Average response
13. My science teachers pay much attention to male students than females.	135	90	1.50	30.0
24. No special attention is given to either male or female students.	380	90	4.22	84.4
23. Equal Attention is given to both Male and Female students.	388	90	4.31	86.2
25. Much attention is given to female students than male students	149	90	1.66	33.2

NB: 1. Total number of female respondents = 60
2. Total number of male respondents = 90
3. Maximum value for the scale of agreement or disagreement to question item is 5

Figure 2a: Comparison of the Pre and Post Intervention Responses of the Female Students about Gender Difference and Students' Attitude towards Science

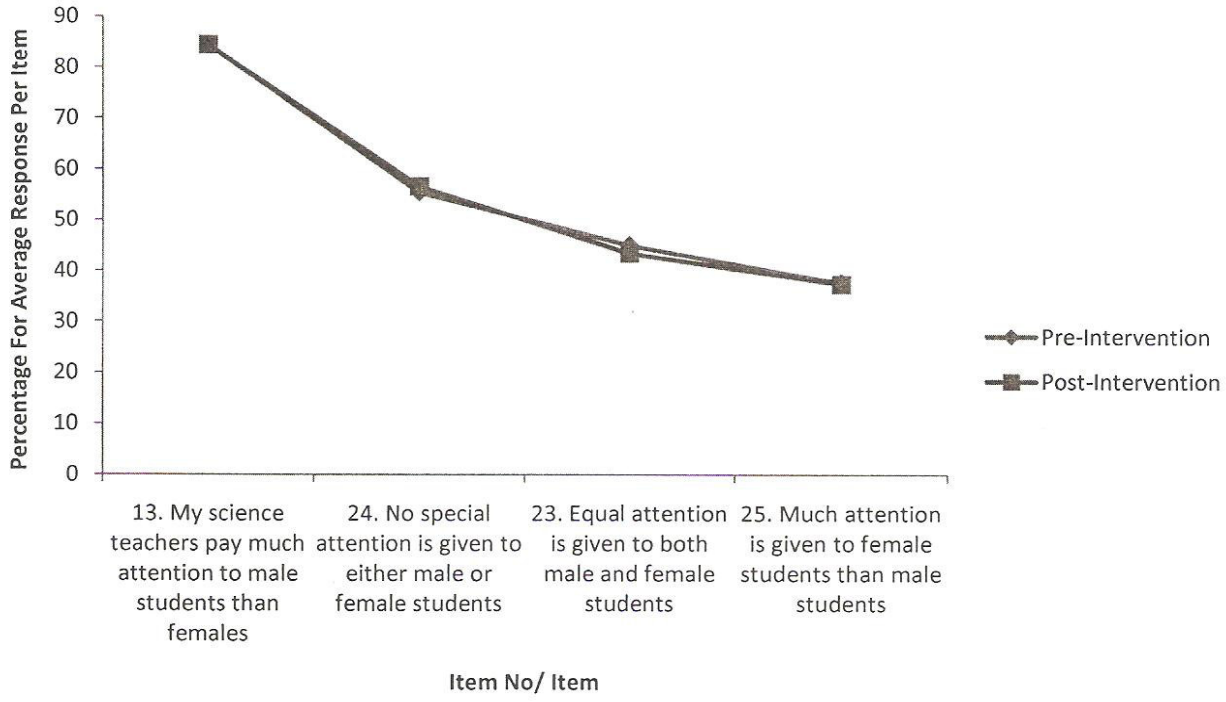
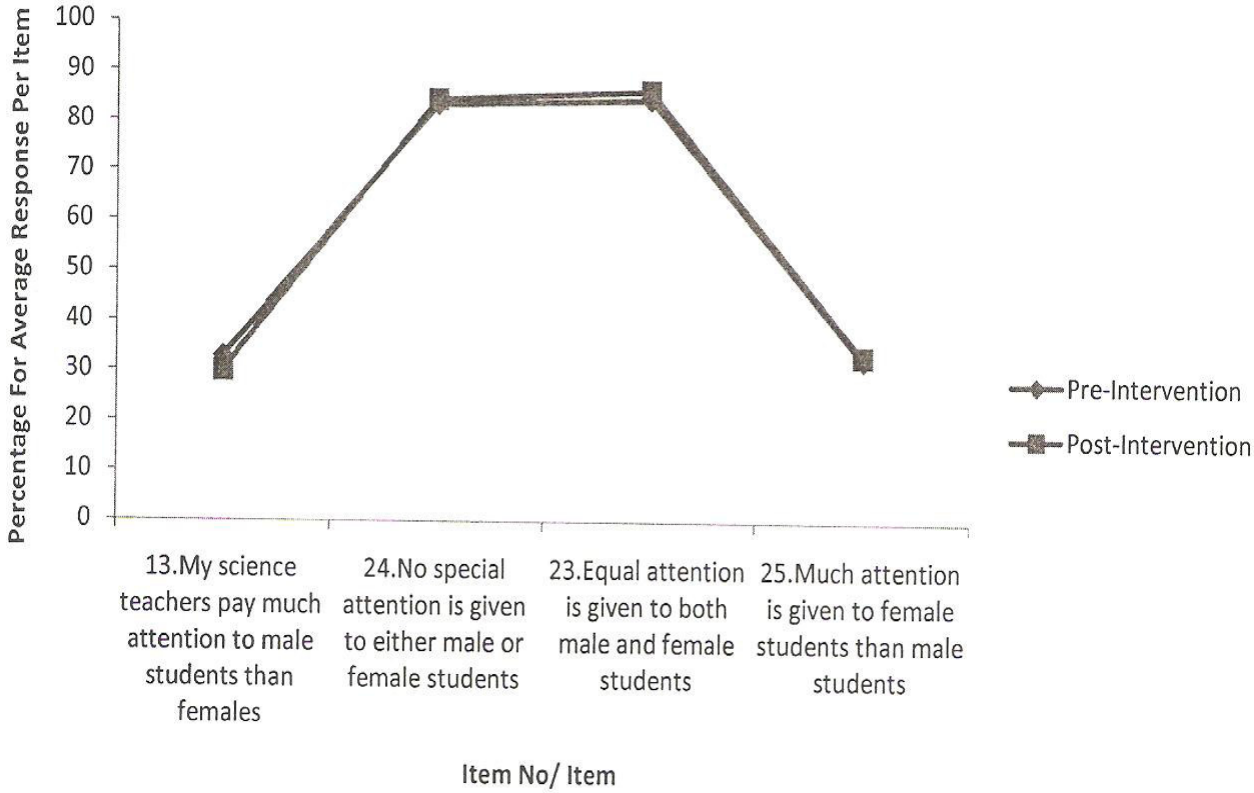


Figure 2b: Comparing of the Pre and Post Intervention Responses of the Male Students about Gender Difference and Students' Attitude towards Science



The question item, "My science teacher pay much attention to male students than female students" yielded a mean score value of 4.22 with a corresponding percentage of 84.4 for both pre- intervention and post – intervention stages for the female respondents. The male respondents rether recorded mean score values of 32.8 and 30.0 for pre and post-intervention stages respoctively. These outcomes therefore, indicated that in both pre and post – intervention stages, the females strongly agreed to the above statement while the male however, expressed opposite opinion to that of the female which showed their disagreement to the statement that, 'science teachers pay much attention to male students than their females counterparts'.

Also, the female respondents produced mean scores of 2.77 with a percentage of 55.4 and 2.83 which represents a percentage of 56.6 for per and post – intervention stages respectively. These data represent the female respondent's reaction to the question item which reads, "No special attention is given to either male or female students". These values are below average (mean) score value of 3.0, a percentage value of 60. This gives a clear indication of the females' disagreement to this statement. They rather believed that the attention given to them was not the same as that of their male counterpart. As the females disagreed, the male students on the other hand, showed a high level of agreement to this same item. They recorded a mean value of 4.17 which represents a percentage of 83.4 for pre-intervention and 4.22 mean score value representing a percentage of 84.4 for post-intervention.

"Equal attention is given to both male and female students" is also one of the items set to find out if gender difference influences students' attitude towards the study of science.

The mean values recorded by the females with respect to this item are 2.25 which corresponded to a percentage of 45.0 for pre-intervention stage and 2.17 with a percentage of 43.4 for post-intervention stage. The values obtained by the females for this item too also gave indication of their disagreement to it. The male respondents this however, have indicated their agreement to this item. They obtained mean score values of 4.22, representing a percentage of 84.4 and 4.31 which corresponded to 86% for pre and post-intervention. For the item, "Much attention is given to female students than the male student", the female respondents again expressed their disagreement to this item. The values recorded which represented their responses were: 1.88mean score which represented 37.6% and 1.87 mean score which represented 37.4 for pre and post –intervention respectively. The male students similarly, disagreed to the statement that, "much attention is given to female students than male students" for both pre and post-intervention stages. The data recorded for the males during pre-intervention stage was 1.63 as the value representing 32.6%. At the post-intervention however, 1.66 representing 33.2% was recorded.

Lourdusamy and Khine (2001) have found out that gender seems to have no influence on the perception of students of their teachers' interpersonal behaviors. The data collected to find out whether gender difference also influences students' attitude towards the study of science has rather provided two different responses. The female college students agreed that gender difference their attitude towards the study of science (see Table 2(a) and Figure 2(a)). This is clearly shown by the females' responses to the four question items (13, 24, 23 and 25) set purposely to investigate into gender issue with respect to science studies in colleges in Ghana. They strongly to the question item 13 for both pre and post-intervention stages and they disagreed to items 24, 23 and 25 for both pre-intervention and post-intervention responses. The data however, showed that their male counterparts were of the view that gender difference has no influence on their attitude towards the study of science. That is, they strongly disagreed to question items 13 and 25 for both pre and post-intervention stages and rather agreed strongly to the items 24 and 23 for both pre-intervention and post intervention stages of the study (see Table 2(b) and Figure 2(b)).

Science Teachers' Instructional Strategies and Students' Leaning Style

"Do Science teachers' instructional strategies and students' leaning style?" was also one of the research questions of the study. This question was aimed at finding out if the kind of attitude and the perception those students especially teacher trainees in the colleges of education have towards science is due to the fact that the teachers' instructional strategies did not match their learning style. 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 1.93which represented 38.6%. This is a perfect indication that before the administration of the intervention activity, learners truly did not like their teachers' intervention 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.

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 and 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 behavior. 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 (Erinosha, 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 places the learner at the 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) all emphasis on activities. All the above gives clear indication that the use of practical instructional approach (activity lesson) which emphasis on the learners enhance understanding of science concepts and that matches perfectly with students learning style. Below table and graphs give summary of students' response about their science teacher's instructional strategies and their learning style Table 3: Teacher trainee students' response about science teacher's instructional strategies and their learning style

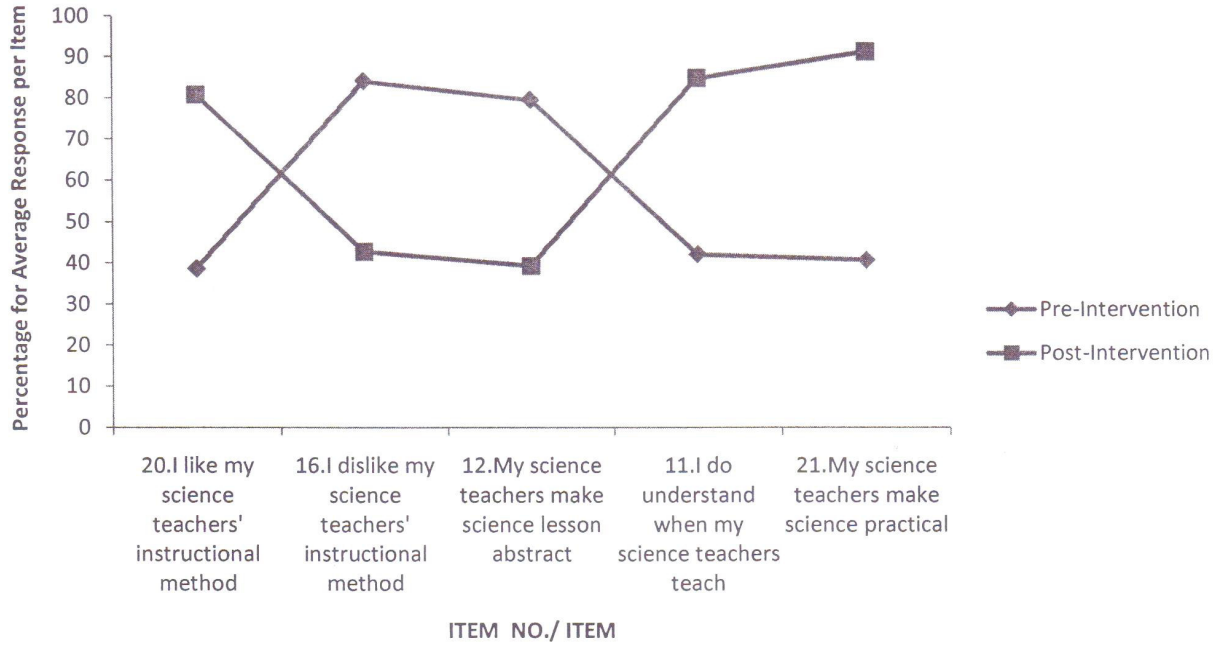
Pre-intervention Result

Item No./Item	item(X) Sum score Per	Total no. of responded items (N)	Average (mean) response per item (X/N)	% for Average response
20. I like my ScienceteachersInstructionalMethod	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 ScienceLessonAbstract	595	150	3.97	79.4
11. I do Understand When my science Teachers Teach	315	150	2.10	4.20
21. My science Teachers Make science Practical	304	150	2.03	40.61

Post-intervention Result

Item No./Item	item(X) Sum score Per	Total no. of responded items (N)	Average (mean) response per item (X/N)	% for Average response
20. I like my ScienceteachersInstructionalMethod	605	150	4.03	80.7
16. I dislike My science teacher's Instructional Method	320	150	2.13	42.7
12. My science Teachers make ScienceLessonAbstract	294	150	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

Figure 3: Chart Comparing Students' Response about Science Teachers' instructional Strategies and their Learning Style for Pre-Intervention and Post-Intervention



Summary, Recommendations, Suggestions and Conclusion

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 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 teacher's 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.

Recommendations

Ghana stands a better chance of achieving the vision 2020 agenda if much attention is given to science and technology education. In the light of this, a firm foundation in science is required to be built at all levels of education in the country especially at the basic level. This implies that science teachers need to exhibit all the skills that will permit and encourage young learners develop positive attitudes towards the study of science. To achieve this, science teacher in the colleges of education need to adopt practical instructional approaches in the teaching of college science to enable teacher trainees develop positive attitude towards science. This will help ensure learner's active participation and motivation to learn the college science.

Once again, it is recommended that, a prominent part of in-service training or education to science teachers particularly those in the colleges of education organized by the Ghana Education Service (GES) or any stakeholder of education should address the teachers that, they should not act as authoritative experts, the main

source of knowledge and focal point of all activities in the classroom. Rather, a teacher should perceive him/herself as a facilitator and prefer approaches that introduce more flexibility and more student engagement "as co-creator in the learning process" (McCombs and Whister, 1997). I believe this behaviour of the teacher in classroom will help stimulate students' interest, motivate them and inculcate in them positive attitude towards the study of science.

Suggestion for future studies

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 gender difference that affect student's attitude towards the study of science especially in the colleges of education in the country.

Also, the outcome concerning gender issue was analyzed was in terms of sex. That is, it was analyzed into responses of female and male students. The responses of students to the other issues investigated into the study were analyzed in terms of traits/dimension of attitude considered in this study and in terms of question. It is my suggestion therefore that future studies into this topic will go another length to analyze the responses of the subject in college bases and even if possible in terms of classes as well.

Conclusion

The ever increasing attention on the topic, "attitude towards science" shows that all is not well with school science and as such far more people are alienated by a subject that has ever increasing importance in man's life both at personal and societal levels. Where then lies the solution to this 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. Then, science educators have much to learn from the growing body of literature on the study of motivation (Begin 1999; Dweck 1986; Dweck and Leggett 1988; Hidi 2000; Paris 1998). The common feature of much of this work is recognition of distinction between individual and interest and situational and extrinsic interest. The latter is stimulated by contextual factors such as good teaching that stimulate interest and engagement. Hidi (2000), in particular has argued that the role of situational interest is highly significant in classroom or subject where children are disinterest in the subject at hand or are academically unmotivated. Paris (1998), also argued that the essential ingredients of motivation are opportunities to choose, challenge, control over the pace and nature of learning and collaboration. Similarly, Wallace's (1996), detailed research on the views of pupils about learning and its implications led her to conclude that engagement was raised by pupils to take control of their learning and greater pupil's autonomy. Osborne and Collins (2000), work has revealed that pupils desired more opportunities in science for practical work, extended investigation and opportunities for discussions-all of which provide enhanced role for personal autonomy.

A number of studies have likewise confirmed the significant role that teachers plays in learners' attitude formation. The work of Sunberg et al (1994), which studied 2965 United States College pupils' attitude towards science, is a typical example. Again, Simpson and Oliver (1990), Myers and Fouts (1992), Piburn and Baker (1993), in their studies, all have agreed that teachers' attitude has been cited by several studies as an important determinant in attitude formation of students. This study as well, has shown that students' attitudes towards science are significantly influenced by teachers' 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.

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