UNIVERSITY OF CAPE COAST

TEACHER TRAINEES' ATTITUDE TOWARDS LEARNING MATHEMATICS AND ANXIETY LEVELS FOR TEACHING MATHEMATICS

BONIFACE SIGME BOINDE

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BY

BONIFACE SIGME BOINDE

Thesis submitted to the Department of Science and Mathematics Education of the Faculty of Education, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Philosophy Degree, in Mathematics Education

JUNE, 2009

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature.....Date.....

Name: Boniface Sigme Boinde

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guide lines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's signature.....Date.....

Name: Prof. Benjamin A. Eshun

Co-supervisor's signature.....Date.....

Name: Mr. Alex Asare-Inkoom

ABSTRACT

The purpose of the study was to investigate teacher trainees' attitude towards learning mathematics and their anxiety levels for teaching mathematics as trainees in the internship of the out-segment programme. The study involved 160 third year teacher trainees comprising 55 trainees from Upper East Region, 50 from Upper West Region and 55 from Central Region of Ghana using purposive sampling technique.

Teacher trainees showed positive attitude towards all the six variables measured. The independent t-test showed no significant difference between males and females trainees' attitude towards learning mathematics except in college A. The one way Analysis of variance (ANOVA) test for significant difference on trainees scores at 0.05 alpha level showed no significant differences in attitude towards learning mathematics among trainees in the three colleges (with $F < 3.00$ $p > 0.05$). Slightly more than one tenth showed no anxiety teaching mathematics; twice as many indicated high anxiety level teaching mathematics. 32% of the trainees showed slight anxiety level teaching mathematics. No significant difference was found between males and females anxiety level teaching mathematics. The result of the ANOVA shows no significant differences in anxiety teaching mathematics among trainees in the three colleges. There was low but significant negative correlation between trainees' attitude towards learning mathematics and their anxiety level for teaching mathematics. Implications of the findings were discussed and recommendations made.

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DEDICATION

To my beloved wife, Christina and children: Taciecious Niberninaa, Wisdom Benonle, Lagrange Lebnir and Mathew

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

Background to the Study

Mathematics, as a field of study, has features that set it at a distance from almost any other scholastic discipline. Modern civilization depends, to an unprecedented extent, upon science, and a great deal of that science would be impossible in the absence of a highly developed mathematical technique and positive attitude. Mathematics is a way of organising our experiences of the world. It enriches our understanding of the scientific world and enables us to communicate and make sense of our experiences. Emphasising on the importance of mathematics, the Principles and Standards for School Mathematics also declare, "Mathematics is one of the greatest cultural and intellectual achievements of humankind, and citizens should develop an appreciation and understanding of that achievement" (NCTM, 2000, p. 4).

The prestige enjoyed by mathematicians in every civilized country is not altogether easy to understand. In Ghana, Mathematics is a pre-requisite for students to enter second cycle or tertiary institutions and most job places. It is a core subject of study in Ghanaian schools right from Kindergarten (KG) to teacher training college level. Also, all cultures in Ghana have mathematics systems that they use for trade, art and design, and other human endeavours.

Nabie, (2002) said fishermen weave and cast nets with precision, traditional art and craftsmen weave hats and mats of different shapes and dimensions and traditional farmers make yam mounds in definite patterns and can easily determine the number of mounds by simple indigenous mathematical methods. Estimation is a common thing among market women, farmers and travellers. This inevitable role Mathematics plays in the overall development of an individual and a country, qualifies it as the mother of all subjects. Hence, anything that is valued by the generality of man is either useful or pleasant, or both. Therefore, every teacher trainee in the colleges of education is expected to take mathematics among others as a core subject and to teach it during practice teaching. But there are a lot of factors affecting successful teaching in mathematics. One of these factors is students' mathematical anxiety, in other words, their fear of mathematics. One of the reasons for mathematical anxiety is attitude towards mathematics (Baloğlu, cited in Peker & Mirasyedioğlu, 2007). There is the need, therefore, to investigate the attitudes of teacher trainees towards mathematics and the anxieties they have in learning and subsequent teaching of mathematics in Ghanaian basic schools.

The Ministry of Education and Sports and the Ghana Education Service had therefore over the years, and in recent time more especially made several attempts to reform the teacher education and the training system to enhance the quality of teaching and learning of science and mathematics. The upgrading of the teaching training certificate to diploma, and the setting aside of 15 colleges to pursue quasi specialist programme in science and mathematics is one of the major innovation strategies to improve the teaching and learning of science and mathematics in the colleges and schools. A

developing country like Ghana needs a human resource base that is well-equipped with the skills, knowledge, positive attitudes and competencies in science and technology. Therefore, the training and development of the right type of teachers who are competent, committed and dedicated to the task of teaching are needed. The Ministry of Education, Teacher Education Division Guidelines for Internal Quality Assurance for Colleges of Education (2009), declares that:

> Teacher education in Ghana seeks to ensure the training and development of competent, committed and dedicated teachers,
>
> who will be able, among other functions, to:
>
> - Mediate between knowledge and learners
> - Initiate and stimulate school learning activities
> - Forge a working relationship between school and community
> - Offer guidance and counselling to enable learners overcome their problems
> - Develop competencies for effective teaching in diverse contexts
> - Integrate content knowledge with methods of teaching (p.2).

But, teacher trainees in the out segment programme, from the Colleges of Education in Ghana are usually posted to basic schools to teach. Trained as 'generalists', they are responsible for helping children to learn Mathematics as a subject among others in primary school. The old adage that, "no one gives what he has not", is very relevant in this context. To this end, there is therefore the need for teacher trainees, also known as Pre-service Elementary School

Teachers, to be equipped with the requisite knowledge, skills, experiences, positive attitudes in the learning and teaching of Mathematics if they must facilitate learning among students. Quality teachers with positive attitudes towards mathematics influence others positively. However, Mathematics appears to be a subject dreaded by many learners. Of course, learning Mathematics is not an easy task irrespective of the level. The abstract nature of certain aspects of Mathematics alone is an enough signal to teachers teaching Mathematics to strive to put children in high spirit to study it.

Various people elsewhere have done research on students' anxiety level and attitudes towards mathematics. But, at the colleges of education level in Ghana, little evidence is available on studies conducted on teacher trainees' anxiety level for teaching mathematics during the one year out-segment programme. Therefore, there is the need to investigate teacher trainees' attitudes towards mathematics and anxiety level for teaching mathematics in Ghana. As once said, unless one has the right attitude towards what he/she is doing, his/her performance will probably not represent the best (Kundu & Tutoo, 1988). World Education Report (1998), confirms in this regard that, when a child's or adult's first teacher is poorly trained and poorly motivated, the very foundation on which all subsequent learning will depend on, will be unsound. There are other reports all over the world including developed countries like the United States. According to the results of international tests, the mathematics performance of students in the United States is comparatively weak on even the most basic of mathematical concepts. As a result, interest in K-12 mathematics education reform continues to build and attract a wider audience (Perry, 2007).

In fact, "many teachers in our society always have a mathematics anxiety in themselves... This is cause for concern considering that teachers who possess higher levels of mathematics anxiety may unintentionally pass on these negative feelings to their students" (Wood, cited in Bintas, 2008, p.46). Learning mathematics and how to teach it, as a student and as a prospective teacher, demand desirable attitudes towards the subject. Invariably, as stated, "Mathematics anxiety is a global problem which calls for a better curriculum, competent teachers, improved teaching strategies, appropriate learning materials, and prudent use of technology in the classroom" (Acelajado, 2003, p. 16). Commenting on attitudes that foster learning and what makes a teacher effective, Ryan and Cooper (1998) said that, effective teaching is much more than an intuitive process. A teacher must continually make decisions and act on those decisions. To do this effectively, the teacher must have knowledge, both theoretical knowledge about learning and human behaviour and specific knowledge about the subject matter to be taught. A teacher also must demonstrate a repertoire of teaching skills that are believed to facilitate student learning, must display attitudes that foster learning and genuine human relationships. In light of this, if prospective teachers have negative attitudes towards learning mathematics and high anxiety level for teaching, they may transfer these attitudes onto their students. In a study in Botswana, Caswell (1996) indicated that, teachers' belief and attitudes towards Mathematics affect their pedagogical practices and their students' belief and attitudes towards Mathematics. According to a web page, (http://www.counseling.swt.edu/bro/math.htm, 12/11/2008) the incidence of mathematics anxiety among college pre-service elementary school teachers

has risen significantly over the last decade. Many students have even chosen their college major on the basis of how little mathematics is required for the degree. Mathematics anxiety is an emotional, rather than intellectual, problem. However, mathematics anxiety interferes with a person's ability to learn mathematics and therefore results in an intellectual problem.

Statement of the Problem

Students admitted into the colleges of education in Ghana, usually come in with various experiences in learning mathematics. Some are admitted with a grade point in one sitting, while others faced what is described as "second world war in mathematics" (second attempt at writing mathematics) to gets a pass grade point for entry, into teacher training college. Still, others could not make it but had the chance into the college through other programmes like "access course" where a student is allowed entry without a pass in Mathematics but going through a course in Mathematics as a prerequisite before gaining entry into the college. It is believed that, people who suffer from mathematics failure before, like those described above, feel that they are incapable of doing activities and learning things that involve mathematics. According to the Chief Examiner's reports (1st semester, 2007), for Colleges of Education in Ghana, Generally, trainees do not perform well in both internal and external examinations. Consequently, bad grades are usually recorded in the semester's examination in mathematics. The report stated that, "Most of the students did not perform well in both section A and B, because they lacked adequate understanding of the basic geometry concepts and the basic computational skills". Similar results were reported in 2007(2nd semester) and 2008 (1st and 2nd semesters) colleges of education chief

examiners reports. This situation calls for the investigation into trainees' attitude towards confidence in learning mathematics, usefulness of mathematics, like doing mathematics, understanding mathematics, male domain and anxiety learning mathematics plus their anxiety level for teaching mathematics during teaching practice.

According to Betz, (cited in Zakaria & Nordin 2008), in Malaysia, Mathematics anxiety is prevalent among pre-service elementary school teachers' population; Betz result showed "students perform poorly as a result of their anxiety levels and attitude towards learning mathematics", (p.1). Another studies in a causal analysis of attitude towards mathematics concluded that, "the general attitude of the class towards mathematics is related to the quality of the teaching and to the social-psychological climate of the class" (Haladyna, Shaughnessy, & Shaughnessy, 1983 p.19). Hembree, (cited in Bintus 2008), also pointed out that, "Mathematics anxiety is prevalent among the pre-service teacher population" in Turkey (p. 47).

Tapia & Marsh II, (2004) result shows that pre-service elementary teachers have mathematics anxiety. Their result shows that students with negative attitudes towards mathematics have performance problems simply because of Anxiety".

There is therefore the need to investigate the attitudes of teacher trainees in Ghana towards learning mathematics and in particular, their anxiety level for teaching mathematics as one year internship during the out segment of the colleges of education programme.

Purpose of the Study

The purpose of this study was to;

1. investigate teacher trainees' attitudes towards learning mathematics
2. investigate teacher trainees' mathematics anxiety levels for teaching during the one year internship programme.

Specifically, the study investigated trainees' attitudes along six dimensions of: confidence in learning mathematics, usefulness of mathematics, understanding mathematics, like doing mathematics, mathematics as a male domain and anxieties learning mathematics, plus trainees' anxiety levels for teaching mathematics.

Research Questions

To find out whether trainees have positive or negative attitudes towards learning mathematics and to investigate in their anxiety levels for teaching mathematics, the following research questions were formulated to guide the study for data collection:

1. What is teacher trainees' attitude towards learning mathematics along the following dimensions:
   a. confidence in learning mathematics,
   b. usefulness of mathematics,
   c. understanding learning mathematics,
   d. like doing mathematics,
   e. male domain, and
   f. anxiety learning mathematics?
2. What are teacher trainees' anxiety levels in teaching mathematics during the one year internship programme?

Hypotheses

The following alternate and null hypotheses were formulated to guide the study:

1. **H_1** : there is significant difference between the attitude of male and female teacher trainees' in college A, B, C and all colleges towards learning mathematics along the dimension
   - **a.** confidence in learning mathematics,
   - **b.** usefulness of mathematics,
   - **c.** understanding learning mathematics,
   - **d.** like doing mathematics,
   - **e.** male domain, and
   - **f.** anxiety learning mathematics

   H_0 : there is no significant difference between the attitude of male and female teacher trainees' in college A, B, C and all colleges towards learning mathematics along the dimensions:
   - a. confidence in learning mathematics,
   - b. usefulness of mathematics,
   - c. understanding learning mathematics,
   - d. like doing mathematics,
   - e. male domain, and
   - f. anxiety learning mathematics

2. **H_1**: There is correlation among scores of the various attitudinal variables for all the colleges

   H_0: There is no correlation among scores of the various attitudinal variables for all the colleges

3. $\mathbf{H_1}$: there is significant difference between male and female teacher trainees' anxiety levels for teaching mathematics

   $\mathbf{H_0}$: there is no significant difference between male and female teacher trainees' anxiety levels for teaching mathematics

4. $\mathbf{H_1}$: There is correlation between trainees attitudes towards learning mathematics and anxiety level for teaching mathematics

   $\mathbf{H_0}$: There is no correlation between trainees' attitudes towards learning mathematics and anxiety level for teaching mathematics

Significance of the Study

The proper goal of the college classroom is 'work,' and only by understanding the obstacle to work that flow from the complexity of the teacher's task, the students' diversity, and the nature of group development can the teacher make his optimal contribution to this goal (Mann, cited in Lowman,1987). Taking attitudes towards learning mathematics, and anxiety level in teaching of mathematics into account will help teachers to be more tactful and approach the subject with the attitude that will help students' to learn. Teachers may also take extra care to teach well topics that are said to be scary and to encourage questions and students learning to improve on their attitude towards learning. This will help them address students' needs as prospective teachers and/or fight the anxiety of their future students and to instil and improve attitude towards Mathematics in general. Hence, the findings will contribute to greater understanding of students' attitude towards mathematics and how mathematics anxiety can be managed effectively. This will enhance the teaching and learning of Mathematics.

It will also add to the existing body of knowledge in the teaching and learning of Mathematics. Other researchers can use it as reference for further similar study. The research work will inform, educate and sensitize teacher trainees to develop confidence and greater interest and cultivate positive attitudes towards the teaching and learning of mathematics

It will guide and facilitate the formulation of new policy and curriculum development in mathematics for schools and colleges in Ghana

Delimitations

I would have wished to do the study in all the colleges in Ghana, but owing to limited time to write and present the thesis and also financial constraints, the study was limited to only third year students in three selected Teacher Training Colleges of Education [in upper East region, Upper West region and Central region]. Other teacher trainees from the universities were not involved in this study because the focus of this study was on those, train as 'generalist' from colleges of Education. Only six attitudinal variables (confidence in doing mathematics, usefulness of mathematics, like doing mathematics, understanding mathematics, mathematics as a male domain and anxiety learning mathematics) and anxiety level for teaching mathematics variable were considered. These variables were considered because they dealt directly with the student's effort towards learning and teaching.

Limitations

The limitations of this study warrant discussion and suggest the need for caution when interpreting the results. The findings of this study could only be generalized within the sampled colleges, but could not generalise for all

colleges in Ghana because of the purposive sampling and convenience sampling techniques used for selecting the colleges.

The use of self-report instruments developed by Doepken et al (2008), for attitudes of students towards mathematics, Woods (2008) and Eshun (1987), for anxiety rating scale alone in this study to determine trainees' attitude towards learning mathematics and anxiety level for teaching mathematics might not have given a deeper insight into their attitude, even though questionnaires are widely used in assessing peoples' attitudes. A scientific approach to studying attitude towards learning according to Braginsky and Braginsky (1974) should have an insight to deal with the facts rather than with what someone has said about them. Thus it could be possible that combination of different techniques (like questionnaire and interview or observation) could produce better result than what has been produced by the questionnaire alone. That means there is no guarantee that errors will not occur no matter how well thought out the researcher is speaking on prediction (Orne cited in Braginsky and Braginsky). Braginsky and Braginsky argue that, generalization may distort and obscure those which the researcher wants to understand. But quickly add that, statistical procedures do not assure "truth". Citing the views of other authorities on the contention that, logical errors may occur when generalizing from a small sample to a large universe especially when the studies is about people, Braginsky and Braginsky agree that statistical procedures do not guarantee objectivity or meaningful results and conclude that, statistical generalization does not provide wisdom or foolishness; both are a function of the intelligence and good sense of the investigator who uses these procedures.

I was mindful of the fact that there are no known measurements of the attitude of human beings that can be used accurately.

One limiting factor was the methodology used for college selection. The findings of this study can only be generalized within the sampled colleges, but could not be generalised for all colleges in Ghana because of the purposive sampling and convenience sampling techniques used for selecting the colleges.

Another problem was the interval nature of the instrument. The interval between strongly agree and agree may not be equal to the interval between agree and disagree or the spread of the responses, limited respondents options. The transformation of negative statement into the same variable group may have effect on the result which may be not easily known. Therefore, there were likely to be gaps in the data collection, analysis and interpretation.

All unanswered statements were assumed and interpreted as neutral response which may influence the result.

I encountered certain difficulties during the data collection in the Upper West Region even though arrangement had been made earlier. It was difficult to get some of the respondents who had sent their schools' sports teams for the championship.

Definition of terms

Concepts may differ in meaning depending on the context in which they are used. It is, therefore, necessary to give some working definitions to the following key terms used in the study:

Access course: A remedial course organised for candidates wishing to enter into an institution of learning without the basic requirements. The

candidate is tested at the end of the programme and if satisfactorily performed, is enrolled into the institution

Attitude towards mathematics: It is defined as the displayed behaviour of an individual towards Mathematics that shows or indicates how he or she feels and thinks about Mathematics. These behaviours are always cultivated as a result of experiences which one can get rid of. These beliefs and attitudes normally make teachers and students either to embrace, or shy away from mathematics new educational programmes.

Mathematics Anxiety: a state of feeling, one has towards Mathematics as a subject that may motivate or de-motivate his or her learning. It is the extreme fear of performing poorly or well in Mathematics. It is push or pulls feeling towards Mathematics that can be controlled.

Male Domain: the perception that males can perform better than females in mathematics a belief that mathematics is meant for males. It is a misconception that males are better than females in learning and doing mathematics

Problem solving: Problem solving is the process of finding a solution where no way is known off hand, or finding a way out of a difficulty or finding a way around an obstacle to attain a direct end that is not immediately attainable, by acceptable, specific, and logical means.

Problem solving classroom: classrooms where students have opportunities to consistently engage in problem solving, discuss their solution strategies and build on their own informal strategies for solving problems.

Second World War in mathematics: one who failed in an examination, and registered again to write the second time

Teacher Trainees: students undergoing training to become teachers

Organisation of the study

This study was to assess teacher trainees' attitude towards Mathematics and their anxiety in teaching it. The introductory chapter of this thesis includes background to the study which explains the background of the research problem, the importance of mathematics, the need for the study. This information is included because it is important for the reader to have a basic understanding of mathematics anxiety and attitude towards mathematics. The statement of the problem, the purpose and significance of the research are well elaborated. More importantly, the research questions that are the primary focus of this thesis are identified under this chapter. The scope and limitation of the study are outlined. The last part of this chapter comprises the operational definitions of some terms or words used in the report as well as the organisation of the study.

Chapter two reviews relevant related literature. I try to identify, locate, read and evaluate relevant previous studies, observations, opinions and comments related to the research. Chapter three explains the methodology used. It looks at the research design, the population and sampling, research instruments, validity, data collection and data analysis procedures in the context of a descriptive research survey. The results and findings of the study are presented by research questions in chapter four while chapter five summarises the key findings, conclusions, implications and possibilities for future research in this area.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Overview

Chapter two is a review of the relevant literature. The researcher has tried to evaluate previous studies, observations, opinions and comments related to this research. Literature review is necessary to avoid the risk of duplicating previous studies, using unproductive techniques, and therefore not contributing much to the advancement of human knowledge. It is also to acknowledge works of other authorities so as to avoid plagiarism.

More specifically, studies about attitudes of teacher trainees in the colleges of education towards the learning and teaching of mathematics are discussed here. The following primary factors inter alia, are discussed: confidence in learning mathematics, usefulness of mathematics, understanding mathematics, like doing mathematics, male domain toward mathematics and their mathematics anxiety. Thus, teacher trainees' attitudes towards learning and the anxiety level in their teaching are the focus throughout this thesis.

Theoretical and Conceptual Perspectives

Teacher trainees' attitude towards learning Mathematics and the anxiety level for teaching mathematics are addressed under the following primary areas

Theoretical Review

Concept and Definitions: Learning as a concept, has been difficult to define. There is no acceptable, unambiguous and meaningful definition of learning (Braginsky & Braginsky, 1974). Conceptually, the various definitions of learning could hardly differentiate between learning and memory. At best, learning has been referred "to the phenomena that behaviour is shaped through contact with the environment". Hence, the teacher trainees' responses on whether they have positive attitude towards learning mathematics could be pointing to their past experiences and memory of mathematics classes. Also, their attitudes towards the teaching of mathematics might have been influenced by their learning and teaching environment. Another conceptual difficulty is the term "attitude". Human attitude may be synonymous with human behaviour; attitudes are the primary attributes of the human beings scientific milieu. This is why science is said to be "a set of attitudes" (Braginsky & Braginsky, 1974). Therefore, a scientific approach to studying the attitudes of teacher trainees towards the learning and teaching of mathematics should deal with the facts rather than with what someone has said about them. It is the wish of policy makers, educators and parents that learners develop desirable attitudes towards the learning of mathematics. It is, therefore, important to understand the concept of attitude and what others have found on attitudes.

Attitudes: To explain attitudes and how they developed in learners may require a scientific approach. Discussing the concept of attitudes, Skinner (cited in Braginsky & Braginsky, 1974), stated that, "Science is first of all a set of attitudes. It is a disposition to deal with the facts rather than with what someone has said about them…" (p.72). this explains the scientific nature of human attitudes. However, it is difficult to define human attitudes in terms of physical science alone because the human being is also a social animal with unpredictable behavior or attitude. Attitudinal research in the field of mathematics has dealt almost exclusively with the entire three domains of human growth in educational development of human life. That is, the psychomotor domain, cognitive domain and affective domain. Hence, mathematics education aims at developing in children positive attitudes towards learning mathematics

According to Zanna and Rempel (1988), attitude is a disposition to respond favourably or unfavourably toward some person, thing, event, place, idea or situation. Attitudes are the thought and feelings that motivate someone to act as though he likes or dislikes something or somebody. Some of the earlier researchers on attitude towards mathematics itself and the teaching and learning of mathematics include Caswell (1996); Fennema , (1989); Fennema & Sherman, (1976); Aiken, (1974); Taylor, (1971); Aiken & Dreger, (1961); and Carey, (1958).

In an effort to study students' attitudes towards mathematics, Fennema and Sherman (1976) constructed four attitude sub-scales in the early 1970s. This scale could give a teacher useful information about a particular student's attitude(s) towards mathematics. The Fennema-Sherman Mathematics Attitude

Scales (1976) consisted of a group of nine instruments: 1. Attitude Toward Success in Mathematics Scale, 2. Mathematics as a Male Domain Scale, 3. Mother/Father Scale, 5. Teacher Scale, 6. Confidence in Learning Mathematics Scale, 7. Mathematics Anxiety Scale, 8. Effectance Motivation Scale in Mathematics, and 9. Mathematics Usefulness Scale, to cover more dimension of students' attitudes towards mathematics. This scale has become one of the most popular instruments used in research over the past decades. But this scale was originally written more than thirty years ago; hence, the subtle meanings and connotations of words have changed in that time period. It is therefore, important that this scale be modified and used for modern research. This was modified by Doepken et al. (2008), as Modified Fennema-Sherman Attitude Scales. Therefore, I find these measurements scales to be relevant to this study. Hence, the adaption and modification of the seven scales to measure teacher trainees' attitude towards mathematics and their anxieties in teaching mathematics as internship students in Ghana.

In a study to help students overcome mathematics anxiety, Tobias (1978) agreed that, secondary school teachers of algebra and geometry frequently see their subjects as being of a far higher status than the preceding elementary school arithmetic. Calculus teachers, too, often treat their subject with a reverence and an awe that communicates a belief that calculus can only be achieved by exceptional minds. She cautions mathematics teachers to be circumspect about the way and manner they talk about the subject. If a mathematics teacher always portrays a happy and successful time with mathematics, especially when he or she was in school or always talking about their old school day's work in mathematics, then students may feel inferior if

the teacher seems to be gifted in mathematics. According to Tobias, students may feel that they will never be as good as their teacher. This suggests that, a teacher's behaviour or action or reaction can influence learners' attitudes towards mathematics. One student pinpoints a specific negative mathematics experience which influence his attitude towards mathematics in the following:

> I remember very clearly my first experience with numbers and addition, and it was not a positive one. My kindergarten teacher, Mrs. Sonders, had auburn hair and wore bright red lipstick. I can't remember her ever smiling. It is my belief today that this woman had no business teaching anybody anything. We were given sheets of paper and told to draw a certain number of circles and then to add another number of circles. She walked by and pointed at my paper and with an angry voice said I was wrong. My mum was called, and the next day she came in for a parent teacher Conference. I felt embarrassed as I swung on the jungle gym outside, while Mrs. Sonders spoke with my mum in the classroom. I knew they were talking about my circles. That's when I began hating Mathematics (Arem, cited in Kidd, 2003, p.9).

This encounter shows how a teacher's behaviour can put a learner in the truck of mathematics anxiety.

Steele and Arth (1998) state teachers have to be extremely careful in the manner in which they ask for correct answers as this can influence a learner's attitude towards mathematics. Steele and Arth suggest that teachers

should not always single out a student before question; instead, the question should be asked first, before calling names. This suggests that, teachers' questioning technique can be a barrier for students' learning. When a teacher asked a question, pause, before calling on students' names will allow them to think and organise their ideas before talking.

Also, if students are struggling with a problem, teachers need to encourage them not to give up, but to point out to them the positive things they are doing to solve the problem. It should be reinforced to students the difference in giving up and taking a break from a difficult problem. This researcher agrees with Williams (1988), that teachers need to be familiar with the mathematics strengths and weaknesses of each student. Teachers must motivate weaker mathematics students to feel successful by giving them assignments that will more than likely guarantee them a success.

The concept of Attitude borders on response to stimuli. Perry (2007) describes attitudes as being learned tendencies to respond in a generally favourable or unfavourable manner towards some object. Research on attitude may focus on one or more of the four conceptual distinctions of attitude: (a) affect, (b) cognition, (c) conation, and (d) behaviour. Affect refers to feelings toward some object, while cognition indicates beliefs about the object. Conation refers to a person's intentions to perform certain behaviours, and the behaviour category represents the actual observed overt acts.

Various people attempted defining attitude to reflect how they saw it demonstrated. Some examples of these peoples include the following: Kyriacou (as cited in Nabie, 2002) defines attitude as one's feeling towards some particular object or class of objects. Nabie's further definition of

attitudes towards Mathematics implies that it involves the acquisition of certain behaviours or feelings that turn to influence the choice of actions towards Mathematics in a certain manner. Also, Eshun (2000), sees "...attitudes towards Mathematics as a predisposition towards an aspect of Mathematics that has been acquired by an individual through his or her beliefs and experiences but which could be changed", (p.2). This means that a change in behaviour as a result of experience constitute one's attitude. The nature of experience usually determines the type of attitude put forth

Di Martino and Zan, (cited in Hannula, 2002), distinguish two basic approaches to defining attitude towards mathematics:

1. A 'simple' definition describes it as the degree of affect, associated with Mathematics; in other words, attitude is the emotional disposition toward mathematics. However, the affect or the emotions are integral of the attitudinal disposition a person displays. Hence, the cognitive and psychomotor domains are ignored
2. A three-component definition distinguishes emotional response, beliefs, and behaviour as components of attitude.

This was supported by McLeod (1992), generally; attitude, belief, and emotion are the major descriptors of the affective domain in mathematics education. The above definitions imply that attitudes towards Mathematics may be from several factors including experience with the Mathematics itself, confidence in solving Mathematics problems, understanding concepts in Mathematics, like doing mathematics, usefulness of Mathematics, or Mathematics as male domain.

The researcher sees attitude as that displayed behaviour of an individual that is activated by feelings, seeing, hearing, smells or a touch to show the extent of effect. Attitudes towards mathematics are those characteristics that show or indicate how one feels and thinks about Mathematics, based on the person's experience. Even though one's attitude is uncertain or unpredictable, it is always cultivated as a result of experiences which one encounters, but could be eliminated.

Mathematics Anxiety: There are many definitions of mathematics anxiety. According to Fiore (1999), Tobias and Weissbrod, (cited in Johnson, 2003), mathematics anxiety is "the panic, helplessness, paralysis, and mental disorganization that arises among some people when they are required to solve a mathematical problem", (p.1). It is both an emotional and cognitive dread of mathematics. Some researchers in mathematics education argue that mathematics anxiety can be good or bad depending on the magnitude and how it is controlled. "Despite the fact that some anxiety can be motivating or even exciting, too much anxiety can cause "downshifting" in which the brain's normal processing mechanisms begin to change by narrowing perceptions, inhibiting short term memory and behaving in more primal reactions" (McKee 2002. p.2). Pries and Biggs (2001) describe mathematics anxiety in terms of phases known as a 'cycle of mathematics avoidance': In phase one, the person experiences negative reactions to mathematic situations. These may result from past negative experiences with mathematics, and lead to a second phase in which a person avoids mathematics situations. This avoidance leads to phase three, poor mathematics preparation, which brings them to phase four, poor

mathematics performance. This generates more negative experiences with mathematics and brings us back to phase one. This cycle can repeat so often that the mathematics anxious person becomes convinced they cannot do mathematics and the cycle is rarely broken.

Sheffield and Hunt, (2007) explained that mathematics anxiety in many ways is easy to describe and define: it is the feelings of anxiety that some individuals experience when facing mathematical problems. Like other forms of anxiety, students may feel their heart beat more quickly or strongly, they may believe they are not capable of completing mathematical problems, or they may avoid attempting mathematics courses. Usually mathematics anxiety stems from unpleasant experiences in mathematics.

Mathematics anxiety has been defined as feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations. Mathematics anxiety can cause one to forget and lose one's self-confidence (Tobias, 1993, Richardson and Suinn, 1972).

In a web page, Levine, (1995), described mathematics anxiety as involving feelings of anxiety and tension that interfere with doing mathematical operations. A child with a negative attitude and anxiety towards a subject will always find ways to avoid it. In the same vein, a teacher's attitude towards mathematics can encourage or discourage children in their learning process. Mathematics anxiety is an emotional reaction to mathematics, based on a past unpleasant experience which harms future learning (http://www.mathpower.com/anxtest.htm 28/11/08). Hence, mathematics anxiety is a type of feeling within oneself as a result of what he

or she sees, hears, smells, touches or experiences. It can be good or bad and is relative. In other words, it is the state of feeling in one that tells him or her that something good or bad may happen. It is also a feeling of tension and uncertainty of what is ahead that can interfere with manipulation of numbers and the solving of mathematics problems. It is a premonition one has about a mathematics class or test

Mathematics anxiety, according to a web page, can be defined as "a feeling of intense frustration or helplessness about one's ability to do mathematics" (http://www.mathacademy.com/pr/minitext/anxiety/ 28/11/08). In the same vein, Mathison (1977) explained that mathematics anxiety is an irrational fear of mathematics that can range from a simple discomfort associated with numerical operations to a total avoidance of mathematics and mathematics classes.

Empirical Review

The principle of all science is 'seeing is believing'. Every theory needs to be backed up with solid empirical evidence. That is, there is need for data to confirmed theories. The principle of empirical verification, according to Anderson (1971) as well as almost every scientist is the single most important principle for scientific description to which the three other principles (operational definition, statistical generalization, and control) are subordinated. Hence, there is the need for empirical review.

Confidence in learning mathematics:

Several research work has confirm that people do things best they have confidence in doing. Confidence, impacts a lot on a person's attitude to and perception of certain situations or understanding of issues or doing things.

Confidence in learning mathematics can, therefore, influence students' attitude towards learning mathematics. Attitudes towards Mathematics may influence the readiness and willingness with which an individual learns and benefits from Mathematics teaching and learning. However, the work of Furner & Duffy, (2002), indicate that many children, including those with disabilities and those without disabilities, as well as adults, do not feel confident in their ability to do mathematics. Hannula et al. (2004), in their longitudinal study on self- confidence indicate that the learning of mathematics is influenced by the student's mathematics related beliefs, especially self confidence. There is evidence that, "as early as sixth grade, girls expressed less confidence than boys in their ability to do mathematics, and the subject was clearly sex-typed male, especially by boys" (Fennema & Sherman, 1976, p. 31). Cann (2009) revealed that in all the schools in Wales girls were more likely than boys to report feelings of anxiety and a lack of confidence in mathematics.

Brown (cited in Kidd, 2003) says, "Attitudes together with wants and interests influence and modify the behaviour of people", (p.52). Students' attitude towards learning of mathematics can be situational and unpredictable depending on their confidence level. Some students can be good in terms of knowledge in mathematics but if there is no confidence in learning or doing mathematics can lead them to negative attitude towards learning mathematics. Kidd (2003) supported this by saying, "In light of the idea that mathematics is difficult, even gruelling, for so many people, feelings of dislike, frustration, and failure could have an effect on a person's attitude'', (p.52). It is extremely important to build self confidence towards learning mathematics.

Negative classroom experiences;-especially experiences directly involving the learner self confidence, can be damaging and can cause the learner's blood pressure to go high. It seems just one bad experience with a teacher trainee can put him/her on the road to mathematics anxiety. If a teacher trainee does not get excited about mathematics, is afraid of certain topics that must be covered in the curriculum, will not ask questions in class because of fear that his/her colleagues will laugh at him/her, appears frustrated and angry, then, that teacher trainee lacks confidence in learning mathematics; he/she, may not learn anything at the end and pick up on these attitudes, which can directly affect him/her.

Peker and Mirasyedioğlu (2008) investigated the differences of pre-service elementary school teachers' attitudes towards mathematics according to their learning styles. The study concluded that there were statistically significant differences found between the attitudes of learners, convergent and assimilator, and that the convergent learners had more positive attitudes towards mathematics than the assimilator learners. That is, ones learning style can give him/her the comfort and confidence to learn better.

Lowman (1987) observed that students vary greatly in the way they approach the work assigned and the degree to which they apply their intellectual talents. He said some students will do anything asked of them, dutifully reading every assignment on time memorizing every definition written on the board; showing a sign of confidence in learning mathematics. To Lowman, such students may be frustrating to the teacher, because of their excessive dependency and confidence level. Jones and Smart (1995), observe lack of confidence to be the main reason for girls' low participation in

mathematics. Lowman perceive that, dutiful and compliant students are often unduly anxious about the way their work will be evaluated. This is a symptom of low or no confidence. In contrast, Lowman said, some students are contentious and distrustful. This attitude is evident in their tone when they object to tutors assignments, reporting to lectures late, giving excuses for late submission of assignments among others. However, whether students are dutiful and compliant or contentious and distrustful, certain academic situation or the structure of the programme may create anxiety in learning and negative attitude towards mathematics.

A study conducted by Eshun (2000), indicated that in general, secondary school students had least positive effective motivation and confidence in doing Mathematics among other variables measured. Their low achievement in Mathematics could partly be attributed to lack of motivation (from the teacher) and confidence to learn the subject. Students who had success in doing Mathematics also had confidence in learning Mathematics; such students saw Mathematics as useful, had understanding of Mathematics, had less Mathematics anxiety and were effectively motivated. A child with a negative attitude and anxiety towards a subject will always find ways to avoid it. Such a child is learning mathematics without confidence. Also a teacher's attitude towards mathematics can encourage or discourage children in their learning process.

Attitude towards usefulness of Mathematics:

The present position accorded to mathematics by the non-mathematical public is due to the usefulness of mathematics and partly to the persistence, in a more or less vague form of old and erroneous ideas respecting its real significance. Several researchers and mathematics educators have talked a lot about the usefulness of mathematics in our lives. Others spoke about how learners of mathematics have seen its usefulness in their educational career.

Studies by Eshun (2000), indicated that in general, secondary school students had positive attitudes towards Mathematics especially along the attitudinal variables, usefulness of Mathematics, like Mathematics and success in doing Mathematics. Eshun's result shows that students who liked Mathematics saw Mathematics as useful, had success in doing Mathematics and had less anxiety in Mathematics.

Attitude towards Like Doing Mathematics:

In the colleges of education in Ghana, several activities and programmes compete for attention. Both curricular and co-curricular activities need active participation by all students. Even though teacher trainees may like doing mathematics, these activities and programmes can serve as external stimuli drawing students away from having time to do mathematics. According to Nabie (2002), to get a learner actively involved in and like doing mathematics, the learner must find the learning situation interesting, relevant and more rewarding enough than the other external stimuli competing for attention. Nabie further stated that properly designed mathematics investigative tasks stimulate children's interest to learn even in the absence of the teacher. If tasks are not properly designed, they can frustrate children's

efforts to learn. Frustrations in tasks can kill interest (p.72). Otchey's (2000) studies on attitude of teachers and students towards mathematics and their effect on JSS students' achievements revealed among other things the following:

- Attitude of teachers towards mathematics contributes significantly to the achievement of JSS students in mathematics
- The attitude of JSS students' towards mathematics contributes significantly to their achievement in mathematics
- Males and female students do not differ in their attitudes toward mathematics
- Female JSS students achieve higher in mathematics than their male counterparts
- JSS3 students from single-sex schools achieve higher in mathematics than their counterparts from mixed schools
- Boys (from boys' JSS) achieve lower in mathematics than girls (from girls' JSS)
- The attitude of JSS mathematics teaches towards mathematics is not significantly related to (i) the number of years of teaching the subject and (ii) the sizes of his/her class

Attitude towards Understanding Mathematics

Typically people have phobias for mathematics due to the way mathematics was presented to them by their first mathematics teacher that limited their understanding. Writing on the topic 'developing mathematical understanding', Nabie (2002), stated that, One of our greatest responsibilities as mathematics teachers especially at the basic level, is to provide a sound

mathematical foundation of children under our care. Unfortunately, this may be impossible due to our attitude towards mathematics and anxieties learning it. Mathematics anxiety may be due to poor teaching and bad experiences in mathematics which typically leads to mathematics anxiety. Nabie said that, good mathematics teachers try to help children to understand mathematical structures rather than to become competent in calculation techniques. Many students usually demonstrate an over reliance on procedures in mathematics as opposed to actually understanding the mathematics. When one tries to memorize procedures, rules and routines without much understanding, the mathematics is quickly forgotten and panic soon sets in.

Norwood (1994) emphasized that mathematics anxiety did not appear to have single cause, but was, in fact, the result of many different factors such as truancy, poor self image, poor coping skills, teacher attitude and emphasis on learning mathematics through drill without understanding. When a student is away during lessons he/she will not understand anything. However, Greenwood (1984) further stated that the principal cause of mathematics anxiety has been in teaching methodologies. He said mathematics classes did not encourage reasoning and understanding. Understanding the mathematics is critical. Once students realize they can do the mathematics, the whole notion of mathematics anxiety can be overcome

Learning with understanding is very paramount to every learner and teachers feel happy when students understand lessons. There is, therefore, the need to break all barriers that block understanding or create anxiety. Acelajado (2003) designed an experiential study to determine the effects of using technology, specifically graphing calculators, on students' achievement in

college algebra, attitude, and anxiety in mathematics. The results in each case were tested for significant difference using the t-tests for dependent and independent samples. Significant differences were noted in the pre-test and post-test mean scores in the achievement, attitude, and anxiety of the different ability groups in favour of the high ability group. No significant difference existed between the levels of anxiety of the three groups of students, although the use of graphing calculators was found to reduce their anxiety scores. This presupposes that some activities in school have the tendency to either impede or improve on students' performance. Students in the Colleges of Education in Ghana are adults. The tutors therefore, need to know how to relate with them in order to create and maintain an enabling environment for teaching and learning of mathematics. Some students need just a word of encouragement to put them on gear.

Kidd (2003) said that in terms of college students and relational teaching, it seems that once again, the level of comfort had much to do with whether or not these students experienced a reduction in mathematics anxiety. For many college students, using manipulative was a new experience. Having to learn for the very first time how to use manipulative, along with trying to learn mathematics from the manipulative, even increased some subjects' mathematics anxiety. Overall, the more structured the environment the more comfortable these college students felt and the more likely their anxiety decreased.

Also, in terms of pre-service teachers and relational teaching, Kidd (2003), feels that if they were taught how to teach their students mathematics and not just how to do mathematics, then mathematics anxiety would

decrease. Furthermore, some of the pre-service teachers involved in the studies did experience a reduction in mathematics anxiety because they enjoyed using manipulative and developed a deeper understanding in mathematics. However, like other populations, some pre-service teachers felt more comfortable learning instrumentally and participating in a more structured environment. Therefore, their mathematics anxiety did not decrease as a result of relational teaching.

Zaslavsky (1994) asserted that mathematics taught in school is very responsible for many of these mathematics misconceptions. If these myths stem from school, it seems likely mathematics anxiety can infect a student at a very young age. However, teacher trainees need confidence and understanding to be able to do away with these misconceptions.

Mathematics as a male domain

Gone are the days, when mathematics was said to be reserved for men and any woman seen to be good in mathematics or showing positive attitude towards mathematic was seen to be queer. It is evident that these misconceptions could discourage females from learning mathematics. Most text books and classroom examples were always framed using males. As part of the 1987 Educational reforms the Government of Ghana, in its way to check gender bias and inequality or non representation of females, introduced, Science, Technology and Mathematics Educational (STME) clinics to encourage and sustain the participation of females in Science, Technology and Mathematics in The Senior Secondary Schools (Awotwi, 1998). The clinics which were initially focused on Senior Secondary School girls, now involve boys and girls from the Junior Secondary Schools.

Far back in the 1980s, Eshun (1987) conducted studies on senior secondary school students' achievement. The result indicated that, males in single sex senior secondary school achieve higher than their females counterparts. But achievement is highest in single sex senior secondary school when compared with achievement of males and females in mixed senior secondary school. Besides, both males and females in mixed and single-sex secondary school at the 'O' level and 'A' levels have positive attitude towards mathematics. In this modern era, it is believed that what men can do women can also do. In fact, some of the misconceptions about mathematics brought about people's attitude towards mathematics. But, attitude towards something or an object or an idea is situational and if not checked can lead to under achievement in mathematics. Learning mathematics at the secondary school may not be the same as in the teacher training college. There is the need to also examine students' attitude at the colleges

Hanson (1997), indicates that mathematics anxiety is females' dispositions toward mathematics. Hence achievement and participation in mathematics are believed to be socialised, inculcated by a society that tend to view mathematics as a male domain and which perpetuates the idea that males are naturally more mathematically inclined.

In a study on Attitude toward Self, Social Factors, and Achievement in Mathematics, Ma and Kisbor (1997), noted that Research on gender-role standards in educational activities can be traced back to the 1950s. Carey, (cited in Ma & Kisbor,1997), found that, for college students, gender differences in problem-solving are in part a reflection of their attitudes toward the gender-appropriateness of problem-solving, and that gender differences

can be diminished through group discussions about gender-role standards. Milton, (cited in Ma & Kisbor, 1997), demonstrated that when problems to be solved are made less appropriate to the masculine gender role, gender differences in problem-solving activities that can be previously observed tend to disappear. At the school level, Stin and Smithells, (cited in Ma & Kisbor, 1997), found that both boys and girls considered arithmetic activities masculine. The concept of gender-role standards (perceptions of gender appropriateness in educational activities) was formally proposed by Kagan (cited in Ma & Kisbor), who observed that, second and third graders considered many school-related objects and activities feminine. This concept was substantially developed later through the examination of age and gender differences in children's gender role standards about achievement.

In a study to examine the effects of type of school and sex of teacher on attitudes toward mathematics of female students in Plateau State, Nigeria, the result indicated that generally, the females have positive attitudes toward mathematics. The highest proportion of females demonstrating positive attitudes toward mathematics was found in all-girls' secondary schools where mathematics is taught by female teachers while the lowest proportion was in co-educational secondary schools where mathematics is taught by male teachers (Mallam, 1993).

Anxiety learning and teaching of mathematics

The aspect of anxiety in mathematics education is still an area that needs further investigation to fully understand its level of occurrence and management. Williams (1988), in an attempt to explain the causes of Mathematics anxiety said it has its roots in teaching and teachers; and has

been tied to poor academic performance of students, as well as to the effectiveness of elementary teacher. Miller (1985) also remarked that mathematics anxiety is a popular expression in social and academic circles. Fears of mathematics, avoidance of mathematics, and even poor attitude towards Mathematics are often associated with the popular term mathematics anxiety. Richardson and Suinn, (cited in Miller 1985) claimed that Mathematics anxiety involves feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of Mathematical problems in a wide variety of ordinary life and academic situations. This is in conformity with Fennema and Sherman (1976). Fennema and Sherman described mathematics anxiety as something involving strong feelings of fear and apprehension when faced with the possibility of dealing with a mathematics problem. The mood of a learner is a very important factor that can influence the rate and amount of learning at any particular time. Teacher trainees who experience constant failure in mathematics up to the training college level are more likely to show dejection and apathy for mathematics than those who always experience success. Betz (1978) and Tobias (1980) asserted that most students feel anxious and tense when manipulating numbers and solving mathematical problems. Mathematics anxiety is a psychological state engendered when a student experiences or expects to lose self-esteem in confronting a mathematical situation. Such anxiety prevents a student from learning even the simplest mathematical task. It has been found that negative feelings and attitudes toward mathematics intruded on the development of formal reasoning powers.

Researchers have developed instrument for measuring students' mathematics anxiety. For example, (Dutton, 1954; Dutton & Blum, 1968) developed Mathematics Anxiety Rating Scale to measured "feelings" toward arithmetic. Some researchers developed scales dealing exclusively with mathematics anxiety. Examples of such scales are the Mathematics Anxiety Rating Scale (Richardson & Suinn, 1972), the Mathematics Anxiety Rating Scale–Revised (Plake & Parker, 1982) and the Mathematics Anxiety Questionnaires (Wigfield & Meece, 1988). But Mathematics Anxiety Rating Scale (Woods, 2008; Eshun, 1987) was found appropriate to use in this study. Regardless of the precise measure used, the prevalence of mathematics anxiety appears to be high. For example, in a study of over 9,000 American students, Jones (2001) found that 25.9% had a moderate to high need of help with mathematics anxiety. It is unclear what the prevalence of mathematics anxiety is in the United Kingdom, but our studies and anecdotal evidence suggests the prevalence may be similar to the American studies. Further, mathematics anxiety is not restricted to students studying the Arts subjects. Our work and those of colleagues in the United Kingdom suggest that a portion of students of subjects that include some specialist mathematics knowledge, including Psychology and Engineering, experience mathematics anxiety (Sheffield & Hunt 2007). However, the situation of anxiety learning and teaching of mathematics in the Colleges of Education in Ghana is not very clear. Therefore, there is the need to investigate into colleges of education in Ghana trainees' anxiety level for teaching mathematics.

Accumulation of fear leads to anxiety. And learning mathematics with anxiety can be harmful to the development of any country. Mathematics

anxiety is very real and occurs among many learners of Mathematics (Curtain-Phillips, 2008). Teacher trainees are both learners and at the same time teachers in a making. It may sound ironic training learners with mathematics anxiety to become teachers of the subject. There are several causes of mathematics anxiety that have been identified by researchers and educators that include; mathematics myths, classroom experiences and/or attitudes, teaching methods, and family. Although some of this information is based on research, much of the information included in this section is based on experiences researchers and educators have had.

From the researcher's own experience as a mathematics teacher, some students do well during mathematics lessons and assignments, yet fail to perform well in mathematics semester examination due to being over anxious to pass. Others too, though anxious, are still willing to teach it. Although there are many diverse reasons influencing teacher trainees doing mathematics, and teaching mathematics, one prevalent variable worth considering is mathematics anxiety, the focus of this study.

Studies by Karp (1991), to document the teaching behaviour and instructional method of elementary school teachers when engaged in mathematics instruction and the relationship with their attitude towards Mathematics had the following: the daily experience of students in mathematics classes of teachers with positive attitudes were found to be substantially different from those of students in classrooms of teachers with negative attitudes. The data suggest that these teachers with both similar profession backgrounds and students of comparable abilities engaged in dissimilar instructional activities. The findings indicated that, overall, teachers

with negative attitudes towards mathematics, employ methods that fostered dependency, whereas, teachers with positive attitude were found to encourage students' initiative and independence. The identified instructional differences have ramifications for all students. Karp studies investigated on teachers already in the field. Their negative attitudes may be traced back to the days of learning mathematics as students. Again, a teacher with negative attitude towards mathematics creates tension and discomfort in his/her class.

In a similar study, Hart (1987) measured four factors of student teachers' anxieties and their relationships to pupil disruption in class. It was noticed that, student teachers' 'evaluation' anxiety showed the highest positive correlation with pupil disruption followed by class control anxiety 'teaching practice requirements' anxiety showed a statistically significant correlation but a non-significant partial correlation with pupil disruption. Anxiety arising from pupil and professional concerns showed no statistically significant correlation with pupil disruption levels in the student teachers' classrooms. A high level of anxiety among student teachers has been found in association with observed class control problems (Petrisich, cited in Hart, 1987), and has indeed been suggested as a cause of these problems in some cases (Preece, cited in Hart, 1987).

It seems timely and worthwhile, therefore, to inquire whether teaching practice anxiety comprised more than one measurable factor and whether there were any particular forms of teaching practice anxiety which were most clearly associated with classroom disruption.

Studies on school related attitudes of 11-year-old pupils in spacious and space-restricted classrooms results showed that pupils in spacious

classrooms expressed more favourable attitude towards their class image. They also claimed to conform more closely to classroom more and to have better relationships with their teachers as compared with pupils in space-restricted classrooms. The findings, though tentative, do suggest that spatial aspects of the classroom environment may have significant consequences for school-related attitude amongst primary school pupils (Clift et al., 1984),

Awanta (2000) claims that relationship between anxiety and learning of Mathematics is complex. Anxiety as a form of arousal of alertness, of paying attention can be helpful in learning. But too much anxiety, especially when combined with real or perceived lack of ability or complicated by distractions, can seriously hinder learning.

Hackworth (1985) asserted that most mathematics anxious people who remember these school experiences claim they occurred in elementary school when learning fractions. Few of the mathematics anxious people claim it began in junior high school, though some say their mathematics confidence was pretty good until they took algebra or geometry. If mathematics anxious students did not become anxious in elementary or junior high schools, they often did in college due to a first course in calculus. Hackworth identifies three mathematics topics studied in school that seem to be "stumbling blocks": fractions, algebra or geometry, and calculus. He claims one reason for this could be the teachers' attitudes when teaching these particular concepts. Hackworth says Elementary school teachers, especially when approaching the teaching of fractions, often express fear or dislike of mathematics.

It is common for these experiences to begin in teacher training college with prospective teachers. Therefore, in school and for that matter teaching;

what we say, do or may not say or do, has an influence in our classroom out comes.

Teaching methods used in a Mathematics classroom seem to have an effect on mathematics anxiety (Martinez, 1987; Greenwood, 1984; Lazarus, 1974). These anxieties and attitudes normally make teachers and students embrace or shy away from new educational programmes. When mathematics lesson is presented so abstract to learners or teaching without building on pre-requisite learning, it puts learners on the road to anxiety. Greenwood (1984), suggests that mathematics anxiety is, "a problem whose solution lies almost entirely within the domain of mathematics education", (p. 662) and that the "major source of mathematics anxiety lies in the impersonal, non- growth, non-rational methodologies that are characterized by the 'explain-practice-memorize' paradigm", (p. 663). In support, Williams (1988) claims teachers should accommodate various learning styles. She says that, those students who learn best through a tactile and/or kinaesthetic approach, will learn more meaningfully through manipulative aids

Every teacher has his or her own 'bag of tricks' that may work effectively. However, all conscientious teachers are constantly searching for new ideas and techniques to adopt in their classrooms. When one tries to memorize procedures, rules and routines without much understanding, the Mathematics is quickly forgotten and panic soon sets in. Teachers and parents have an important role to ensure that students understand the mathematics being presented to them to avoid anxiety learning mathematics and unsatisfactory performances.

Zakaria and Nordin (2008) provided evidence to show the effects of mathematics anxiety on matriculation students as related to motivation and achievement. The results showed that the mean achievement scores and motivation scores of low, moderate and high anxiety groups were significantly different. Findings also revealed a low ($r = -0.32$) but significant ($p < 0.05$) negative correlation between mathematics anxiety and achievement and also a strong ($r=-0.72$) significant ($p<0.05$) negative correlation between mathematics anxiety and motivation. Zakaria and Nordin study also revealed a low but significant positive correlation ($r=0.31$) between motivation and achievement. But as to whether this influenced attitude of students was silent

In 2003, Kidd conducted a study to evaluate whether or not, relational teaching reduces mathematics anxiety. Four of the eight studies pertaining to relational teaching support the idea that relational teaching reduce mathematics anxiety. Four of the eight studies do not support this idea. In terms of elementary school students and relational teaching, researchers feel that the reason relational teaching reduced mathematics anxiety is because students were learning Mathematics with an emphasis on true understanding. These students liked using hands-on manipulative to learn, and the setting was small and comfortable. However, elementary school students who experienced a reduction in their mathematics anxiety due to instrumental learning did so, according to researchers, because the topic they were learning was quite algorithmic. As a result, drill-and-practice and memorization were enough to succeed. Kidd said, in terms of high school students and relational teaching, reduction in mathematics anxiety due to relational teaching did not occur because students were learning an abstract mathematics—one in which

memorization is not enough to succeed. These students found it easier to be shown and told how to do algebra instead of having to truly understand it. Overall, it seems the comfort level played a significant part in whether or not high school students' mathematics anxiety was reduced by relational teaching.

Steele and Arth (1998) explain further that, this all too common cycle includes explaining how to do the problems, doing the problems, memorizing the formula/algorithm for the problems, correcting the problems, and assessing whether or not the problems are understood through a test. Steele and Arth believe this cycle is a leading source of mathematics anxiety. A significant part of the, 'explain-practice-memorize' teaching method, is the lack of making connections. If teachers, according to Steele and Arth (1998), are not relating mathematics to real life, then students have a difficult time connecting mathematics to anything relevant. Taylor and Brooks (1986) state, "When students can relate mathematics to their daily lives, they begin to relax and to develop an interest and enjoyment in mathematics". According to Steele and Arth (1998), when relationships are not made, students spend much of their time learning and practicing mathematics concepts they do not truly understand. Because students cannot connect mathematics to anything, they turn to memorization as a survival tactic. As a result of memorizing pieces of information here and there, mathematics makes no sense to students and the road to becoming anxious is now open. Steele and Arth say students begin to feel as if memorizing is their only way to succeed in mathematics. It does not take long for students to realize memorization is not the key to success in mathematics and, therefore, start to fear and avoid mathematics.

Usually, mathematics anxiety stems from unpleasant experiences in mathematics. Typically mathematics phobics have had mathematics presented in such a fashion that it led to limited understanding. Unfortunately, mathematics anxiety is often due to poor teaching and poor experiences in mathematics which typically leads to mathematics anxiety (Russell, 2008).

Tobias (1978) claims that the purpose of her book, *Overcoming Mathematics Anxiety,* was to convince women and men that have mathematics anxiety that, their fear of mathematics was the result and not the cause of their negative experiences with mathematics, and to encourage them to give themselves one more chance to reduce mathematics anxiety. In order for mathematics anxious people to give themselves one more chance, it is important to fully understand exactly how people develop mathematics anxiety. If the causes of mathematics anxiety can be pinpointed, then it is more likely that effective preventions can be implemented.

A misconception about mathematics, or mathematics myths, seems to be one of the causes of mathematics anxiety. Tobias (1978) notes another mathematics myth that says either a person has or does not have a mathematical mind. Taylor and Brooks (1986) note an extremely common myth that says males are better at mathematics than females. These mathematics myths can be detrimental to a person's ability to learn mathematics. For instance, if a student believes there is just one right answer to a mathematics problem and no manipulative can be used to solve that problem, then it could be quite easy for a student to give up after a few unsuccessful attempts. Giving up in frustration may eventually lead to a feeling of failure. This thinking can be further reinforced when the teacher

forces the student to follow exactly his or her procedures. When this happens, many times the teacher will count a problem incorrect if the student solves the problem differently from the procedure taught. Therefore, the pressure of successfully and "correctly" finding that one right solution may certainly lead to mathematics anxiety. As a result, students may avoid mathematics altogether. Furthermore, students who believe only geniuses can understand mathematics and that either a person has or does not have a mathematical mind can often succeed in some parts of mathematics and still maintain a negative outlook on mathematics—all due to these mathematics myths. Common sense indicates that these myths hold no real value.

It seems the family has a part in the development of mathematics anxiety, as well (Schwartz, 2000). Schwartz says many parents, either directly or indirectly, support another common myth which says that, being successful in mathematics is something with which a person is born. It is not uncommon to hear a parent say he or she was never good in mathematics, which explains why the child struggles. Tobias (1978) also claims that the New Mathematics of the 1960's introduced a new mathematics vocabulary. As a result, mathematics texts were rewritten and elementary teachers were now going to clinics to help them understand these changes. During this time, parents were encouraged to take a crash course in the New Mathematics so they would be able to help their children at home. This caused problems. If a parent had never taken advanced mathematics in college or did not try to learn the New Mathematics, then the child would get no support from home. Tobias thus poses how you help a child who talks about 'sets' when you have never heard of them and the child says *you* don't know what the teacher is doing. Tobias

therefore attributed students' unsatisfactory performance in mathematics to lack of support at home. On the contrary, Arem (2003) expresses some reservations about parents support in the learning of mathematics. He says that parents' lack of support is not the only way family can contribute to mathematics anxiety. Some parents push their children too much to succeed in mathematics. Arem describes a girl whose father tutored her and went over her homework every night. He would get very frustrated with her if she did not catch on fast enough and would slam the book closed. As a result, the girl started to avoid taking mathematics classes in high school because she was afraid of not pleasing her father. Discussing the disadvantages of comparing siblings in the learning of mathematics. Arem, also says that, comparing one child to a sibling who is very successful in mathematics can also cause anxious feelings about mathematics

Zaslavsky (1994) also supports parental involvement in mathematics learning. When children are especially young, parents have great opportunities to help foster and develop mathematics attitudes and learning. She emphasizes that parents have the ability to boost their child's self-esteem. Children will do much better in school and in mathematics the earlier parents begin their interventions. Also, it is crucial to intervene as soon as a child falls behind as well. Zaslavsky is thus of the view that a great way to get children involved in mathematics at home is through games. The nice part about playing games is that formal mathematics is not needed to play games involving mathematics. Zaslavsky sums up the idea of the home being such an influential learning environment: The home is the world's largest and best school system. Parents as teachers are not burdened with twenty or thirty students, nor are they

regulated by school bells and administrative duties. Home is the ideal setting for children to learn attitudes and concepts, how to ask questions, how to seek and verify knowledge. Learning how to find answers is a skill that will serve for a lifetime.

A study on helping students conquer mathematics anxiety by Arem, (2003) suggests two strategies for helping to develop a positive mathematics attitude in students. The first is an exercise on rewriting disempowering mathematics beliefs. In this exercise, common mathematics myths are listed, and each myth must be countered so that it turns into a reasonable positive belief as in figure 1.

Disempowering Mathematics Belief	Reasonable Mathematics Belief
1. Mathematics should come easily to me.	Mathematicians work hard at doing mathematics, so why should it come easily to me?
2. There's a right way to do Mathematics.	There are lots of okay ways to do anything, including Mathematics.
3. No one in my family ever succeeded in mathematics, so why should I?	I'm an intelligent and capable person; I've succeeded in a lot of things in my life; why not Mathematics?

Fig.1: Sample of rewriting disempowering mathematics beliefs by Arem (2003)

The second suggestion Arem (2003) has for developing a positive mathematics attitude is for anxious people to act on their mathematics rights. When these rights are evaluated, changed to suit the mathematics anxious person, and used with good judgment, the mathematics anxious person's attitude toward Mathematics will also become more positive. Arem identifies the following as mathematics rights: having the right to ask, "Why;" having the right to say, "I don't know" or "I don't understand;" and having the right to make mistakes in mathematics and learn from those mistakes.

However, having your mathematics rights and the freedom to exercise them depend on the attitude of the teacher and other factors. Some mathematics teachers' faces alone look scary. Some have bad personal relationships. Teachers must make every effort to create a mathematics learning environment that allows students exercise their mathematics right. This can easily promote positive attitudes towards learning mathematics. Along with positive mathematics attitudes are positive mathematics experiences. This includes a positive learning environment. The environment in which students learn is important. Williams (1988), suggests that mathematics teachers should provide a classroom in which students feel comfortable. Teachers need to closely examine their actions and reactions to students and others' actions and reactions as well, for criticizing should not take place. If any of these actions and reactions is negative, Williams says a change in the classroom environment needs to occur.

Researchers and educators have spent a great deal of time focusing on the causes of mathematics anxiety. While these causes are extremely

important to understand, it is also imperative to find ways to prevent mathematics anxiety—or in the very least, ways to lessen its effects.

Major findings of the literature review

The theoretical and the empirical review of literature brought out the following issues. Attitude in simple terms is how one thinks about, feels, believes and behaves towards a thing, an object or an idea. It is a way of behaviour which involves the three domains of human development namely the psychomotor, cognitive and affective domain. Anxiety also in sum is the feeling of nervousness or discomfort or fear of something, object or an idea.

Generally, the literature identifies several attitudinal variables. Such as; Attitude Toward Success in Mathematics Scale, Mathematics as a Male Domain Scale, Mother/Father Scale, Teacher Scale, Confidence in Learning Mathematics Scale, Mathematics Anxiety Scale, Effectance Motivation Scale in Mathematics, and Mathematics Usefulness Scale. Some researchers who developed instruments for measuring attitude towards mathematics include; Dutton (1954), Dutton & Blum (1968), Modified Fennema-Sherman Attitude Scales (Doepken, Lawsky, & Padwa, 2008) and Mathematics Anxiety Rating Scale (Richardson & Suinn, 1972); the Mathematics Anxiety Rating Scale–Revised (Plake & Parker, 1982); the Mathematics Anxiety Questionnaires (Wigfield & Meece, 1988). Anxiety Rating Scale (Woods, 2007); and Eshun, (1987).

Some of the earlier researchers on attitude towards mathematics and it's teaching and learning include; Eshun, (1999;2000); Caswell, (1996); Fennema, (1989); Betz (1978) Fennema & Sherman, (1976); Aiken (1974); Taylor, (1971); Aiken & Dreger, (1961); and Carey (1958). Most of these

identify causes and remedies. The home, the teacher, the subject itself, policy makers, and the mathematics learning environment were among other factors causing negative attitudes towards mathematics and the anxieties they have in learning and teaching of mathematics.

There was no much to find under anxiety teaching mathematics by teacher trainees. Most of the literature revolves around primary, junior secondary and senior secondary school

CHAPTER THREE

METHODOLOGY

Introduction

The chapter looks at the research design, population and sampling, research instruments, validity and reliability, data collection and data analysis procedures in the context of a descriptive research method.

Research Design

Descriptive survey design (using the cross-sectional and Delphi technique) was adapted in this study applying both qualitative and quantitative research methodologies. The study used structured closed-ended questionnaire as the main instrument to collect data along side with observation as qualitative approach which were quantified into values for interpretation. Descriptive survey design, according to Amedahe and Gyimah (2003), makes use of various data collection techniques involving observation, interview, questionnaires, attitude scale and examination of teaching documents. I used both quantitative and qualitative research methods to collect, interpret, and analyse data because according to Knupfer and McLellan (2001) , 'descriptive research does not fit neatly into the definition of either quantitative or qualitative research methodologies, but it can utilize elements of both, often within the same study'. When in-depth, narrative descriptions

of cases are involved, the researcher uses description as a tool to organize data into patterns that emerge during analysis. Those patterns aid the mind in comprehending a qualitative study and its implications (http://www.aect.org/edtech/edl/default.htm 27/11/08).

This study, reports summary data such as measures of central tendency (Mean) the spread of responses (standard deviations), percentages, and correlation between variables. Hence, it fits into a descriptive survey design. Survey research commonly includes that type of measurement, but often goes beyond the descriptive statistics in order to draw inferences. Descriptive studies can yield rich data that lead to important recommendations.

Fraenkle and Wallen (1993) listed the following as advantages of descriptive research:

1. It provides a good numbers of responses from numerous people
2. It provides a meaningful picture of events and seeks to explain people's perception and behaviour on the basis of information obtained at a point in time
3. It can be used with greater confidence with regard to particular questions which are of special interest and values to a researcher
4. In-depth follow-up questions can be asked and items that are not clear can be explained.
5. It is very easy to analyse the responses obtained from the respondents.

They also provide the following demerits:

1. Answers can vary greatly depending on the exact wording of questions or statements.

2. It can produce untrustworthy results because they may delve into private and emotional matters that respondents may not be completely truthful about

One major weakness of descriptive research is that, answers to descriptive research do not enable us to understand why people feel or think or behave in a certain way, why programs pose certain characteristic, why a particular strategy is used at a certain time and so forth. As a result, our understanding of a situation, group or phenomenon is limited.

In spite of these couple of demerits, the rationale for this design chosen was to enable more respondents to be questioned fairly quickly and observed at less cost and also since questions are structured, there would be less bias in analysing the data yielded. There would also be less influence from the dynamics of interpersonal variable such as personality influences. Also it allows for greater degree of accuracy, reliability, standardizations of measurement and the uniqueness of the study; much information can be obtained from individual respondent of the population. Finally, not so much involving in terms of time and energy

Population and Sampling

Identifying the population of a research is a sine qua non since no research is carried out in a vacuum. It is, therefore, imperative to know the target population in order to decide on what sample size to use for the research. Nworgu (2006) classifies population into target and accessible. The target population is all the members of a specified group to which the investigation is related, while the accessible population is defined in terms of those elements in the group within the reach of the researcher.

Population

The target population of this study were all teacher trainees in the Upper East Region, Upper West region, Brong Ahafo Region and Central Region of Ghana. The accessible population was all final year groups of teacher trainees in the selected regions. The subjects were 820 final year teacher trainees, 413 males and 407 females, on the field for teaching practice. The final year students were chosen because they had gone through the course content and methods of teaching mathematics in the teacher training college and were more appropriate. Secondly, they were out for teaching practice and had more experience about the teaching and learning of mathematics in their one year internship.

Sample

A hybrid sampling method was used to arrive at the sample population. Three colleges: College A in the Upper East Region, College B in the Upper West region and college C in Central Region were selected based on convenience, proximity or closeness at hand (Kannae, 2004). Besides, the researcher had established good rapport with them and was familiar with the three colleges and could get access to the facilities and support.

Purposive sampling was used to select final year students in the three colleges because of their advantage of three years experience and was appropriate for the study. In purposive sampling, the researcher handpicks the cases to be included in the sample on the basis of judgement of their typicality and uniqueness, or particularly knowledgeable about the issues under study. Thus, in purposive sampling, also known as judgemental sampling, the

researcher purposely chooses subjects whose opinions are thought to be relevant to the research topic (Amedahe & Gyimah, 2003).

To ensure adequate representation of essential categories of the population and increase in sampling precision for generalization, 20% of the assessable population representing 160 teacher trainees from all the three colleges were selected to represent the sample size. Convenience sampling was used to select

Table 1 shows the breakdown of teacher trainees in the accessible population and sample population from the various colleges.

Table 1

Teacher Trainees by College Population and Sample size

College	Population	Sample
College A	270	55
College B	250	50
College C	300	55
All	820	160

However, trainees that were readily available in schools the researcher could reach were used. Thus, convenient sampling technique was used to select 55 out of 60 trainees in College A, 55 out of 70 from college C. Accidental sampling was used to select 50 out of 250 teacher trainees from college B. This was because they were readily available and could be used.

Table 2 shows the breakdown of the teacher trainees by college and sex

Table 2

Sex Distribution of Sampled Trainees by Colleges

College A		College B		College C		
Male	Female	Male	Female	Male	Female	All
28	27	30	20	25	30	160

Instrumentation

One of the most popular instruments used in research over the last three decades is the Fennema-Sherman Mathematics Attitude Scales (1976) which has clearly been the most popular instrument in research about attitudes toward mathematics. This study used two sets of questionnaire (The Modified Fennema-Sherman Attitude Scale with self constructed items and Mathematics Anxiety Rating Scale), consisting of 36 items and divided into two parts. I adapted and used these two sets of questionnaires of the Likert type scale with the assistance of the supervisor. According to Best and Khan (1989), the likert type scale enables respondents to indicate the degree of their beliefs and feelings about a given statement or object.

Part 1 of the questionnaire requested for background information on the respondents. Part 2 consisted of items or statements to which the student was required to agree or disagree to reflect his/her feelings and attitudes towards mathematics.

Table 3 shows the weights attached to responses to the part 2 A of the questionnaire on attitude towards learning. The likert scale of attitude score was used.

Table 3

Weight Attached to Responses on the Attitudinal Dimensions

Statement	5 SA	4 A	3 U	2 D	1 SD
1. Taking mathematics is a waste of time	√				
2. I am sure I can do mathematics.					√

Table 4 shows the weights attached to responses to the part 2B of the questionnaire on anxiety learning mathematics. The likert scale of anxiety score was used.

Table 4

Weight Attached to Responses on Anxiety Teaching Mathematics

Statement	1 SA	2 A	0 U	-1 D	-2 SD
1. I have visible signs of nervousness such as sweaty palms, shaky hands, and so on right before and during mathematics lessons.	√				
2. I feel confident teaching mathematics.					√

The statements in part 2A were grouped to form six attitudinal variables, each regarded as a dimension along which a score reflected a positive or negative attitude of trainees. That is, 29 of the Modified Fennema-Sherman Attitude Scale and Wood (2008) items were adopted as attitude questionnaires to determine the following dimensions in students: confidence in doing mathematics, usefulness of mathematics, like doing mathematics, understanding mathematics, mathematics as a male domain and anxiety learning mathematics to investigate trainees' attitude towards Mathematics.

The part 2B consisted of 7 self constructed statements and selected Mathematics Anxiety Rating items from Eshun (1987), to measure trainees anxieties in teaching mathematics (See Appendix B).

Table 5 shows the six attitudinal and typical variables and typical statements in the questionnaire that reflect the attitude being measured

Table 5

Attitudinal Variables and Typical Items

Item	Variable	Statement	SA	A	U	D	SD
3	Confidence	I am sure I can learn mathematics					
22	Usefulness	I study mathematics because I know how useful it is					
25	Like Maths	I really like studying mathematics					
19	Understanding	It takes me time to understand any idea in mathematics					
18	Male Domain	studying mathematics is good for women as for men					
26	Anxiety learning	I am always under a terrible strain in a mathematics class					

The items were placed into seven independent variables. Each variable consisted of a collection of various items of the questionnaire into a unit that point to specific aspect of the attitude or anxiety towards mathematics. For example, a statement 'I become physically agitated when I have to go to mathematics class' brings out the feeling of 'anxiety in mathematics'. Mixtures of positive and negative statements were included to increase the internal consistency of the questionnaire.

Table 6 shows the classification of the questionnaire items (see Appendix B)

Table 6

Questionnaire Items Contributing to the Various Dimensions by Nature of Statement

Attitude Variable	Statement	
	Positive	Negative
Confidence in mathematics	3, 9	7, 13, 21
Usefulness of mathematics	22	6, 8, 20,
Mathematics as a male domain	4, 10, 18	5
Understanding mathematics	14, 15, 16	11, 19,
Like doing mathematics	12, 17, 24, 25	23,
Anxiety learning mathematics	27,	26, 28, 29,
Anxiety teaching mathematics	30, 32, 33, 34	31, 35, 36

In addition to the questionnaire, empirical verification was done via observation on trainees teaching mathematics. This was so, because, a descriptive statement is regarded as true if and only if it is found to correspond with observed reality. The ultimate test of the truth or falsity of an empirical statement is the test of observation (Anderson, 1971). Although, some behaviour cannot be seen within observation or some observations may be play acted because of the presence of the observer and also the problem of organizing information after observation, it has many advantages which include:

- It helps to watch and describe behaviour the way it occurs in a natural setting.

- Empirical evidence and first hand information will be obtained, since the study will involve action and behaviour;
- Things are seen the way they are in reality.
- The observation method has the advantage of collecting data on actual behaviour rather than self reported behaviour or perceptions.

The researcher employed a "rapport" along side. This is because some important facts or information about the attitude of the teacher trainees towards Mathematics cannot be obtained from questionnaire. All the Vice Principals and Teaching Practice Coordinators in the three colleges were, therefore, interviewed orally during the rapport to find out how trainees accept teaching mathematic during posting.

Validity and Reliability of the Instruments

Other researchers suggest that students may find mathematics to be simply unappealing or socially unacceptable, although they may actually have high aptitude. In any case, it is crucial that any investigation of attitudes is assessed with an instrument that has good technical characteristics if research conclusions are to be meaningful (Tapia & Marsh II, 2004). To validate the instruments, the questionnaire and observation check list were discussed with colleagues known to be critical mathematics friends and expert lecturers in the Department of Mathematics and Science Education about the content against the research questions, Since one of the means of achieving content validity is by expert judgement (Guy, 1987). 98 questionnaire items (Appendix A) were constructed and discussed with colleagues and the supervisors.

The 98 questionnaire items were pilot tested first at Komenda Training College. Pilot study helps the researcher to decide whether the study is

feasible and whether it is worthwhile to continue. It provides the opportunity to assess the appropriateness and practicality of the data collection instruments. It permits a preliminary testing of the hypothesis (research questions), which may give some indication of its tenability and suggest whether refinement is needed. It will be able to demonstrate the adequacy of the research procedures and the measures that may have been selected for the variables. Unanticipated problems that appear may be solved at this stage, thereby saving time and effort later, (Ary, Jacobs and Razavied, 1990). To estimate internal consistency of the scores, Cronbach alpha was calculated and the reliability coefficient found to be 0.68. Of the 98 items, 36 had item-to-total correlations above 0.58 and the highest being 0.62. This suggested that most of the items contributed to the total inventory.

An item deletion process was performed in order to increase the value of alpha. Items were deleted based on their item-to-total correlation. 72 items which had correlations lower than 0.58 were deleted one at a time starting with the one with the lowest item-to-total correlation. After deleting 72 items, the alpha reached a value of 0.71.

The questionnaires were finally reduced in consultation with the researcher's supervisor to 36 after corrections by dropping those found not to be suitable and also to make a balance of positive and negative items. The items were pilot tested finally at Bechem training college which has similar characteristics as the sample colleges. The revised inventory had a mean of 93.7, standard deviation of 11.3and the alpha value was 0.70 indicating a high degree of internal consistency for group analyses.

Scoring the Items of the Instruments

Value labels were assigned to sex and college as follows: Male = 1 and female = 2. College 'A' as labelled 1 College 'B' as 2 and College 'C' as 3.

The responses of the various instruments were scored using the five point scale and weight, depending on whether the item was worded positively or negatively. All the items were rated on a scale of 1 to 5 with 1 being *disagreed strongly* and 5 being *agreed strongly*. The negatively worded items were noted and were transformed during data analyses by recoding into the same variable group in order for a high score to indicate a favourable mathematical self-concept.

Table 7 shows the rating scale of the responses to the items based on the wording.

Table 7

Rating Scale for the Responses

Rating	Positive wording	Negative wording
Strongly agree	5	1
Agree	4	2
Not certain	3	3
Disagree	2	4
Strongly disagree	1	5

A total score of 34 indicates the least score and a total score of 170 the highest attitude score of a person. The mean score for each variable was determined by dividing the total score by the total frequency.

The responses to the Anxiety level for teaching mathematics questionnaires were scored from -2 (strongly disagree) to 2 (strongly agree). That is,

-2 SD: strongly disagree

-1 D: disagree

0 NA: not applicable; no opinion

+1 A: agree

+2 SA: strongly agree

A score of less than zero means slight anxiety level for teaching mathematics (better) and a score of > 0 but ≤ 1 means moderate anxiety level for teaching mathematics (good). A zero score indicate no anxiety (best). A score more than one means high anxiety level for teaching mathematics (bad). For a reverse scored questions, the scoring was transformed for all negative statement in to the same variable group for uniformity. The totals for each anxiety scale were then averaged to give a single value in the range from -2 to +2. This scoring procedure is similar to Kaatz (2006) with slight modifications in the interpretation.

However, all analyses and values obtained from this study were done by the statistical computer application software called the Statistical Package for Social Sciences (SPSS)

Data Collection Procedure

The data collection procedure determines the outcome of the study results. It was, therefore, imperative to adopt a standard, workable method of collecting the relevant data to ensure that the results of the study would be acceptable. It is acceptable to carry out a preliminary survey to appreciate

some of the knotty issues that could impede the successful conduct of the research hence the need for a preliminary survey to this study.

Preliminary survey

A preliminary survey was carried out to enable me to modulate the questionnaire, identify available and credible sources of data, and ascertain any challenges likely to hinder the smooth conduct of the study.

In order to obtain maximum cooperation from the respondents and also have access to credible sources of secondary data, the researcher visited the selected colleges and sought permission from the Principals through a letter from the Department of Science and Mathematics Education, UCC (See Appendix B). This was to enable me not only to gain entry for the study but to confirm current programmes, study the time table, and to arrange for contact persons and identify Informants. Meeting schedules were arranged with them. The researcher finally visited the colleges and was led by the Teaching Practice Coordinator to the trainees who were out on their teaching practice. The purpose of the study and the rationale for them to answer the items independently was explained to the teacher trainees involved and their mentors before the instruments were administered. The Teaching Practice Coordinator and the mentor assisted in the distribution and collection of the questionnaires. I waited and collected the instruments back on the same day after the trainees had responded to them.

Procedure

The questionnaire was administered to all the trainees in the classrooms and supervised by the researcher and mentors of the trainees. I collected the completed questionnaires from the trainees and prepared a data file using the statistical computer application software called the Statistical

Package for Some Solutions (SPSS) by assigning identity numbers to cases and preparing variable list and names. The responses were analyzed by colleges and sex. The tests for relationships were conducted at 0.05 level of significance.

Data Analysis and Presentation

This study used a mix-method (both qualitative and quantitative) to analyse data. Knupfer and McLellan (2001) remarked that, any measured quality has just the magnitude expressed in its measure and quantities are of qualities. According to an International Program for Development Evaluation Training – 2007, whether you choose qualitative data or quantitative data, you will find your data collection and data analysis will overlap. Tesch, cited in Fara Jr., Brown, and Mangione (2002), also indicated that, 'a process of data analysis is eclectic; there is no 'right way''. Creswell, cited in Fara Jr., et al. (2002), also noted that, ''unquestionably, there is not one single way to analyze qualitative data- it is an eclectic process in which you try to make sense of the information. Thus, the approaches to data analysis espoused by qualitative writers will vary considerably'', (p.28). The study was interested in describing students' attitudes towards Mathematics both within and between college systems and to understand the anxieties and attitudes of final year students who had three years experience in the college.

Mix- methods were used to enable the researcher to;

- elaborate or develop analysis, providing richer detail
- initiate new lines of thinking through attention to surprises or paradoxes, "turning ideas around" and providing fresh insight.

The completed questionnaires collected were counted to determine the response rate. Even though, there was a 100% return, yet, there were five uncompleted items which were interpreted as undecided. The data gathered was coded and the results analysed under each variable. Both descriptive and inferential statistics were used.

The choice of the SPSS software package over the other packages was because: 1. that is the software package the researcher is familiar with. 2. of large sample size to use manual calculation. The main inferential statistics used in testing the hypotheses were the independent t-test and the ANOVA. The One-Way ANOVA procedure produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable. Analysis of variance is used to test the hypothesis that several means are equal. In addition to determining that differences exist among the means, I want to know which means differ. Hence, one way ANOVA tests and Turkey's HSD (Honestly Significant Difference) tests were used to compare the mean attitudes scores and mathematics anxiety level scores of the different mathematics anxiety groups. The Pearson product correlation coefficients of the trainees' attitudes scores and mathematics anxiety level scores were calculated to explain the possible relationships between these variables.

Finally, the correlation coefficients between attitudinal variables were also presented. The independent sample t-test was used against other inferential tests for the anxiety teaching mathematics because I wanted to compare the mean scores of two groups that were different and indifferent (Fraenkel & Wallen, 2000). The two groups of participants (male and female)

have their individual opinions. Secondly no population information is known. And finally the two subjects in the two groups are not matched.

Presentation of results

I used descriptive statistics such as tabulation, frequencies, mean, standard deviations and percentages to make inferences and used statements to describe the findings. The necessary statistical procedures are presented and the results presented according to the research question. Conclusions from relevant related literature are captured along to authenticate the findings of this study.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents the results, analyses and discussion of the data gathered from the respondents. It entails an overview of statistical procedures, presentation of results by research questions and hypotheses. It also includes other findings and a summary of the chapter.

Overview of Statistical Procedures

This overview provides an inside of the statistical procedures used to analyse results for discussions and drawing conclusions.

The analyses and discussions are focussed on the six attitudinal variables and the seven anxiety rating items for Anxiety level for Teaching Mathematics. The Statistical Package for Social Sciences (SPSS) soft ware package was used to analyse the data gathered in this study. The tables presented in this chapter look at relationships, the spread, measures of associations and proportions. How pairs of attitudinal variables are correlated positively or negatively with the attitude dimension in which they are component parts are all looked at under this section. The means, standard deviations, percentages, and correlations are used to make comparisons and

relationships. In addition to determining what differences exist among the means, the researcher wants to know which means differ. Hence, the independent sample t-test and the ANOVA were carried out at the analyses of the difference in anxiety teaching mathematics and attitude towards learning mathematics respectively by college and gender. The results have been presented under each of the research questions and the hypotheses formulated.

Findings and discussions

The following findings were obtained from the data analysis and are presented as tables and interpretations are done according to the relevant tables. All the details of the findings from the individual questionnaire items were not tabulated here owing to limitation of time and space. However, the discussion will not be limited to those tabulated only. Relevant information from the individual items that indicates a peculiar case will be commented on.

Research question one

Research question one was formulated as follows:

What is teacher trainees' attitude towards learning mathematics along the following dimensions?

a. confidence in learning mathematics,

b. usefulness of mathematics,

c. understanding learning mathematics,

d. like doing mathematics,

e. male domain, and

f. anxiety learning mathematics

The attitude scores of trainees in each of the colleges were put together. Descriptive and inferential statistical indices for each sex and college were found.

Table 8 shows the percentage of trainees selecting positive (strongly agree or agree) or negative (strongly disagree or disagree) response on the attitude scale on Confidence in Learning Mathematics. The table shows that teacher trainees have confidence in learning mathematics. More than three quarters of the trainees agreed with the statements 'I am sure I can do mathematics' (item 3); 'I am not the type to do well in mathematics' (item 7) and 'most subject I can handle ok, but I just can't do a good job with mathematics' (item 13).

Table 8

Percentage of Trainees Responding to the Various Items on Confidence in Learning Mathematics

Item	Positive	Neither	Negative
3.	93.1	2.5	4.4
7.	80	5	15
9.	58.1	10.9	25
13.	75.0	2.5	22.5
21.	66.9	9.4	23.9
All	**73.4**	**7.3**	**18.2**

The least confirmed statement was "I think I could handle more difficult mathematics" (item 9) with slightly more than half of the trainees responding to it.

Table 9 shows the means of scores of responses on 'confidence in learning mathematics' in all the colleges by sex. The table shows that the mean scores for all trainees in the sample colleges were more than 3 for both sexes and in all colleges. The spread in individual colleges was a little more in males than in females in college A and in college C. But indicating more in females than in males in college B. The independent sample t-test is used to test whether the difference were significant.

Table 9

Means of Responses on Confidence Learning Mathematics by College and Sex

		Sex		
College		Male	Female	All
A	n	28	27	55
	$\bar{x}$	3.99	3.90	3.95
	s	0.76	0.60	0.68
B	n	30	20	50
	$\bar{x}$	3.81	3.95	3.88
	s	0.70	0.73	0.63
C	n	25	30	55
	$\bar{x}$	3.92	3.84	3.88
	s	0.81	0.71	0.76
All	**n**	**83**	**77**	**160**
	$\bar{x}$	**3.90**	**3.89**	**3.90**
	s	**0.75**	**0.67**	**0.13**

The hypothesis tested was as follows:

H_0: There is no significant difference between the confidence of males and females trainees' towards learning mathematics in college A, B, C and all colleges

H_1: There is significant difference between the confidence of males and females trainees' towards learning mathematics in college A, B, C and all colleges

Table 10 shows the independent sample t-test used to compare the means between males and female in the individual and all colleges. The table shows that the research hypothesis was not rejected for all colleges.

Table 10

Independent Sample t-test on Sex and Confidence in Learning Mathematics by College

	t-test for Equality of Means		
	t	df	sig
College A	0.48	53	0.63
College B	-1.17	49	0.25
College C	0.41	52	0.68
All	**-0.10**	**158**	**0.93**

The t-test value of -0.10 is less than the table value of 1.96. this shows that the t-test with 158 degree of freedom was not significant at 0.05 confidence level. The researcher, therefore, fails to reject the null hypothesis. No significant differences were found between males and females trainees' towards learning mathematics in collgegs A, B and C. The researcher, therefore, fail to reject null hypothesis

Table 11 shows the raw counts of the responses to the likert scale on usefulness in Learning Mathematics. The table shows that over half the trainees in the study reacted positively to all the items on usefulness of mathematics dimension. The three highest positive responses were for the statements; 'I don't expect to use much mathematics when I get out of school'; 'taking mathematics is waste of time' and 'I study mathematics because I know how useful it is'. The least positive item for usefulness of mathematics was 'mathematics is not important in my life'.

Table 11

Percentages of Trainees Responding to the Various Items Constituting Usefulness of Mathematics

Item	Positive	Neither	Negative
6	76.2	6.9	16.9
8	75.6	6.2	18.1
15	56.9	3.8	39.4
20	55.6	7.5	36.9
22	71.3	10.0	18.8
All	**68.1**	**6.5**	**26.4**

Table 12 shows the means of scores of responses on 'usefulness in learning mathematics' in all the colleges by sex. The spread in individual colleges was a little more in male than in females in college B and more in females than in males in college A. But, indicating almost the same in college C.

Table 12

Means of Responses on Usefulness of Mathematics by College and Sex

		Sex		
College		Male	Female	All
A	n	28	27	55
	$\bar{x}$	3.71	2.79	3.25
	s	0.43	0.68	0.56
B	n	30	20	50
	$\bar{x}$	3.39	3.68	3.54
	s	0.71	0.41	0.56
C	n	25	30	55
	$\bar{x}$	3.48	3.47	3.48
	s	0.63	0.64	0.64
All	**n**	**83**	**77**	**160**
	$\bar{x}$	**3.52**	**3.25**	**3.39**
	s	**0.61**	**0.70**	**0.66**

The independent sample t-test is used to test whether the difference were significant (appendix C). However, there was significant difference between males' and females' attitudes towards the usefulness in learning mathematics in Colleges A and for understanding mathematics in college B.

The effect size in colleges A and B were calculated to determine the extent of the effect. Cohen &Manion (1988) classifies effect size values into the following categories: $d < 0.2$, means small; $0.2 < d < 0.8$ means medium and $d > 0.8$ large mean difference where d= effect size. Hence the effect size

in college A was calculated to be 0.68, indicating that the difference between the means was medium. For understanding mathematics in college A was 0.16 which shows that the mean difference was small.

Table 13 shows the raw counts of the responses to the likert scale on 'Mathematics as a male domain'. The table shows that more than half of the trainees indicated positive response to the statements 'it is hard to believe a female could be a genius in mathematics' and 'females are as good as males in geometry'. Also, slightly less than half of the trainees did not support the statements 'males are not naturally better than females in mathematics' and 'studying mathematics is just as good as for women as for men'. The least response was in statement 'females are as good as males in geometry'

Table 13

Percentages of Trainees Responding to the Various Items Constituting Mathematics as Male Domain

Item	positive	neither	negative
4	43.8	11.9	34.4
5	56.9	5.6	37.5
10	60.6	15.6	23.7
18	43.1	10	46.9
All	**51.8**	**6.7**	**41.5**

Table 14 shows the means and standard deviations of responses on 'Mathematics as a male domain' by college and sex. The table shows that males responded more positively than females in all the colleges but the mean score of females is higher than males in college B and lower in college A and C.

These differences were subjected to independent sample t-test to determine whether the differences were significant.

Table 14

Means of Responses on Mathematics as Male Domain by College and Sex

		Sex		
College		Male	Female	All
A	n	28	27	55
	$\bar{x}$	3.57	2.79	3.28
	s	0.93	0.75	0.84
B	n	30	20	50
	$\bar{x}$	3.44	3.61	3.53
	s	1.02	0.93	0.98
C	n	25	30	55
	$\bar{x}$	3.20	3.13	3.11
	s	0.19	0.80	0.50
All	**n**	**83**	**77**	**160**
	$\bar{x}$	**3.41**	**3.14**	**3.58**
	s	**0.96**	**0.87**	**0.91**

Table 15 shows the Independent Sample t-test used to compare the means of responses on attitude towards 'Mathematics as a male domain'. The table shows that the research hypothesis was not supported. The t-test value of 1.90 is less than the table value of 1.96. This shows that the t-test with 158 degree of freedom was not significant. The researcher therefore fails to reject the null hypothesis.

Table 15

Independent Sample t-test on Sex and Mathematics as a Male Domain

	t-test for equality of means		
	t	df	sig (2 tailed)
College A	3.40	53	0.00
College B	-0.63	49	0.53
College C	0.31	52	0.76
All	**1.90**	**158**	**0.06**

Table 16 shows Percentages of Trainees Responding to the Various Items to the likert scale on understanding learning mathematics.

Table 16

Percentages of Trainees Responding to the Various Items Constituting Understanding Learning Mathematics

Item	Positive	Neither	Negative
11	63.7	14.4	21.9
15	74.4	7.5	18.1
16	83.8	4.4	11.8
19	75.6	6.2	28.2
All	**65.1**	**8.1**	**27.8**

The table shows that over half of the trainees in the study reacted positively to all the items on the scale on understanding learning mathematics. The three highest positive responses were for the statements; 'I feel at ease in mathematics and I like it very much'; 'it takes me too much time to understand

any idea in mathematics'; and 'I'll need a good understanding of mathematics for my future work'. The least positive response was in; 'I sometimes avoid mathematics class because I cannot understand anything'. The table shows trainees have positive attitude towards understanding mathematics.

Table 17 shows the means and standard deviations of responses on 'understanding mathematics' by college and sex. The table shows mean score differences between males and females which were subjected to independent t-test to determine whether the difference was significant

Table 17

Means and Standard Deviations of Responses on Understanding Learning Mathematics by College and Sex

		Sex		
College		Male	Female	All
A	n	28	27	**55**
	$\bar{x}$	3.64	3.56	**3.60**
	s	0.50	0.50	**0.50**
B	n	30	20	**50**
	$\bar{x}$	3.63	3.59	**3.61**
	s	0.57	0.40	**0.49**
C	n	25	30	**55**
	$\bar{x}$	3.69	3.61	**3.65**
	s	0.59	0.60	**0.60**
All	**n**	**83**	**77**	**160**
	$\bar{\mathbf{x}}$	**3.65**	**3.59**	**3.62**
	s	**0.55**	**0.51**	**0.53**

The research hypothesis was not supported. The t-test value of 0.75 for all colleges is less than the table value of 1.96 (appendix C). This shows that the t-test with 158 degree of freedom was not significant. The researcher therefore, fail to reject the null hypothesis and conclude that the differences between the means is not significant

Table 18 shows the raw counts of the responses to the likert scale on like doing mathematics.

The table shows that, about three-quarters of the trainees indicated highest positive attitude in the statements; 'when I hear the word mathematics, I have a feeling of dislike' and 'I am interested in solving mathematical problems';

Table 18

Percentages of Trainees Responding to the Various Items Constituting Like Doing Mathematics

Item	positive	neither	negative
12	76.2	5.6	18.1
17	63.1	2.5	34.4
23	76.9	2.5	15
24	55.6	8.5	36.9
25	61.0	6.9	32.5
All	**62.6**	**6.6**	**27.2**

Table 19 shows the means and standard deviations of responses on attitude towards 'like doing mathematics' by college and sex. The table illustrate that males show a positive characteristic of the attitudinal variable 'like doing mathematics' than females with distribution of the scores slightly

spread out in males than in females in college A, college C and for all colleges, but indicating more in females than in males in college B.

Table 19

Means and Standard Deviations of Responses on Like Doing Mathematics by College and Sex

		Sex		
College		Male	Female	**All**
A	n	28	27	**55**
	$\bar{x}$	3.80	3.50	**3.65**
	s	0.80	0.67	**0.74**
B	n	30	20	**50**
	$\bar{x}$	3.48	3.84	**3.66**
	s	0.66	0.85	**0.76**
C	n	25	30	**55**
	$\bar{x}$	3.64	3.43	**3.54**
	s	0.75	0.69	**0.69**
All	**n**	**83**	**77**	**160**
	$\bar{x}$	**3.64**	**3.56**	**3.60**
	s	**0.74**	**0.74**	**0.74**

Table 20 shows the Independent Sample t-test used to compare the means of responses on attitude towards 'like doing mathematics'. The table shows that the research hypothesis was not supported. The t-test value of 0.64 in all colleges is less than the table value of 1.96. This shows that the t-test with 158 degree of freedom was not significant. The researcher therefore fails to reject the null hypothesis. No significant differences were found between males and

females trainees' towards like doing mathematics in collgegs A, B and C. The researcher, therefore, fail to reject the null hypothesis

Table 20

Independent Sample t-test on Sex and Like Doing Mathematics

	t-test for Equality of Means		
	t	df	sig (2 tailed)
College A	1.49	53	0.14
College B	-1.67	49	0.10
College C	1.09	52	0.28
All	0.64	158	0.52

Table 21 shows the raw counts of the responses to the likert scale on Anxiety in Learning Mathematics. The table shows that, teacher trainees have positive anxiety learning mathematics. The three highest positive responses with over half of the trainees were in items 35(how I wish mathematics would be completely deleted from my course curriculum), item 26 (I am always under terrible train in learning mathematics) and item 33 (I tend to lose my concentration in mathematics class) the least positive response was in item 28 (I always feel like learning mathematics all the time). The responses from the table shows trainees do not have anxiety learning mathematics.

The responses on trainees having 'anxiety learning mathematics' by college and sex (appendix C), illustrate differences in means between males and females. These differences were subjected to independent sample t-test for significance

Table 21

Percentages of Trainees Responding to the Various Items Constituting Anxiety in Learning Mathematics

Item	positive	neither	negative
26	55.0	3.8	41.2
28	34.4	3.8	61.9
32	51.9	8.1	40
33	55.0	4.4	40.6
34	43.1	2.5	54.4
35	61.3	3.1	35.6
All	**59.06**	**4.3**	**45.5**

Table 22 shows Independent Sample t-test on Sex and Anxiety Learning Mathematics. From the table, the researcher, therefore fail to reject the null hypothesis and conclude that, trainees from the various colleges do not differ by males and females in anxiety learning mathematics.

Table 22

Independent Sample t-test on Sex and Anxiety Learning Mathematics

	t-test for Equality of Means		
	t	df	sig (2 tailed)
College A	-0.27	53	0.79
College B	0.93	49	0.36
College C	-0.92	52	0.36
All	**-0.25**	**158**	**0.81**

Table 23 shows the percentage of trainees selecting positive (strongly agree or agree) responses on the attitude scale by college. The table shows

that over half the students in the study reacted positively to all the six attitudinal variables measured. The highest score expression of positive attitude variable was in confidence in learning mathematics in all colleges. This contradicts Karp's (1988; 1991) findings that pre-service elementary teachers have low confidence in learning mathematics`. Also, usefulness in college B had the highest score expression of positive attitude variable.

Notably, college B had highest in four out of the six attitudinal variables to rank highest in all the dimensions. Trainees in college C expressed the least positive attitude in male domain and in all the dimensions measured as well as had the highest anxiety learning mathematics. Less than half of the trainees in all colleges had mathematics anxiety. As many as three quarters of the trainees expressed confidence in learning mathematics in college A and B. This contradicts Ma (1999) pre-service elementary teachers lacked confidence and that, among the elementary teachers she observed, "Not a single teacher… would promote learning beyond his or her own mathematical knowledge. Another contradiction is the finding of Furner and Duffy (2002) that many children, including those with disabilities and those without disabilities, as well as adults, do not feel confident in their ability to do mathematics. This result supports the claim by Brown, cited in Kidd, (2003), that Students' attitude towards learning of mathematics can be situational and unpredictable depending on their confidence level. The table also shows that about two-fifth of the trainees in college C showed the least positive attitude response among the colleges. The result shows that trainees in all the three colleges together showed positive attitude towards mathematics in all the six attitudinal dimensions measured. This finding is consistent with Eshun (2000) that in

general, secondary school students had positive attitudes towards Mathematics especially along the attitudinal variables, usefulness of Mathematics, like Mathematics and success in doing Mathematics.

Table 23

Percentage of Trainees Selecting Positive Responses for Various Attitudinal Dimensions in all Colleges

Attitude Variables	Percentage Positive Responses			
	College A	College B	College C	**All**
Confidence in learning maths	75.0	74.9	74.1	**74.7**
Usefulness of the mathematics	69.0	80.4	70.3	**73.2**
Male domain	52.3	60.7	44.1	**53.0**
Understanding mathematics	67.3	68.2	65.5	**67.0**
Like doing mathematics	67.2	68.6	64.1	**66.7**
Anxiety learning mathematics	50.4	49.3	52.1	**50.3**
All	**63.5**	**68.0**	**61.7**	**64.2**

Table 24 shows the mean scores and standard deviations of the six attitude dimensions by sex. The table shows that the mean scores for both sexes in the sample population were above average for all attitude variables. This is consistent with the results in Table 14 and shows that the trainees selected more positive items of the attitude dimensions.

The standard deviation of 0.66 for all the variables shows that both sexes attitude towards learning mathematics were homogeneous i.e. at about the same level. The most positive responses by both sexes were for confidence in learning mathematics, understanding mathematics and like doing

mathematics in that order. The table confirms that trainees in all the colleges have positive attitudes in all the six dimensions.

Table 24

Mean scores and standard deviations of Attitude variable by Sex

Variables		Male	Female	**All**
Confidence in learning maths	$\bar{x}$	3.92	3.87	**3.90**
	S	0.75	0.67	**0.71**
Usefulness of maths	$\bar{x}$	3.52	3.45	**3.49**
	S	0.61	0.70	**0.66**
Maths as a male domain	$\bar{x}$	3.59	3.57	**3.58**
	S	0.96	0.87	**0.92**
Understanding mathematics	$\bar{x}$	3.65	3.59	**3.62**
	S	0.55	0.51	**0.53**
Like doing mathematics	$\bar{x}$	3.64	3.56	**3.60**
	S	0.74	0.74	**0.74**
Anxiety learning mathematics	$\bar{x}$	3.42	3.44	**3.43**
	S	0.36	0.32	**0.34**
All	$\bar{x}$	**3.63**	**3.58**	**3.61**
	S	**0. 66**	**0.64**	**0.65**

The table shows males expressed confidence in learning mathematics, see mathematics as useful, have understanding and like doing mathematics more than the females. This is consistent with Fennema and Sherman's (1978) finding that females tend to have less confidence than males in learning mathematics. The result is also consistent with Wilmot's (2001) finding that there was a significant difference in achievement in favour of boys...

However, trainees had almost the same mean score in male domain and anxieties in learning mathematics dimensions. That is students do not differ in their attitudes towards male domain and no difference in anxiety learning. This is consistent with Otchey's (2000) claim that, male and female students do not differ in their attitudes towards mathematics. Also Appiah-Ofori (1993) report that male and female students do not differ in their attitudes towards mathematics

Table 25 shows the mean scores and standard deviations of Attitude variable by college. The mean scores for all the colleges were above average for all attitudinal dimensions. This is, consistent with the tables on the mean score by sex presented in Table 15. The standard deviations in all the dimensions measured show homogeneity among the respondents in all the colleges.

It is significant to note from the results that college B scored the highest in three of the dimensions (usefulness, male domain and like doing). College C had the highest in two dimensions (understanding and anxiety learning) and College A had the highest in only confidence learning mathematics dimension. The overall highest score is in confidence in learning mathematics and the lowest in mathematics as male domain.

The overall score shows trainees have positive attitude towards all the dimensions measured and in the individual colleges. This finding supports Eshun (2000), that in general the students had positive attitude towards mathematics especially along the attitudinal variables, usefulness of mathematics, like mathematics and success in doing mathematics.

Table 25

Mean Scores of Attitude Variable by College

Variables		College A	College B	College C	**All**
Confidence in learning maths	$\bar{x}$	3.95	3.88	3.88	**3.90**
	S	0.68	0.63	0.76	**0.69**
Usefulness of maths	$\bar{x}$	3.45	3.54	3.48	**3.49**
	S	0.56	0.56	0.64	**0.66**
Maths as a male domain	$\bar{x}$	3.57	3.60	3.54	**3.58**
	S	0.84	0.98	0.50	**0.91**
Understanding mathematics	$\bar{x}$	3.60	3.61	3.65	**3.62**
	S	0.50	0.49	0.60	**0.53**
Like doing mathematics	$\bar{x}$	3.65	3.66	3.54	**3.60**
	S	0.74	0.76	0.69	**0.74**
Anxiety learning mathematics	$\bar{x}$	3.41	3.42	3.45	**3.43**
	S	0.37	0.34	0.34	**0.34**
All	$\bar{x}$	**3.61**	**3.62**	**3.59**	**3.61**
	S	**0.61**	**0.62**	**0.59**	**0.61**

The one way Analysis of variance (ANOVA) was conducted to find out whether there are differences in attitude among the three colleges trainees learning mathematics. The null hypotheses of non-significant difference in attitude among the colleges were tested using the ANOVA on trainees' scores at 0.05 alpha level.

Table 26 shows the result of the one-way Analysis of variance (ANOVA).

Table 26

One-Way ANOVA Results for the Difference of Trainees' Attitude towards Learning

Dimension		Sum of sq.	df	Mean Square	F	P
Confidence	Between groups	0.112	2	0.056	0.110	0.896
	Within groups	80.195	157	0.511		
	Total	80.305	159			
Usefulness	Between groups	1.704	2	0.852	1.939	0.147
	Within groups	69.00	157	0.439		
	Total	70.704	159			
Male domain	Between groups	3.828	2	1.914	2.270	0.107
	Within groups	132.344	157	0.843		
	Total	136.171	159			
Understanding	Between groups	0.046	2	0.023	0.081	0.923
	Within groups	44.451	157	0.283		
	Total	44.496	159			
Like doing	Between groups	0.519	2	0.259	0.306	0.737
	Within groups	86.121	157	0.549		
	Total	86.600	159			
Anxiety	Between groups	0.073	2	0.037	0.306	0.737
	Within groups	18.195	157	0.120		
	Total	18.869	159			
Attitude	Between groups	0.246	2	0.123	0.857	0.426
	Within groups	22.544	157	0.144		
	Total	22.790	15			

The outcome of this analysis shows that, there were no significant differences in attitude towards learning mathematics among trainees in the three colleges (with $F<3.00$ $p> 0.05$ in all colleges). This finding is inconsistent with Peker and Mirasyedioğlu's (2008) conclusion that there were statistically significant differences found between the attitudes of pre-service elementary school teachers towards mathematics according to their learning styles. Also Lowman (1987) observed that students vary greatly in the way they approach the work assigned and the degree to which they apply their intellectual talents.

No significant difference was found (Appendix C) between males and females trainees attitude towards learning mathematics along the dimensions; like doing mathematics, Mathematics as a male domain, and anxiety learning mathematics in the three colleges. Similar findings that males do not differ from females significantly in attitudes and performance includes Sokpe (2000), that the males' responses did not differ from the females'.
Kpemlie (1993) findings that males and females could perform equally well in all content areas.

It was hypothesized that: There is no correlation between the scores of the various attitudinal variables for all the colleges.

Table 27 shows the Correlation Coefficients between scores of the various attitudinal variables for trainees in all colleges. The table shows that, apart from anxiety in learning mathematics, all the other variables correlated positively with confidence in learning mathematics and significantly at 0.05 levels (2-tailed) except male domain and anxiety learning mathematics. The results again indicated that there was very weak or no correlation between

anxiety learning mathematics and the other variables except understanding mathematics.

The most positive and significant correlation coefficients were between 'confidence in learning mathematics' and the variables 'like doing mathematics', 'understanding mathematics' and 'usefulness of mathematics' and also between 'usefulness of mathematics' and the variables 'male domain' and 'understanding mathematics'. Only six pairs (confidence and usefulness; confidence and understanding; confidence and like doing; at one side and also between usefulness and male domain; usefulness and understanding; and usefulness and like doing mathematics on the other side) had their correlation coefficient significant at 0.05 levels.

There was a low but positive (r=0.16) correlation between understanding and like doing mathematics and a low (r=-0.14) but significant ($p<0.05$) negative correlation between mathematics anxiety and understanding. This is consistent with Zakaria and Nordin's (2008) findings that there were low (r =-0.32) but significant ($p < 0.05$) negative correlation between mathematics anxiety and achievement and also a strong (r=-0.72) significant ($p<0.05$) negative correlation between mathematics anxiety and motivation.

The strongest($r = 0.50$) and significant ($p< 0.05$) correlation coefficient was found between the variables, like doing mathematics and confidence learning mathematics. Only five pairs had their correlation coefficient significant at 0.01 levels. Also, a pair of variables had their correlation coefficients significant at 0.05 levels.

Table 27

Correlation Coefficients between Attitudinal Variables for Trainees in all Colleges

Attitude variable	Con	US	MD	UN	LD	AL
Confidence (Con)	1					
Usefulness (US)	0.30**	1				
Male domain (MD)	0.06	0.42**	1			
Understanding (UN)	0.30**	0.31**	0.01	1		
Like doing (LD)	0.50**	0.28**	0.14	0.16**	1	
Anxiety Learning (AL)	-0.04	0.09	-0.04	-0.12*	-0.01	1

**Correlation is significant at 0.05 levels (2-tailed)

Research Question two

Research question two was formulated as follows:

What is Teacher Trainees' Anxiety level for teaching Mathematics?

Table 28 shows the percentage of trainees selecting positive (strongly agree or agree) or negative (strongly disagree or disagree) response on items for Anxiety teaching Mathematics. The table shows that teacher trainees have slight anxiety level teaching mathematics. Less than half of all the trainees responding to items on the variable expressed having anxiety in teaching mathematics. This result is consistent with Kidd (2003) that pre-service elementary school teachers have less anxiety teaching mathematics and that teaching techniques did not have any significant influence on the level of mathematics anxiety. Also, the result was consistent with the following studies; Cohen & Leung (2004) that while pre-service elementary school teachers are somewhat mathematics anxious at the end of the course, their level of mathematics

anxiety was substantially reduced and their anxiety was often related to specific mathematics topics that they had not yet mastered. Warfield, Wood and Lehman's (2005) conclusion that pre-service elementary school teachers have anxiety in learning to teach mathematics and that the tasks of learning to teach differ across the continuum. Betz (1978) and Tobias's (1980) asserted that most pre-service elementary school teachers feel anxious and tense when manipulating numbers and solving mathematical problems. Miller (1985) saw in his investigation that mathematics anxiety is a popular expression in social and academic circles and affect teaching in basic schools. Curtain-Phillips (2008) findings also indicated that Mathematics anxiety is very real and occurs among many learners of Mathematics in the colleges of pre-service. Zakaria & Nordin (2008), findings that, Mathematics anxiety is prevalent among the pre-service elementary school teachers' population;

Also, the result shows that while, slightly more than one tenth showed no anxiety teaching mathematics, twice as many indicated high anxiety level teaching mathematics. More than half of the trainees have slight to moderate anxiety level teaching mathematics. That is, 32% of the trainees have slight anxiety level teaching mathematics. About one-quarter of the trainees indicated moderate anxiety level teaching mathematics, however, about 4% remained neutral in response to the questionnaire.

The most expression of no anxiety level for teaching mathematics was obtained in item 35 (how I wish mathematics teaching would have been deleted from teaching practice subject) and item 36 (I sometimes feel nervous going to teach Mathematics). The least expression of no anxiety was in item 31 and item32 (Mathematics teaching makes me feel uncomfortable, restless,

irritable, and impatient; and I have no trouble teaching mathematics respectively). More than one quarter of the trainees had slight anxiety level teaching mathematics in all the items. The most expression of high level of anxiety teaching mathematics is in item 31 (Mathematics teaching makes me feel uncomfortable, restless, irritable, and impatient) The least expression of high anxiety level teaching mathematics was for the statements 'I sometimes feel nervous going to teach Mathematics'. Less than one-tenth indicated they were undecided.

Table 28

Percentages of Teacher Trainees' responding to various levels of Anxiety for Teaching Mathematics Questionnaire items

Item	No Anxiety	undecided	Slight	moderate	High
30	7.4	3.7	30.2	30.9	26.5
31	1.2	3.1	34	22.2	38.3
32	1.2	5.6	36.4	30.9	24.7
33	7.4	1.2	34.6	24.1	31.5
34	10.5	6.2	30.9	27.8	23.5
35	27.2	8.0	30.2	24.1	27.2
36	23.5	1.2	27.8	20.2	9.3
All	**11.2**	**4.1**	**32.0**	**25.7**	**22.1**

Table 29 shows the means and standard deviations of responses on 'anxiety teaching mathematics' by college and sex.

Table 29

Means of Responses on Anxiety Teaching Mathematics by College and Sex

		Sex		
College		Male	Female	All
A	$\bar{x}$	0.17	0.15	0.16
	S	0.59	0.58	0.59
B	$\bar{x}$	0.20	0.22	0.21
	S	0.58	0.62	0.60
C	$\bar{x}$	0.13	0.15	0.14
	S	0.58	0.55	0.57
All	x	0.17	0.18	0.18
	S	0.58	0.58	0.58

The table shows that, the spread was a little more in males than in females in college A and in college C, but indicating more in females than in males in college C. It is shown also that, while the mean score of males and females in all colleges and college A are the same, there are differences in means of college B and college C. These differences are subjected to the independent sample t-test to determine whether the differences are statistically significant.

The hypothesis tested was:

H_0 : there is no significant difference between male and female teacher trainees anxieties in teaching mathematics

Table 30 shows that the research hypothesis was not supported. The t-test value of -0.24 and -0.68 for college B and college C respectively were

not significant. The researcher, therefore, does not reject the null hypothesis and conclude that the difference between the anxiety teaching mathematics of males and females by trainees is not significant in college B and college C. The implication is that teacher trainees in the training colleges of education do not differ in sex with regards to anxiety teaching mathematics.

Table 30

Independent Sample t-test on Sex and Anxiety Teaching Mathematics

	t-test for Equality of Means		
	t	df	sig (2 tailed)
College B	-0.24	49	0.81
College C	-0.68	52	0.50

The findings in this study on the dimension anxiety teaching mathematics show that, Teacher Trainees have negative anxiety teaching mathematics. This is consistent with a study by Miller (1985), that the general attitude exhibited by the participants in the study was found to be negative and that, students' Mathematics anxiety was not greater than that of the average adult's. He indicated that mathematics anxiety is a threat to our society's intellectual advancement and remarked that, a teacher's attitude is a potent force in the classroom. This means that, if mathematics anxiety is not handled well, it can cause students' poor performance. Teachers are a very important educational influence on students' learning of mathematics. Miller added that, College and University personnel should become more attuned to the anxieties and attitudes of pre-service elementary teachers.

This study again is consistent with that of Karp (1991) that, overall, teachers have negative attitudes towards teaching mathematics. The study shows that the only negative response in all the variables measured was in anxiety teaching mathematics where less than half of the students confirmed having anxiety in teaching. This shows that in this study, even though trainees have high percentage response from anxiety learning mathematics, they still have fears in teaching mathematics more than in learning. Karp added that, such teachers employ methods that fostered dependency, whereas, teachers with positive attitude were found to encourage students' initiative and independence. The identified instructional differences have ramifications for all students. Other researchers that found high mathematics anxiety among student teachers include Tobias (1978), and Hart (1987).

Performing one-way Analysis of variance (ANOVA) on trainees' scores at 0.05 alpha level, research hypotheses of non-significant difference in attitude between males and females among colleges were tested.

Table 31 shows the result of the one-way Analysis of variance (ANOVA). The outcome of this analysis shows that there were no significant differences in levels of anxiety teaching mathematics among trainees in the three colleges (with $F<3.00$ $p> 0.05$ in all colleges). This finding is consistent with Acelajado's (2003) that no significant difference existed between the levels of anxiety of the three groups of students, although the use of graphing calculators was found to reduce their anxiety scores

Table 31

Results of the one-way Analysis of Variance (ANOVA) on trainees' anxiety teaching mathematics among the three colleges

	Sum of Squares	df	Mean Square	F	P
Between groups	0.429	2	0.107	0.326	0.860
Within groups	50.967	157	0.329		
Total	51.396	159			

Table 32 shows the relationship between trainees' attitude towards learning mathematics and their anxiety for teaching mathematics using Pearson product-moment correlation coefficient. The result shows low positive correlation between the variables (r=0.237, n=160, p=-value <0.01). This suggests that low positive attitude towards learning mathematics is associated with low positive anxiety level for teaching mathematics. While high positive attitude towards learning mathematics is associated with high positive anxiety level for teaching mathematics.

A correlation analysis of the data indicates that trainees attitude towards learning mathematics and anxiety level for teaching mathematics are significantly negatively related, r=0.002,p=0.01, two tail. As trainees attitude towards learning mathematics increases so does their anxiety level for teaching mathematics becomes better and the vice versa. This indicates that trainees with positive attitude towards learning mathematics generally will have less anxiety teaching mathematics.

Table 32

Correlation Coefficients between Attitude towards Learning Mathematics and Anxiety Level for Teaching Mathematics

Variable		attitude	anxiety
Attitude		1	
Anxiety	Pearson correlation	- 0.237**	1
	Sig (2 tailed)	0.002	
	N	160	160

**. Correlation is significant at the 0.01 level (2-tailed).

There is therefore, enough evidence to reject H_0 and conclude that there a significant relationship between trainees' attitude towards learning mathematics and their anxiety level teaching mathematics

Summary of the chapter

The results of this study show that in general, the trainees had positive attitudes towards learning mathematics especially along the attitudinal variables, confidence in learning, usefulness of the mathematics, understanding mathematics and like doing mathematics in descending order. But, the trainees were least positive about the dimension male domain and anxiety learning mathematics. This finding is consistent with that of Eshun (2000) who claimed that the students had positive attitudes towards mathematics especially along the attitudinal variables, usefulness of mathematics, like mathematics and success in doing mathematics. It was also significant from the results that both males and females showed positive attitude towards confidence in learning mathematics, usefulness of the

mathematics, male domain, and understanding mathematics, like doing mathematics and anxiety learning mathematics in the individual colleges.

The study shows no significant difference between males and females trainees' attitude towards learning mathematics. However, significant differences were found between males and females in the variables; usefulness of mathematics in college A and understanding mathematics in college B. The effect sizes were respectively calculated to be 0.60 and 0.26 indicating that the differences between the means were medium and large in that order

The result shows that when all the variables were correlated to determine their relationships, it was noticed that, apart from anxiety in learning mathematics and male domain, all the other variables correlated positively and significantly ($p<0.05$) with confidence in learning mathematics. There were other negative relationships that existed between: male domain and anxiety learning mathematics; male domain and understanding mathematics. The strongest($r = 0.50$) but significant ($p< 0.05$) correlation coefficient was found between the variables like doing mathematics and confidence learning mathematics. Only five pairs had their correlation coefficient significant at 0.01 levels. Also, a pair of variables (like doing mathematics and understanding learning mathematics) had their correlation coefficients significant at 0.05 levels.

The outcome of the research hypotheses of non-significant difference in attitude among the colleges tested using the one way Analysis of variance (ANOVA) on trainees scores at 0.05 alpha level shows that, there were no significant differences in attitude towards learning mathematics among trainees in the three colleges (with $F<3.00$ $p> 0.05$ in all colleges).

The result shows that 32% of the trainees have slight anxiety level teaching mathematics. About one-quarter of the trainees indicated moderate anxiety level teaching mathematics, while, slightly more than one tenth showed no anxiety teaching mathematics, twice as many indicated high anxiety level. However, about 4% remained neutral in response to the questionnaire.

Teacher trainees in the training colleges of education do not differ in sex with regards to anxiety teaching mathematics. The result of the one-way Analysis of variance (ANOVA) shows that there were no significant differences in anxiety teaching mathematics among trainees in the three colleges (with $F<3.00$ $p> 0.05$ in all colleges)

The relationship between trainees' attitude towards learning mathematics and their anxiety level for teaching mathematics determined using Pearson product-moment correlation coefficient shows low negative correlation between the two variables ($r = -0.237$, p-value <0.01). A correlation analysis of the two variables indicated that trainees attitude towards learning mathematics and anxiety level for teaching mathematics were significantly and negatively related,(sig. value=0.002)

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

An overview of the research problem, methodology and key findings are presented in reference to the findings. Each finding is evaluated and implications examined with respect to the current theoretical and educational practice. Conclusions, specific limitations of the research are provided in this chapter. Recommendations and suggestions for future studies are also given.

Summary of the Study

The study investigated teacher trainees' attitude towards learning mathematics and the anxiety level for teaching mathematics in the internship programme. Hypotheses on differences between male and female teacher trainees' attitudes towards learning mathematics, differences among colleges and correlation between the scores on the various attitudinal variables for all the colleges were investigated.

Five anxiety levels (high positive, low positive, not applicable, low negative and high negative) for teaching mathematics were investigated. The difference between males and females trainees' anxiety levels and differences in anxiety level among colleges, for teaching mathematics were investigated.

The accessible population was the 2008/2009 third year group teacher trainees. The subjects were 820 final year teacher trainees, 413 males and 407 females, on the field for teaching practice. Convenience sampling was used to select 55 out of 270 trainees from College A and 55 out of 300 from college C, for both colleges. Accidental sampling was used to select 50 out of 250 teacher trainees from college B. Descriptive survey design was adapted. Questionnaires were used as the main tool to collect data. The data gathered from the questionnaire were analysed quantitatively. The results of the study indicated among other things the following:

1. Nearly all teacher trainees had positive attitudes towards learning mathematics especially along the attitudinal variables, confidence in learning mathematics, understanding mathematics, like doing mathematics, and male domain. However, the trainees were least positive about usefulness of mathematics and anxiety learning mathematics.
2. Even though male teacher trainee trainees showed more positive attitude in all the dimensions than female teachers, the difference was not significant, indicating that, both male and female trainees have positive attitude towards learning mathematics. However, significant differences were found between males and females in the variables; usefulness of mathematics in college A and understanding mathematics in college B. The effect sizes were calculated to be 0.60 and 0.26 indicating that the differences between the means were medium and large respectively. The difficulty in measuring attitudes of persons especially when they

are made aware of being tested is the tendency for respondents to pretend or distort the information they provide. Hence, it is not likely for female trainees to accept that mathematics is a male domain nor would trainees who lack confidence in mathematics to respond in the affirmative. Hence, the homogeneity among the respondents is unlikely to be repeated.

3. There were no significant differences in the attitudinal dimensions in the three colleges trainees attitude towards learning mathematics (with $F< 3.00$ $p> 0.05$) and all the variables correlated significantly ($p<0.05$) with confidence in learning mathematics except anxiety learning mathematics and male domain. There were other relationships that existed between: male domain and anxiety learning mathematics; male domain and understanding mathematics. The strongest ($r = 0.50$) correlation coefficient was found between the variables, like doing mathematics and confidence learning mathematics. Only five pairs had their correlation coefficient significant at 0.05 levels. Also, a pair of variables (like doing mathematics and understanding learning mathematics) had their correlation coefficients significant at 0.05 levels.
4. The result showed that, slightly more than one tenth showed no anxiety teaching mathematics; twice as many indicated high anxiety level teaching mathematics. More than half of the trainees had slight to moderate level of anxiety teaching mathematics. 32% of the trainees showed slight anxiety level teaching mathematics.

About one-quarter of the trainees indicated moderate anxiety level teaching mathematics. However, about 4% remained neutral in response to the questionnaire.

5. The correlation coefficients were positive and significant, though the values were very low.
6. No significant difference between males and females anxiety level for teaching mathematics among trainees in the three colleges (with $F<3.00$ $p> 0.05$ in all colleges) were found.
7. The relationship between trainees' attitude towards learning mathematics and their anxiety level for teaching mathematics shows low negative correlation between the two variables ($r = -0.237$, $n=160$, p=-value <0.01) and were significantly positively related,(sig. value =0.002, two tail)

Conclusions

The following conclusions were drawn from the results of the analysis:

1. Attitude towards learning mathematics.

a. Trainees showed positive attitude towards confidence in learning mathematics. No significant difference between males and females trainees confidence in learning mathematics was found.

b. Trainees showed positive attitude towards usefulness in learning mathematics. No significant difference was found between males and females trainees' attitude towards usefulness in learning mathematics and among all colleges. However, there was significant difference between males' and females' attitudes towards the usefulness in learning mathematics in Colleges A

c. Trainees showed positive attitude towards Understanding learning mathematics in all colleges. No significant difference was found between males and females trainees and among colleges attitude towards Understanding learning mathematics, except in college B.

d. Trainees showed positive attitude towards like doing mathematics. No significant difference between males and females trainees like doing mathematics was found.

e. Trainees showed positive attitude towards mathematics as male domain. There was no significant difference between males and females trainees attitude towards mathematics as male domain.

f. Trainees showed positive attitude towards anxiety learning mathematics. No significant difference between males and females trainees anxiety learning mathematics was found

g. No significant differences in attitude towards learning mathematics among trainees in the three colleges (with $F<3.00$ $p> 0.05$) was found. This implies that trainees in all colleges have the same attitude towards learning mathematics. There was a positive significant correlation among five of the attitudinal variables with (alpha=0.05 and 0.01).

h. Anxiety learning mathematics correlated negatively with all but one the variables.

2. Anxiety level for teaching mathematics

a. The result showed that, 32% of the trainees showed slight anxiety level teaching mathematics during the out segment programme of their internship.

b. No significant difference was found between males and females anxiety level teaching mathematics.

c. There were no significant differences in anxiety level for teaching mathematics among trainees in the three colleges (with $F<3.00$ $p> 0.05$ in all colleges).

3. There was significantly low and positive correlation between trainees' attitude towards learning mathematics and their anxiety level for teaching mathematics ($r=0.237$, $n=160$, p-value <0.01)

Recommendations

The study's findings show that if the teacher trainees developed confidence in learning mathematics, like doing mathematics, were aware of the usefulness of mathematics and understand learning mathematics, they would have less anxiety learning mathematics. These positive attitudes towards learning mathematics could be passed on to their students too, thereby creating the multiplier effects. To this end, the following recommendations are made to inculcate positive attitude amongst teacher trainees towards learning mathematics for the improvement of mathematics education and good of society:

1. Trainees need where possible, the opportunity to teach basic school students (instead of using their peers) during on campus teaching practise to enable them become familiar with the realities in the

classroom to reduce anxiety level further and increase their confidence level more.

2. Mentors should be present in all lessons in order to assist trainees to improve on their teaching and encourage them where they did well
3. The teaching of mathematics should be made optional where possible during the out segment of the one year internship programme. Therefore, there is the need to re-introduce and emphasis on the training of specialist mathematics teachers to allow only persons interested in the teaching of mathematics to be equipped with the necessary skills, knowledge, exposure and experiences in the teaching of mathematics.
4. The Ministry of Education, Ghana Education Service in collaboration with the Universities and Teacher Training Colleges of Education should source for funds/ sponsorship or best teacher award to cover teacher trainees to motivate them further.
5. Trainees on out segment programme should be put in clusters by the teaching practice coordinator for "reflective teaching"(using multiple embodiment principle to teach an unsuccessful lesson successfully) and demonstration lessons where a new concept can be taught through play acting, cooperative groups, visual aids, hands on activities and technology to reduce the fears in teaching mathematics by trainees further.
6. Teaching practice supervision for Continuous assessment of trainees during the out programme should be regular and severally, to identify areas still coursing anxiety teaching. This may help reduced trainees

anxiety level for teaching mathematics further and eliminating play acting during the old system of fixed day's supervision.

7. Alternating teaching between the mentors and the mentees should be put in place. Mentors should discussed unsuccessful lessons with mentees using any method appropriate. This will help trainees feel more at ease and overcome or reduce the anxiety levels in teaching mathematics further.

Suggestions for further research

1. Further research is needed to assess the effectiveness of teacher trainees on how well they do with instruction during the one year of their internship
2. Further research is needed on teacher trainees' anxiety level for teaching mathematics and impact on performance in the pupils they will be teaching.
3. Research that helps us learn about why and how to identify differences among teacher trainees, and how to adapt professional development in mathematics teaching to reach different teachers would contribute greatly to the field of mathematics teacher education.
4. There should be an investigation into the fundamentals of the psychology of learning to teach mathematics

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APPENDIX A

DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION

TELEGRAMS & CABLES:
UNIVERSITY, CAPE COAST
TELEPHONE:
042-32440/4 EXT. HEAD: 202
OFFICE: 042-34890

FACULTY OF EDUCATION
UNIVERSITY OF CAPE COAST
CAPE COAST, GHANA

Your Ref.:

Our Ref.: SED/045/

Date: 18th February, 2009.

TO WHOM IT MAY CONCERN

RESEARCH VISIT

I am introducing the bearer **MR. BOINDE BONIFACE SIGME** who is an **M.Phil** student of this Department with Registration Number **ED/MAT/07/05** is embarking on a research which will require the participation of staff/student in your institution /organization.

I would be grateful if you could give him your usual co-operation.

Thank you.

Yours faithfully,

Prof. B.A. Eshun
Supervisor

APPENDIX B

DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION

UNIVERSITY OF CAPE COAST

QUESTIONNAIRE FOR STUDENTS - PILOT TEST

PART 1

Background Information/Personal Data

(Tick one, or fill in on the blank line for others if appropriate):

1. Name of college.....

2. Sex : male [ ] female [ ]

Part II

Using this scale will help you and I find out how you feel about yourself and mathematics. On the following pages is a series of sentences. You are to mark your answer sheets by telling how you feel about them. Suppose a statement says: Example 1: I like mathematics. As you read the sentence, you will know whether you agree or disagree. If you strongly agree, circle A next to Number 1. If you agree, but not so strongly, or you only "sort of" agree, circle B. If you disagree with the sentence very much, circle E for strongly disagree. If you disagree, but not so strongly, circle D. If you are not sure about a question or you can't answer it, circle C. Now, mark your sheet, then go on and do Example 2. Do not spend much time with any statement, but be sure to answer every statement. Work fast, but carefully. There are no "right" or "wrong" answers. The only correct responses are those that are true

for you. Whenever possible, let the things that have happened to you help you make a choice.

3.	I am sure that I can learn mathematics.	A	B	C	D	E
4.	My teachers have been interested in my progress in mathematics.	A	B	C	D	E
5.	Knowing mathematics will help me earn a living.	A	B	C	D	E
6.	I don't think I could do advanced mathematics.	A	B	C	D	E
7.	Mathematic will not be important to me in my life's work.	A	B	C	D	E
8.	Males are not naturally better than females in mathematics.	A	B	C	D	E
9.	Getting a teacher to take me seriously in mathematics is a problem.	A	B	C	D	E
10.	Math is hard for me.	A	B	C	D	E
11	It's hard to believe a female could be a genius in mathematics.	A	B	C	D	E
12.	I'll need mathematics for my future work.	A	B	C	D	E
13.	When a woman has to solve a mathematics problem, she should ask a					

	man for help.	A	B	C	D	E
14.	I am sure of myself when I do mathematics.	A	B	C	D	E
15.	I don't expect to use much mathematics when I get out of school.	A	B	C	D	E
16.	I would talk to my mathematics teachers about a career that uses mathematics.	A	B	C	D	E
17.	Women can do just as well as men in mathematics.	A	B	C	D	E
18.	It's hard to get mathematics teachers to respect me.	A	B	C	D	E
19.	Mathematics is a worthwhile, necessary subject.	A	B	C	D	E
20.	I would have more faith in the answer for a mathematics problem solved by a man than a woman.	A	B	C	D	E
21.	I'm not the type to do well in mathematics.	A	B	C	D	E
22.	My teachers have encouraged me to study more mathematics.	A	B	C	D	E
23.	Taking mathematics is a waste of time.	A	B	C	D	E

24.	I have a hard time getting teachers to talk seriously with me about mathemtics.	A	B	C	D	E
25.	Mathematics has been my worst subject.	A	B	C	D	E
26.	Women who enjoy studying mathematics are a little strange.	A	B	C	D	E
27.	I think I could handle more difficult mathematics.	A	B	C	D	E
28.	My teachers think advanced math will be a waste of time for me.	A	B	C	D	E
29.	I will use mathematics in many ways as an adult.	A	B	C	D	E
30.	Females are as good as males in geometry.	A	B	C	D	E
31.	I see mathematics as something I won't use very often when I get out of high school.	A	B	C	D	E
32.	I feel that mathematics teachers ignore me when I try to talk about something serious.	A	B	C	D	E
33.	Women certainly are smart enough to					

	do well in mathematics.	A	B	C	D	E
34.	Most subjects I can handle OK, but I just can't do a good job with mathematics.	A	B	C	D	E
35.	I can get good grades in mathematics.	A	B	C	D	E
34.	I'll need a good understanding of mathematics for my future work.	A	B	C	D	E
35.	My teachers want me to take all the mathematics I can.	A	B	C	D	E
36.	I would expect a woman mathematician to be a forceful type of person.	A	B	C	D	E
37.	I know I can do well in mathematics.	A	B	C	D	E
38.	Studying mathematics is just as good for women as for men.	A	B	C	D	E
39.	Doing well in mathematics is not important for my future.	A	B	C	D	E
40.	My teachers would not take me seriously if I told them I was interested in a career in mathematics.	A	B	C	D	E
41.	I am sure I could do advanced work in mathematics.	A	B	C	D	E

42.	Mathematics is not important for my life.	A	B	C	D	E
43.	I'm no good in mathematics.	A	B	C	D	E
44.	I study mathematics because I know how useful it is.	A	B	C	D	E
45.	Math teachers have made me feel I have the ability to go on in mathematics.	A	B	C	D	E
46.	I would trust a female just as much as I would trust a male to solve important mathematics problems.	A	B	C	D	E
47.	My teachers think I'm the kind of person who could do well in mathematics.	A	B	C	D	E
48.	. Mathematics is useful for problems of everyday life.	A	B	C	D	E
49.	Math is something which I enjoy very much.	A	B	C	D	E
50	I like the easy math problems best	A	B	C	D	E
51	I don't do well in mathematics.	A	B	C	D	E
52	I have a real desire to learn mathematics	A	B	C	D	E
53	Working math problems is fun					

	Using calculators/computers makes	A	B	C	D	E
54	learning math ideas easier.	A	B	C	D	E
55	I enjoy being in math class	A	B	C	D	E
56	I like to read about mathematics outside of math class.	A	B	C	D	E
57	There is little need for mathematics in most jobs.	A	B	C	D	E
58	The instructor shows little interest in the students.	A	B	C	D	E
59	Mathematics is easy for me.	A	B	C	D	E
60	When I hear the word mathematics, I have a feeling of dislike	A	B	C	D	E
61	Most people should study some mathematics	A	B	C	D	E
62	I would like to spend less time in school doing math.	A	B	C	D	E
63	The instructor makes mathematics interesting.	A	B	C	D	E
64	I like exploring math problems using real data and calculators/computers.	A	B	C	D	E
65	Sometimes I read ahead in our math book.	A	B	C	D	E
66	Mathematics is helpful in understanding today's world.	A	B	C	D	E

67	I usually understand what is being discussed in math class.	A	B	C	D	E
68	The instructor presents material in a way that's easy to understand.	A	B	C	D	E
69	It is important to me to understand the work I do in math class.	A	B	C	D	E
70	Using calculators/computers in a math class is a waste of time.	A	B	C	D	E
71		A	B	C	D	E
72	I don't like anything about mathematics.	A	B	C	D	E
73	No matter how hard I try, I can't understand math.	A	B	C	D	E
64	I feel tense when someone talks to me about math.	A	B	C	D	E
65	Using a computer makes learning math harder than it needs to be.	A	B	C	D	E
66	The instructor knows when we are having difficulty in understanding.	A	B	C	D	E
67	The only reason I'm taking math classes is because I have to.	A	B	C	D	E
68	I often think, "I can't do it," when a math problem seems hard.	A	B	C	D	E
69	Mathematics is of great importance to a country's development.	A	B	C	D	E

70	It is important to know mathematics in order to get a good job.	A	B	C	D	E
71	I like to play games that make use of numbers.	A	B	C	D	E
72	I need to learn how to use computers/programs for my future career.	A	B	C	D	E
73	It doesn't disturb me to work on math problems	A	B	C	D	E
74	I would like a job that doesn't use any mathematics.	A	B	C	D	E
75	The instructor doesn't seem to enjoy teaching mathematics.	A	B	C	D	E
76	I have a good feeling towards mathematics.	A	B	C	D	E
77	I enjoy talking to other people about math.	A	B	C	D	E
78	Computers/calculators don't scare me I am good at working math problems.	A	B	C	D	E
79	Mathematics is more of a game than it is hard work.	A	B	C	D	E
80	The instructor is willing to give students individual help.	A	B	C	D	E
81	Sometimes I do more math problems					

	than are assigned in class.	A	B	C	D	E
82	You can get along perfectly well in everyday life without mathematics.	A	B	C	D	E
83	The instructor knows a lot about mathematics.	A	B	C	D	E
84	Working with numbers upsets me.	A	B	C	D	E
85	Using computers or calculators in a math class makes me uncomfortable and nervous	A	B	C	D	E
86	I remember most of what I learn in math class.	A	B	C	D	E
88	It makes me nervous to even think about mathematics.	A	B	C	D	E
89	If I don't see how to work a math problem right away, I never get it.	A	B	C	D	E
90	Most of the ideas in mathematics aren't useful.	A	B	C	D	E
91	The instructor doesn't like students to ask questions.	A	B	C	D	E
92	It scares me to take a mathematics course.	A	B	C	D	E
93	It doesn't scare me to use a computer or a calculator.	A	B	C	D	E
94	I would rather be given the right					

	answer to a math problem than work it myself	A	B	C	D	E
95	I am sure that I can learn mathematics further	A	B	C	D	E
96	I do not like mathematics, and it scares me to learn it.	A	B	C	D	E
97	I am no good in mathematics.	A	B	C	D	E
98	Girls can do just as well as boys in mathematics.	A	B	C	D	E
	I am sure of myself when I do mathematics.	A	B	C	D	E

APPENDIX C

DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION

UNIVERSITY OF CAPE COAST

QUESTIONNAIRE FOR STUDENTS

PART 1

Background Information/Personal Data

(Tick one, or fill in on the blank line for others if appropriate):

1. Name of college.....
2. Sex : male [ ] female [ ]

Part II

The following are series of statements. They have been set up in a way that permits you to indicate the extent to which you agree or disagree with the ideas expressed. Please tick [ ] the box that best describes your response as you read the statement.

Statement	strongly disagree	disagree	undecided	Agree	strongly agree
3. I am sure that I can learn mathematics	1	6	4	65	84
4.Males are not naturally better than females in mathematics	72	56	8	24	10
5.It's hard to believe a female could be a genius in mathematics	15	25	27	58	35

Statement	strongly disagree	disagree	undecided	Agree	strongly agree
6 .I don't expect to use much Mathematics when I get out of school	69	51	4	24	12
7.I'm not the type to do well in mathematics.	14	24	15	40	67
8.Taking mathematics is a waste of time.	33	22	19	55	31
9. I think I could handle more difficult mathematics.	23	37	9	54	37
10. Females are as good as males in geometry.	26	12	25	32	65
11. I sometimes avoid mathematics class because I cannot understand anything	27	48	16	43	26
12. I am interested in solving mathematical problems	57	45	23	19	16
13.Most subjects I can handle OK, but I just can't do a good job with mathematics	27	43	5	25	12
14. I can get good grades in mathematics.	17	12	12	70	49

Statement	strongly disagree	disagree	undecided	Agree	strongly agree
15. I'll need a good understanding Of mathematics for my future work	104	30	7	1	18
16. I feel at ease in mathematics, and I like it very much	79	43	11	15	12
17. The harder the mathematics problem the better I like to try them	15	14	10	56	65
18. Studying mathematics is just as Good for women as for men.	29	62	6	31	32
19. It takes me too much time to understand any ideas in mathematics	20	39	12	40	49
20. Mathematics is not important for my life	12	18	16	47	67
21. I'm not good in mathematics.	1	28	9	74	48
4 22. I study mathematics because I know how useful it is.	2	32	17	44	65
23. when I hear the word mathematics, I have a feeling of dislike	20	35	4	66	35

Statement	strongly disagree	disagree	undecided	Agree	strongly agree
24. mathematics is very interesting to me and I Understand when learning it	79	44	13	10	14
25. l really like mathematics	28	24	11	58	39
26. I am always under a terrible strain in learning mathematics	62	80	6	11	1
27. I always feel happy learning mathematics all the time	72	68	9	11	0
28. I become physically agitated when I have to go to mathematics class.	88	27	13	32	0
29. I tend to lose my concentration in Mathematics class.	57	74	7	22	0

Part B

The following are series of statements. They have been set up in a way that permits you to indicate the extent to which you agree or disagree with the ideas expressed. Please tick [√] the box that best describes your response as you read the statement.

Statement	SA	A	NA	D	SD
30. I feel at ease teaching mathematics	12	49	6	50	43
31. Mathematics teaching makes me feel uncomfortable, restless, irritable, and impatient	62	36	5	55	2
32. I have no trouble teaching mathematics	2	59	9	50	40
33. Mathematics is my favourite subject in teaching	12	56	2	39	51
34. I am always excited teaching mathematics	17	50	10	45	38
35. How I wish Mathematics teaching would be completely deleted from teaching practice subject	16	39	13	49	44
36. I sometimes feel nervous going to teach Mathematics	42	53	2	45	38

APPENDIX D

Other Tables from the Findings

Independent Sample t-test on Sex and Usefulness of Mathematics

	t-test for equality of means		
	t	df	sig
College A	6.04	53	0.00
College B	-1.68	49	0.10
College C	0.63	52	0.53
All	**2.68**	**158**	**0.00**

Independent Sample t-test on Sex and Understanding Mathematics

	t-test for equality of means		
	t	df	sig (2 tailed)
College A	0.58	53	0.57
College B	0.29	49	0.78
College C	0.49	52	0.63
All	**0.75**	**158**	**0.45**

Means and Standard Deviations of Responses on Anxiety Learning Mathematics by College and Sex

		Sex		
College		Male	Female	All
A	n	28	27	55
	$\bar{x}$	3.39	3.42	3.41
	s	0.38	0.36	0.37
B	n	30	20	50
	$\bar{x}$	3.46	3.37	3.42
	s	0.35	0.32	0.34
C	n	25	30	55
	$\bar{x}$	3.41	3.49	3.45
	s	0.37	0.31	0.34
All	**n**	**83**	**77**	**160**
	$\bar{x}$	**3.42**	**3.44**	**3.43**
	s	**0.36**	**0.32**	**0.34**

Means and Standard Deviations of Responses on Anxiety teaching mathematics by questionnaire items

Item	Minimum	Maximum	Mean	Std. Deviation
30	-2	2	.39	1.360
31	-2	2	-.63	1.335
32	-2	2	.42	1.251
33	-2	2	.38	1.427
34	-2	2	.23	1.388
35	-2	2	.43	1.362
36	-2	2	.02	1.582
All	**-1.71**	**1.43**	**.18**	**.596**