STATISTICAL MODELING OF PERFORMANCE OF TEACHER EDUCATION AT DISTANCE AND REGULAR MODES

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DECLARATION

Candidate's Declaration

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

…….. …….

MILLICENTNARH DATE

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Supervisor's Declaration

We hereby certify that this thesis was prepared from the candidates' own research work and supervised in accordance with the guidelines on the supervision of thesis laid down by the University of Ghana.

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ABSTRACT

This research looked at Statistically Modeling Performance of pre-service teachers by finding the differences in performance and perceptions if any, between students in the regular and distance modes of teacher education in university of Cape Coast. Pre-service teachers of Accra College of Education and the College of Distance Education at Papafio hills, both of university of Cape Coast were used as the population of the research. Students who were admitted in the year 2014/2015 academic year were sampled for the study. The total sample of four hundred and fifty five (455) was used for the study. Mixed method which involved the use of both quantitative data collection and qualitative follow-up of administering questionnaire were used in this study. Raw scores of English content, English methodology, Mathematics content, Mathematics methodology, Science content and science methodology were considered as dependent variables whereas category of learning mode with two levels-(regular and distance), was treated as the main independent variable. Variables like gender, age, prior knowledge in mathematics at Senior High level and others were treated as concomitant (blocking) variables. Multivariate Analysis of Variance (MANOVA) and factor analysis were applied. Findings from this showed that differences in means of English content, English methodology, Mathematics content, Mathematics methodology, Science content and Science methodology with regard to category of learning mode were statistically significant with evidence of (p-value <0.001) for regular and distance category. It is therefore recommended that, policy makers should give similar attention if not the same to distance education just as it is done to the regular colleges of Education, so that the differences in performance gap can be closed in the near future.

DEDICATION

This research work is dedicated to my Husband: Andrews Anertey Kert and my lovely kids: Princess, Andrews and Jeffery. I love you for your Patience.

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LIST OF ABBREVIATIONS

AAMT	(Australian Association of Mathematics Teachers)
BECE	(Basic Education Certificate Examination)
Bed	(Bachelor of Education)
CFA	(Confirmatory Factor Analysis)
CoDE	(College of Distance Education)
DBE	(Diploma in Basic Education)
EFA	(Exploratory Factor Analysis)
EFA	(Exploratory Factor Analysis)
EMS	(English, mathematics and Science)
ET	(Evaluation of Teaching)
FA	(Factor Analysis)
GES	(Ghana Education Service)
MOE	(Ministry of Education)
SET	(Student Evaluation on Teaching)
SMC	(Scores in mathematics content)
SMM	(Scores in mathematics methodology)
SSC	(Scores in Science content)
SSM	(Scores in science methodology)
TE	(Teacher Education)
TED	(Teacher Education Division)
U.S.A	(United State of America)
UCC	(University of Cape Coast)
UK	(United Kingdom)
WASSCE	(West Africa Senior Secondary Certificate Examination)

CHAPTER 1

INTRODUCTION

1.0 Overview

The general introduction of the research is what this chapter stands for. It entails the background to the study with the statement of the problem and the purpose of the study. It also has the hypothesis, significance of the study, delimitation, limitation and the organization of the study.

1.1 Background to the Study

Examination results in English language, Mathematics and Science subjects across the different levels of primary, junior and high secondary school education indicate that pupils encounter a lot of problems in acquiring knowledge and skills in these subjects all over the world. Over the past years, students' performance in mathematics and science have not been impressive as evidence in National Education Assessment and "Trends in International Mathematics and Science Study" (TIMSS) report (Anamuah-Mensah, Mereku & Ghartey-Ampiah, 2008). Also, evidence from educational literature suggests that, teachers' intellectual resources significantly affect students learning (e.g., Shulman, 1986; Ball & Bass (2008). For this reason, we must take a critical look at the kind of teachers' knowledge that matters the most in teaching and learning.

Over the years, teacher training and education has gone through a lot of reform in a bid to revamp the sector in terms of producing competent and effective teachers. For some time now higher education has been adversely affected by shrinking budgets which is forcing the government to push most of the expenses to students which eventually become burden on parents for which teacher training college is no exception. The cut in funding has set

out a series of concerns for students, as well as staff and administrators. Sadly, when colleges and universities do not receive enough funding from the government, several things happen: services suffer, tuition fees are increased to cover expenses of programs and other important events, faculty and staff productivity with accountability become scrutinized making tenure become less permanent (Hiltner & Loyland, 1998). Many universities and colleges are forced to improve their financial woes with the offering of distance education courses. Distance education, or learning at a distance, is said to share many of the common characteristics of traditional or face-to-face courses, yet it is sometimes seen as new variables in teaching and education (Benigno & Trentin, 2000; Spooner, et al., 1999). Hall (1995) adds that the movement of distance education extends the traditional college of education structure.

Teacher education in Ghana has been through many stages which has resulted in various categories of teachers in the system, who have different professional qualifications; certificate, diploma and degree. Teachers for the Basic School level are trained by the colleges of education and the duration for teacher training in the colleges of education is three years. With the introduction of distance education, sandwich programmes, and the Untrained Teachers Diploma in Basic Education (UTDBE) programme, there are expanded opportunities for both the initial training and later upgrading of teachers which considers different durations per the programme one is pursuingfor the upgrading from certificate to diploma, it takes two years, upgrading from diploma to degree is two years and when the Untrained Teachers Diploma in Basic Education (UTDBE) programme was introduced, it took four years for completion in gaining a DBE certificate.

In Ghana, most Colleges of Education are affiliated to University of Cape Coast University of Cape Coast runs the regular teacher education courses under the name

Institute of Education and also run the Distance Education under the name College of Distance Education (CoDe). This study sort to find out if there is any significant difference in the performance of both students in the regular face to face programme and the distance programme regarding their English Language, Mathematics and Science courses since pre-service teachers from both modes of studies end up in the basic schools in Ghana. Many researchers have found that most instructors consider teaching quantitative courses like mathematics a big challenge for number of reasons. The challenge seems to be the psychological problems that many learners have with subjects that involve quantitative materials. I think some researchers understand by considering the background of the students. Students differ in their preferred learning strategies and therefore what is preferable for one student may not be preferable for another (Cybinsky & Selvanathan, 2005).

For a long time now, teacher- teaching and student - listening have been the primary mode of traditional education. The medium of teaching at the higher level of education was always a "classroom setting" with a teacher teaching and students listening and taking notes. Lecturer – student interaction has been viewed as an important learning element as far as this form of educational delivery system is concerned (O' Malley & McCraw, 1999). The advent of technologies such as improvements of printing machines, postal services, telephone, radio, television and the internet has been considered as a driving force and has brought new delivery techniques into the educational sector. In Ghana, "residential based model" in the form of students attending lectures at some specific scheduled times and locations is very common with regards to distance education but with the use of printing machines, postal services, telephone, radio, television and the internet which are increasing considerably in manful learning situations, some experts have based

on this to predict that the "residential based model" will gradually disappear in the near future (Blustain, Goldstein & Lozier, 1999; Drucker 1989).

A serious argument has been waged, therefore many people have different opinions about distance learning as against traditional face- to - face education. Some say that distance education is viewed as being different from other forms of education. Many educational – technologies view it as being linked to technology (Garrison, 1989). What is actually in clash is not whether distance education is ideal, but whether it is good enough to merit a college or university degree, and whether it is better than receiving no education at all Fox (1998). He alludes to an argument that states students learn far too little when the teacher presence is not available because the student has more to learn from their teachers than text. Therefore, in order for the students to be taught well, the teacher must always be personally present. Phips & Merisotis, (1999) contend that distance education is as good as traditional education. This means that, learning occurs as much as in distance education as it does in traditional education. The question is: is this really so? Does distance education work better for others as it is opposed to others? Do students' assessments in distance education differ from that in the traditional classroom? (Phips & Merisotis, 1999).

Since Colleges of education are responsible for the training of basic school teachers, they have a part to play as to be recommended or to be blamed for the performance or nonperformance of students in the basic school. Teachers play an essential role in quality education was noted by Savolainen (2009) who quotes McKinsey and Company saying: *the quality of an education system cannot exceed the quality of its teachers* (p. 16). The worth of the teacher adds more to learner success than any other variable, including class size, class composition, or background (Sanders and Horn, 1998; Bailleul et al., 2008). The needs of all learners require 'high quality' teachers equipped to meeting their

expectations to provide not only equal opportunities for all, but also education for an inclusive society.

Multivariate analysis of variance (MANOVA) is a statistical test that captures the effects of multiple independent variables on more than one dependent variable (Bray & Maxwell 1985). An important enquiry in multivariate research is how best to examine and identify significant differences, if any, of varying values of several independent variables on several dependent variables . Since the teacher trained in the regular mode is in the classroom and the one trained by distance mode is also teaching, it is therefore prudent to verify if there is any difference in their performance with English Language, Mathematics and Science courses which form the basics of teaching and learning in Ghana, and if so, what is the significant difference whilst on training?

1.2 Statement of the Problem

The challenge for the Diploma in Basic Education (DBE) course is to provide learning chances for pre-service teachers to advance in pedagogical content knowledge for teaching in the basic school. The value of instruction and learning of distance education as likened to that experienced and achieved by students signed up by regular (face –to –face) program are some of the most frequently asked questions about the efficiency of the basic school teacher. Since the DBE programme is run through both distance and regular modes, and both having the same challenge of providing learning chances for pre-service teachers to develop pedagogical content knowledge for teaching in the basic school, it is prudent to find out if the output of both modes of study are the same.

A number of available documents support the idea that the key to increasing students' knowledge and to closing the achievement gap is to put knowledgeable teachers in every

classroom (e.g Ball, Hill and Bass, 2009; MoESS 2008; National Mathematics Advisory Panel, 2008; Murat & Memnun, 2008; Anamuah-Mensah, Mereku & Ghartey-Ampiah, 2008).The problem of how knowledgeable the teacher himself is, as far as teaching is concerned is a pertinent issue and must be given due consideration.

Many studies have researched various factors pertaining to distance education, yet there is no comprehensive answer to most of the asked questions on whether distance teacher education and regular teacher education are the same. Variances among studies in different variables make research findings difficult to compare which make many observe existing trends (Bangert- Drowns & Rudner, 1991). This study therefore sort to explore the difference if any, that exists between regular and distance modes of training at the University of Cape Coast , Ghana in the quality of learning outcomes and preparation of teachers for teaching Basic school pupils.

1.3 Objectives of the Study

The general objective of the study was to examine the differences, if any, that exist between the perceptions and performance of pre-service teachers of Regular and distance DBE courses and examine whether distance education is equally effective as that of the regular mode in University of Cape Coast.

Specifically, the study sort to:

- Explore the performance of both distance and regular pre-service teachers in EMS courses.
- Investigate the factors that influence the performance of both the regular and distance learners in DBE courses
- Explore the perception of pre-service teachers' evaluation of teaching (ET) on teaching and learning whilst on training

1.4 Hypothesis

H_o: There is no significant difference in the category of learning modes of teacher education with regards to performance and perception in English Language, Mathematics and Science.

H_1: There is significant difference in the category of learning modes of teacher education with regards to performance and perception in English Language, Mathematics and Science.

1.5 Significance of the Study

The outcome of the study will add to existing literature on regular and distance education of Diploma in Basic Education theoretically and assist policy makers on policies formulation regarding teacher education on distance and regular modes of learning. Gallogly (2005) affirmed that underlying comparative studies show relationship that may lead to experimental studies. The study results may provide the basis to conduct further researches into the differences of student's performance in distance learning and traditional (Regular) classrooms practically.

1.6 Limitation

In research terminologies, limitations refer to the weakness of the study. They are those things the researcher could not control, but that may have influenced the results of the study. (Baumgartner, Strong & Hensley, 2002)

As indicated in the methodology, the research also depended on responses of questionnaire aside collecting secondary data from university of Cape coast. Thus where respondents provided false information about their attitude towards the modes of teacher education

thus regular and Distance as well as other relevant questions that were asked, the overall findings of the research was affected in a way. But that notwithstanding, sourcing of data was done on best effort basis to minimise any discrepancies if not eliminated.

1.7 Delimitation

Delimitation refers to the scope of the study. It basically spells out the population studied and includes those things that the researcher can control (Baumgartner, Strong & Hensley, 2002). The research will therefore be delimited by the following;

- The research was conducted in Ghana and not in the whole of Africa
- With respect to the students' population, only one year group was included in the survey. The reason for this is that, there was the need to guarantee progress of students who have done both content and methodology courses.
- The study sample was taken from pre-service teachers of Colleges of Education and not service teachers in Ghana.

1.8 Organization of the Study

This research report is made up of five chapters. The first chapter consists of the general introduction of the write-up. The introduction includes the background to the study, purpose of the study, statement of the problem, research questions and significance of the study. It also has the delimitation, limitation and the organization of the study.

Chapter two, deals with the review of related literature to the study. This covers what has already been written on the topic. The methodology which describes the statistical tool used was fully discussed in chapter three.

Chapter four covers data presentation, analysis of the data and the discussion of the findings whilst chapter five entails the summary, conclusion, and the recommendations of the study.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.0 Overview

Related concepts in teacher education for which other authors have looked at are what this chapter entails. It also elaborated on few issues pertaining to the theoretical and conceptual frame work. The review will be based on theoretical framework, Empirical and conceptual framework with other relevant research findings.

2.1 Theoretical Framework

Without theory, practice is but routine born of habit. The theoretical framework for this research derives from the noteworthy discussion multivariate analysis of variance (MANOVA) which is a statistical test that looks at the effects of multiple independent variables on more than one dependent variable (Bray & Maxwell 1985). An important question in multivariate research is how best to examine and identify significant differences, if any, of varying values of multiple independent variables on multiple dependent variables

It also dwells on a subject-matter content knowledge by Shuman (1986). Comparison of assessment results achieved by distance learning students and class room- based students undertaking the same programme to become basic school teachers is the core framework of this research. The main purpose of this comparison is to come out with some objective measurement of the performance of the students and quality of delivery of distance education in relation to traditional (regular) classroom-based education (Duffy et al., 2002).

Knowledge is not inactively received from the world, from others, or from authoritative sources but it is rather, created as individuals adapt to and make sense of their experiential worlds (Glasersfeld & Steffe 1991). According to Glasersfeld (1995) the essence of "constructivism"is that, knowledge cannot simply be transferred ready-made from parent to child or from teacher to student but has to be actively built up by each learner in his own mind.

In further elaboration of what constructivism is, two hypotheses have emerged (Glasersfeld 1991, 1995a; Lerman 1993):

- ♦ Knowledge is activity constructed by the learner, not passively received from the environment.
- ♦ coming to know is an adaptive process that organises a learner's experimental world.

Knowing cannot be discovered in an independent, preexisting world outside the mind of the learner. A teacher has an important role to play in the constructivist classroom. Rather than impacting knowledge, the teacher is also a guide and a facilitator, who encourage learners to question, challenge, and formulate their own ideas, opinions and conclusions. The teacher de-emphasizes 'correct' answers and single interpretations (Simon 1995, 1997; Steffe 1990; Steffe & Wiegel 1992; Richardson 2003). The teacher whether trained through regular face to face or distance will have to practice the "constructivist theory" of being a guide and a facilitator, who encourages learners to question, challenge, and formulate their own ideas, opinions and conclusions.

From the constructivist viewpoint , learning is a result of individual's construction of knowledge through active engagement in his experiential world. A learner constructs his

or her own new understanding or knowledge through the interaction of what he already knows on the base of his or her existing knowledge (Mereku, 2004).

For the radical constructivist there is no possibility of any certain knowledge about existing world, because all observations are limited by his or her previous, subjective structure of knowledge.

2.2 Teacher Education in Ghana

Over the years teacher training and education has gone through a lot of reform in a bid to revamp the sector in terms of producing competent and effective teachers. Teacher Education in Ghana has a chequered history. Attempts have been made to reform and strengthen Teacher Education programmes in response to the need for teachers to meet requirements of Reform programmes (Macmillan & Kwamena-Po, 1984). In 1991, Teacher Training in Ghana became Post-Secondary programme. Since then the curriculum had continued to change to address the changing needs of the educational system. In response to yet another reform policy in Ghana, the teacher training programme was upgraded from the three-year Post-Secondary to Diploma awarding Institution. The Teacher Education (TE) programme for basic teachers in Ghana was structured to provide a three-year pre-service Diploma in Basic Education (DBE). There are three strands in the TE programmes. The first is designated as Basic Education Programme "A" for teachers who will be teaching at the primary level and Basic Education Programme "B" for teachers at the junior secondary and third, degree programmes in education (Adegoke, 2003). TE is provided through pre-service training within the context of training institutions. It is important to note that teachers from the training colleges are mostly generalists who teach all subjects at the basic level. Teacher Training Colleges were

redesignated as tertiary institutions in 2008. The Colleges of Education Act, Act 847 was passed in 2012 to back the new status of the institutions.

Individuals who are enrolled into Colleges of Education (CE) in Ghana are known as Pre-service teachers. Pre-service teachers are selected into the CE by virtue of their performance in the West Africa Senior Secondary Certificate Examination (WASSCE) and a selection criteria set by the Teacher Education Division (TED) of GES. The CE operates the semester system. Currently each pre-service teacher goes through four semesters in college, and one academic year of internship in a Basic School. Pre-service teachers are taken through well planned series of courses to equip them to teach all subjects in the basic school curriculum. Pre-service teachers in the country's CE are assessed at the end of every semester by the Institute of Education, University of Cape Coast. The step taken by MOE to upgrade the standard of Basic Teacher Education programme to ensure teachers' improvement is a step in the right direction. This will curb the menace of poor performance in the results of B.E.C.E and W.A.S.S.C.E going a long way in improving performance in the universities and other tertiary institutions.

2.3 Teacher Education in the Diaspora

Aldrich (1990), described how teacher Education was developed in England as a family trade with students undergoing apprenticeship before elementary training colleges were established for the purpose of training teachers in mere monitoring of children's learning situations. He opines that obtainable information on the progress of teacher education in other countries is rather vague. Teacher education in the Republic of China started as a foreign idea before it became integrated into the education system of the whole country (Hawley, 1990). He also says teacher education in Japan was influenced by United States. These discoveries by Hawley (1990) give the impression that there were ideas sharing on

education in general and teacher education in particular. The sharing of ideas which occurred, could have affected the ways various countries approached their teacher training programmes. Just as events leading to the establishment of training colleges and programmes in various countries could have been different, it is pleasant to note that Diamond (1991) sees similarities in approaches to teacher training in these different countries. Taylor (1993) as quoted by Smyth (1987) says: The education of teachers has always been problematic, a matter of contention and controversy of competing and conflicting models and paradigms.

South Africa provides a broad and wide, with an attribute specific meaning of teacher education. The committee says the fundamental aim of teacher education is to educate and train teachers to teach effectively in order to facilitate learning, Committee on Teacher Education Policy (COTEP) (1996).

The impact of Teacher Education shows a wholesome collection of attributes which cover parts of classroom management and community incorporation into the school system. The aim of teacher education is to comprehend and find meanings in the trend of education, Mamabalo (1996). He believes teacher education is about humanizing the effectiveness of prospective teachers as facilitators of children's learning. His understanding of teacher education reveals that teacher education is about giving meanings to the trend called education and being about facilitation of the child's process of interacting.

The term teacher education may be taken to include concepts of training and graduation for teaching besides the many other processes and concepts Aldrich (1990). In another development, Stenlev (1993) says according to the 1991 Act of Parliament on Teacher Education in Denmark, teacher education was bound to make available a basis for any

other teaching that would be carried out after the folk school and for educating teachers for the folk school.

It could clearly be seen from the discussion that, the general component in all these definitions is the creation of a personality who facilitates learning and sees children through a learning process. It will, therefore be very important, to get to know the roles of a teacher to be able to relate the aim of teacher education to the actual training the teacher undergoes as he is prepared for the world of teaching.

2.4 The Role of a Teacher

Professional and extracurricular activities are the basic roles of a teacher. The capabilities that are gained after undergoing a teacher education programme should help a teacher to fulfill a specific set of duties that end up marking parameters of his dealings. The professional duties recount to the fundamental business of teaching whilst the extracurricular roles accounts the social roles of a teacher in regards to the child he teaches and the community within which he works. Chivore (1993) provides four guiding principles to a teacher's roles, which are:

- What the teacher views his/her duties to be.
- What parents expect their children to get from the teacher?
- What pupils expect to get from their teacher?
- What the general society expects to get from a teacher at their local school.

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The four guiding principles if taken into consideration will give the teacher clear guidelines on his roles and how to perform them. It also sums up the essence of the fundamental and extracurricular duties and roles of a teacher. Parkay and Hardcastle (1990) describe a teacher as a person who mentors others so that they can feel motivated intellectually. Whilest Deiro (1996) describes a teacher as a guide and facilitator of the

learning process. However, Cropley and Dave (1978) argue that a teacher can perform such roles if he or she remains an imposing source of knowledge, which is only achievable by continuously engaging in lifelong education. They again argue that the mentoring role of the teacher becomes attainable and significant if the teacher plans his work cautiously and thoroughly by using appropriate teaching skills he or she would have mastered while undergoing training.

The teacher's role in mentoring is related to his ability to arouse learning by organising genuine classroom learning experiences that do not only allow learning to take place but that will sustain it to take place enjoyably and efficiently (Jalongo 1991) This is to say that, the teacher has a remarkable duty to keep his pupils fascinated and motivated in the teaching process.

A teacher should play the role of an assessor and judge in the learning process for which his pupils will be involved in (Parkay and Hardcastle) (1990). Parkay & Hardcastle (1990) Connell (1995), and Sapackman (1991) identify that a teacher should put into effect discipline among his pupils both in and out of the classroom. A teacher will himself remain a good role model in both social and academic situations the roles are effectively played.

It is argued that it is also important for a teacher to be able to find out and attend to pupils' needs Deiro (1996). Every teacher should try as much as possible to discover the needs of learners and to check whether pupils are ready to learn or not. This knowledge will, in turn, dare the teacher to take remedial measures where possible or alert parents to their children's problems that impede practical and successful learning. If a teacher is able to know the pupil very well, he or she will be able to establish an understanding between the school and the home (Deiro, 1996). The child who is being taught perceives a relationship

between events that occur at home and the school as far as they affect the whole learning process. The child will feel at ease especially if the teacher visits their home and makes reports and requests that ultimately benefit their learning processes and environment.

There is harmony between the school and the home nurturing and parenting the child, MacDonald (1994). There will therefore be a school and a home that is a field with both teachers and parents sharing the responsibility of the child's learning. Such a move toward the teaching process enables teachers to contribute actively and efficiently in school activities that would clearly impact on the image and way of life of both the school and the community. This will go a long way to let the teacher be acknowledged by the community and could also be called upon to take part in community projects and activities to the advantage of the pupils he or she teaches.

What teachers teach and the way they teach affects creation and procreation of the society and community in which they operate. If the teacher is strongly attached to the society, then as it changes, the teacher gives out the same change to the school, the learning environment and the teaching processes. A properly oriented teacher with competency should be able to read and infer change and build up within the society or the supporting hierarchy. These roles are meant to be expressed to the teachers during their training programme and practiced as they encounter realities of being teachers in the true practical sense of the course. So many programmes besides the curriculum are dissected to equip the pre-service teacher in Ghana.

2.5 Pre-Service and In-service Teacher Education

Pre-service and in-service teachers' takes into consideration both teachers at training and teachers on the field teaching. Mamabolo (1996) and Aldrich (1990) recognize both Pre-

service and In-service teachers' as elements of Teacher Education. Pre-service teacher education as described by Aldrich (1990) as the initial teacher education that exposes a pre-service teacher to processes of teaching, educational theory, teaching practice and subject studies, where specialisation is required.

Mamabolo (1996) and Aldrich (1990) assert that in-service (insert) teacher education as a kind of teacher education given to the practising teachers for purposes of upgrading their qualifications. In-service teacher education itself maybe described very pragmatically and typically as an activity, usually deliberate and formalised whereby teachers marking beyond pre-service years may upgrade their professional understanding, skills and attitudes to broaden their perspectives Diamond (1991). In-service teacher education programme is therefore seen as a gap filling exercise that is also capable of exposing serving teachers to new knowledge in their trade for purposes of widening their professional scope. The issue of in-service training being a tool for improving performance is underscored by Peters (1998) who says; In-service education should make teachers more adequate in the classroom curriculum development, pupil guidance, school organisation and management.

2.6 Distance Education/Teaching and Learning

Distance Education appears in a range of sources either as Distance Teaching or Distance Learning for decades now. Prosser (1970) describes it as Distance Teaching while Keegan (1990) and Peers (1972) refer to it as Distance Education. Distance Education, like any other concept, has a distinct meaning stuck in a historical framework, Waghid (2001: 132). This implies that the historical context of Distance Education has to be investigated first in order to bring about a clearer understanding of it as a concept and then to adopt it as a phenomenon which has come to stay.

Wilson (2002) says that it is only recently that its practice commenced to rely on theory, but the fairly youthful age of theory should not give the notion that the whole structure of distance education is a recent phenomenon. Perraton (2000) argues that distance education began in 1963 while Daniel (2005) postulates that it commenced in 1970. The debate on the exact date of the birth of distance education might be difficult to resolve but what is clear is that it is a fairly. An old practice. The origin of and environments surrounding the births of various sheds of distance education would definitely have an influence on the conflicting ages of the practice.

The three descriptions of generations of Distance Education by Waghid (2001: 205) as a reasonable evolutionary genealogy are simplified as follows:

1) Correspondence teaching/single media characterised by little or no production of materials. Students were given a reading list and set of sample questions which correspondence tutors marked.
2) Multi-media education characterised by the use of one-way communication (predominantly print, broadcasting and cassettes) with the two-way communication being provided by correspondence tutors, or face-to-face materials, and
3) Tele-education and third generation distance education based on the use of electronic information technologies such as telecommunications, computer conferencing or networking and, audio and video conferencing.

It was observed that, the evolutionary genealogy described above clearly shows a purposeful importance on a description that shows delivery modes of distance education and not a report that tells the reader what substance Distance Education is made of. It should be known that a description which does not highlight the technological advancement related to the growth of distance education fails to reflect the technological

perception of distance education providers which is what seems to make distance education both convenient and significant to the changing times. More so, it should also be known that a technologically conscious analysis of the development of distance education only does not adequately describe distance education at any point in time. This calls for various definitions that exhibit a conscious desire to show that Distance Education has both technological and semantic characteristics. This view is also supported by Peters (1998) who believes that communication through a non-face-to face situation is out-rightly both a personal and mechanical and suffers from a lack of face-to-face communication which is personal and humane. Invariably, enrollment figures have proven that the traditional(regular) classroom setting with a teacher (tutor) and a group of students gathered in a classroom at regular and frequent meeting times appeals to have more students than an independent learning situations (Landis, 2001).

2.7 Learning by Distance

Connick (1999) describes Learning by Distance or Distance Learning (DL) as that learning that occurs when one engages in Distance Education (DE). This implies that when a student becomes a distance learner, the learning process they are subjected to is distance learning. Distance learning is an instructional process where students are separated by distance and from their teachers or tutors Barron (2002). From these definitions, it could be seen that Distance Education is synchronous (occurring at the same time with the teaching process) or asynchronous (occurring at different times with the teaching process).

Willis (1993) describes distance learning as the intended outcome of a distance education instructional process. He further explains distance learning as the learning that takes place

at a distance. Keegan (1990: 30-37) also gives an explanation of distance learning that helps to differentiate it from open learning. He says distance learning is not necessarily open. However, the policy to open access to learning succeeds with an educational method that involves some element of distance learning. This, to some extent, provides differences between distance learning and open learning, expressions which are at times wrongly used in a synonymous way.

2.8 Distance Teaching

As much as Distance Learning exists, there is invariably Distance Teaching. Sachs (2003) describes distance teaching as that method by which the teacher imparts knowledge to learners by distance. She further defines the teaching process as a practical exercise that comes from education which itself is a product of politics, hence, the conclusion that distance teaching is practical while distance education is political. Hodgson (1987) say distance teaching is that tuition given by the learning materials that a distance education institution provides to the learner. This makes distance teaching a direct product of the efforts of the distance education providing institution toward the students' learning process.

2.9 The Role of Distance Learning in Teacher Education

Teacher Education just like any other education has had it share with distance education as far as teaching and learning are concerned. Perraton (2000) say the entry of open universities into the field of education between 1970 and 1980 changed the landscape of higher education and created a new system for teacher education. This helped to make powerful teacher education delivery systems to the extent that they were able to run national programmes for teacher promotion. He also argues that the major purpose for the

association of Distance learning in teacher education was to tackle the problem of teacher shortages.

2.10 Difference between Distance Education and traditional education

A good number of literature have come to a conclusion that distance education courses are as efficient as the traditional face –to face courses (Murphy, 2000; Allen at al., 2002; Bernard et al., 2004;Russel, 1999; Machtmes & Asher, 2000; Mayzer & Dejong, 2003; Cavanaugh, 2001 Phipps & Merisotis, 1999; Ramage, 2002;; Schulman & sims,1999;Zhao et.al,2004). These studies reported that students attainment in distance education can be regarded as good as that of students in the face- to- face courses. Some of the studies have also affirmed that students' attainment in distance education settings will have a more positive drift than in the traditional face- to – face settings in the near future (Machtmes & Asher,2000; Zhao et.al et al., 2004). From the range of broad studies ranging from 1928 to 1998 that Russell has compiled and findings of results listed concluded that ninety (90) percent of the main studies reported no significant differences between distance education and traditional (face- to- face) with regard to students' attainment. He therefore affirmed that no matter what type of media that would be used, distance education is as effective as traditional (face-to face) (Russell, 1999).

In another vein, Philips and Merisotis (1999) sampled about forty (40) studies of which some were articles, essays and other writings discovered most of these studies concluded that irrespective of the technique used and other models, distance learning courses compare satisfactorily with traditional classroom – based instruction and enjoy high student's satisfaction (Philips & Merisotis, 1999). Cybinsky & Selvanathan (2005) investigated students' performance in an introductory statistics in two (2) learning modes (traditional and flexible learning environments), also realised that the mathematical

background of traditional students was 76% and that of the flexible learning was 32%. The study came out with the conclusion that despite these differences in prior knowledge in mathematics among the two (2) learning groups, there were no differences in performance outcomes between the two learning modes with p-value of 0.25 and 0.14 for traditional and flexible learning environments respectively.

A meta-analysis of 86 studies between 1990 and 2002 by Shachar & Neuman (2003), which compared students' final scores in distance education with those in traditional classes, resulted in an overall effect size of 0.37. Since the overall effect size showed a significant difference, the conclusion drawn was in favour of the alternative hypothesis; the final academic performance grades of students enrolled in distance education programs are higher than those enrolled in traditional (face- to face) programs. Likewise, Bernard et al. (2004), reviewed literature of empirical studies between 1985 and 2002, which focused on achievement, student attitudes and retention rates. After investigating the effectiveness of distance education compared with its traditional classroom - based counterparts, by analyzing 688 effect sizes from 232 studies across all academic levels, media types, instructional methods and outcome measures, they found that there was a small but significant effect favoring distance education conditions.

The two (2) most common indices for measuring success in any educational setting are class grade and retention rates. A study has proven that distance education students perform well when compared to on-campus face- to face students, either showing no significant differences or slight increase in class grades (Schoenfield- Tacher, Mconnell, & Graham, 2001; Tucker, 2000). Also one difficult thing with the use of grades to measure success is the drop out of students in class. Investigations that make use of grades to measure success do not appear to include students who drop out in distance education, but

distance education tends out to have significantly higher drop outs (Carr, 2000; Garrison, 1987; Tucker, 2000).

Moreover, A research conducted by Deka & Mcmurry (2006) to find out student success in traditional Face-to- Face and distance Tele class Environments employed a Multivariate "Analyses of Variance" (MANOVA) to compare the distance and in- class students on all variables. Learning group (distance or face-to face) was the independent variable and the background (Gender and Age), reading, study skills, self-esteem, and success were dependent variables. A significant effect was found with (p – value < 0.009). Follow up Analysis of Variance (ANOVAs) indicated significant learning group differences in the following variables: Age with ((p – value < 0.001), Reading comprehension with (p – value < 0.04) and success with (p – value < 0.03). However, distance education learners were significantly older than traditional face – to – face learners.

Here again, a research conducted by Tucker (1999) to determine whether distance education is better, worse or as good as traditional face – to – face education examined the following variables: pre-test and post-test scores, age, preferred learning styles, homework grades, research paper grades, final exam scores and final course grades. The results of the study showed that significant differences were found at the 0.05 alpha levels for post-test scores, final exam scores, and age. He recorded no significant difference at the 0.05 alpha levels between the two groups with regards to home work and research paper. Despite the results, Tucker (1999) noted that the evidence is not sufficient to conclude that distance education is superior to traditional education and vice versa.

2.11 Conceptual Framework

Teachers understanding of subject matter must be solid, because for concept to be meaningful to students the teaching has to be effective. Effective teaching requires an

understanding of the underlying meaning of concepts and procedures, as well as justifications for the ideas and procedures presented and the ability to make connections among topics (Ball et al 2007; O' Lawrence (2007). Harris & Parrish (2006) indicate that one of the major goals of research in education is to make teacher education align with professional competence paradigms for what it means to be a teacher in a school.

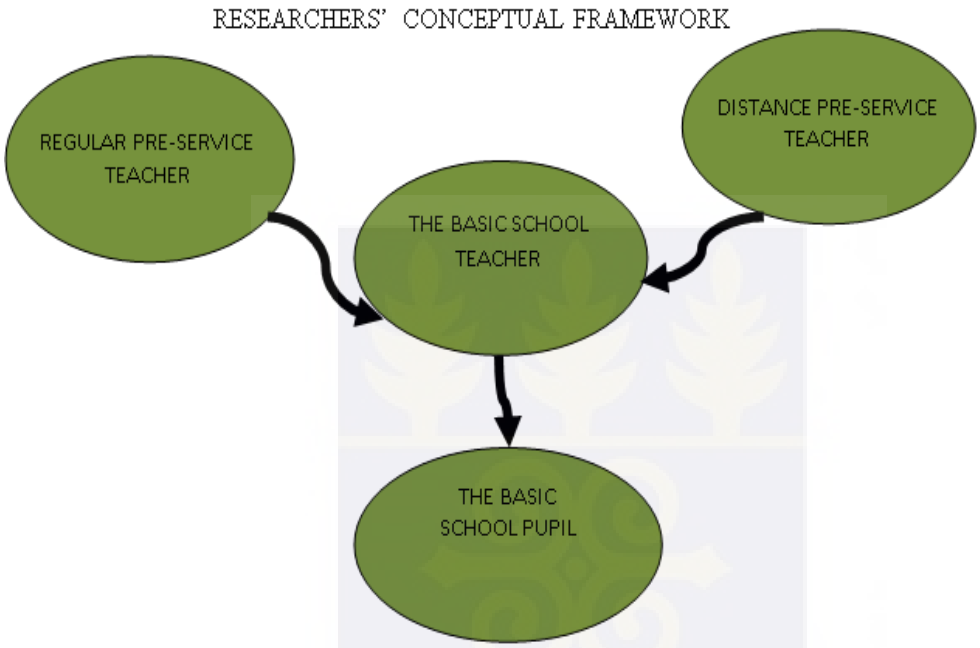

Figure 2.1: Basic school teacher

The model depicts the source of the basic school teacher in the basic school. We believe that the pre-service teacher with regular or Distance mode of learning both end up in our classroom. It is therefore prudent to establish that their performances per the DBE courses are similar if not the same. The knowledge about the child being taught and contextual knowledge forming the part of content to be taught is the pedagogical knowledge which is very important in teaching the basic school child. Experts also agree that teachers need pedagogical content knowledge, which is knowledge about how the concepts relate to the Childs' understanding (Shulman, 1986). If a teacher possess strong pedagogical content

knowledge in the area he or she is teaching, the teacher also would be able to identify the most common student misconceptions and present the most appropriate representations of the concepts.

2.12 Summary

The nature of the obtainable literature which is being reviewed every now and then is very broad and it provides a framework for the current research into distance and regular classroom learning. Considering different levels of reviewed literatures with regards to the comparison of delivery methods and performance of students in distance and traditional classroom environment, a lot has been contributed to the deep meaningful learning, as it can be traced from the historical researches of the introduction of correspondence study in the nineteenth century. The progress of the idea of correspondence study which gave birth to the distance education from the 19th century through 20th century to today's' generation has provided a lot of benefits to the meaningful learning including meeting the needs of non- traditional students who with the family responsibilities could not have the chance to take traditional college courses (O' Lawrence, 2007)

From literature, various extensive studies ranging from 1928 to 1998 that Russell has compiled and findings of results listed concluded that ninety (90) percent of the basic studies showed no significant differences between distance education and traditional face- to- face with regard to students' achievement (Russell, 1999). In contrast, studies has proven that distance education students perform well when compared to on-campus face-to face students, either showing no significant differences or slight increase in class grades (Schoenfield- Tacher, Mconnell, & Graham, 2001; Tucker, 2000). More so Shachar and Neuman (2003) in their discussion indicated that their analyses shows that students engaged in distance education outperformed their traditional face – to – face

counterparts academically. The authors therefore concluded that the focus, which is all along on the question: *Is distance education suitable for all students?* Will now be reverse *Is traditional face – to – face suitable for all students?*

While the objective is the same whether teaching in the traditional classroom or at a distance, there are exceptional characteristics for each method. This uniqueness must be recognized before evaluations can be made as to whether or not the traditional evaluation instrument is suitable for use in evaluating distance courses.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Overview

This chapter entails the research process that informed the study. It comprises of the research design and the format that was used. It discusses the instruments or techniques and how they are developed and applied. It also looked at the data collection methods with the population, sample and sampling technique. The chapter also sheds light in the statistical procedure used on the study.

3.1 Research Design

McMillan (2004) describes surveys as popular because of their 'versatility, efficiency and generalizability'. This research used a survey design, the descriptive survey to be precise without deliberate effort to control the variables. The versatility of survey lies in their ability to 'address a wide range of problems or questions, especially when the purpose is to describe the attitudes, perspectives and beliefs of the respondents'. The descriptive design will provide information about the naturally occurring behavior, attitudes or other characteristics of a particular group towards regular and distance DBE course. Descriptive studies are conducted to demonstrate associations or relationships between things in the world around us (Mertler & Charles, 2005). Creswell (2012) opines that survey design has the advantage of measuring current attitudes or practices.

The researcher used a mixed method research approach. According to Baumgartner et.al.(2002) , using a mixed-method design is considered to be appropriate to gain a more comprehensive picture of the phenomena. This is the use of a combination of both qualitative and quantitative methodology to explain or describe the situation which gives

an in-depth analysis of one or more events, settings, programmes, individuals, or other bounded systems. Using mixed methods research makes it easier to explore different aspects of the problem one is trying to find. Also it would provide the researcher with in-depth knowledge or information about the participants for better analysis to merit generalisation. Tashakkori and Teddlie (2003) opine that multiple methods are useful if they provide better opportunities for a researcher to answer research questions and where the methods allow a researcher to better evaluate the extent to which the research findings can be trusted and inferences to be made from them.

Qualitative research design will be used because it allows for flexibility to modify the data collection instruments in the process. It also provides information that promote better understanding of the phenomenon, enable accurate predictions about future events or lead to interventions that enhance the quality of work life(Saunders, Lewis & Thornhill, 2007)). This data would be obtained from pre-service teachers of the selected colleges through a designed questionnaire.

Quantitative research involves the use of techniques whose findings may be expressed numerically and are amenable to mathematical manipulation enabling the researcher to estimate future events and quantities. This will be used because it produces quantitative reliable data that are usually generalized to some larger population (Creswell, 2012). It will involve collecting pre-service teachers' scores from university of Cape Coast.

3.2 Population and Sampling.

Population is the totality of whatever object or measurement the researcher is investigating. According to Bell (2004), population refers to the complete set of individuals (subjects or events) having common observable characteristics in which the

researcher is interested. The target population will comprise of pre-service teachers in the colleges of education pursuing the general DBE course.

A sample is the part of a population that is selected for investigation. Creswell (2012) opine that the sample should be so carefully chosen that, because through it, the researcher is able to see characteristics of the total population in the same proportions and relationships that they would be seen if the researcher were, in fact, to examine the total population. Accurate information for large population can be obtained with a small sample at relatively low costs (Awanta & Asiedu-Addo, 2008).

According to Leedy and Ormrod (2010), sampling is efficient and precise in that, those resources that might go into collecting an unnecessary number of individuals or groups can be spent on other activities of the research. It helps focus the survey on precisely the characteristics of interest samples, which are expected to be representative of the population. Samples are, therefore chosen by means of sound methodological principles.

Using the purposive sampling technique, the researcher picked the sample from those pre-service teachers offering a general course for the study.According to Awanta and Asiedu-Addo (2008) with purposive sampling, the sample is 'hand-picked' for the research. The term is applied to those situations where the researcher already knows something about the specific people or events and deliberately selects particular ones because they are seen as instances that are likely to produce the most valuable data. Purposive sampling is appropriate for selecting unique cases that are specialized, especially informative or from a difficult-to-reach population (Creswell, 2003).

The researcher conveniently picked the second year group of the chosen colleges of education to represent the sample of the study. According to Creswell (2003),a convenience sample is a non-random sample in which the researcher selects participants

that fit into specific criteria and are accessible. This convenience sampling method was adopted for easy access to participants, which Creswell describes as a quick sampling method. Convenience sampling is particularly useful for detecting relationships among different phenomena in terms of accessibility and proximity to the researcher.

3.3 Data Collection Strategy

Since the study involves categories of groups of students from different backgrounds, secondary data was collected from the scores of students pursuing Diploma in Basic education in both distance and regular modes at University of Cape Coast. Questionnaires were administered to both regular and distance pre - service teachers. With the regular students, the questionnaires were administered to them after the whole group had finished writing an external examination and with the distance, the questionnaires were administered during one of their 'face- to – face' meetings with their course tutors. These exercises were carried out with the help of some other tutors. Students were requested to provide their ID numbers on the questionnaires before submitting the completed questionnaires for which some gladly did. The purpose of the ID on the questionnaires was to use them to trace their scores in the exams they have been writing. After collecting all the completed questionnaires, 455 with valid ID numbers were obtained with 299 from regular students whilst 156 were obtained from distance students. The researcher purposely picked the exam scores of those students whose questionnaires could be traced thus the recording of 299 with regular and 156 with distance groups.

3.4 Validity and Reliability

Baumgartner, Strong & Hansley (2002) described validity as when an instrument measures that which it is supposed to measure. Also Validity is the degree to which a measure is able to represent what it is supposed to be accurate (Hair et al., 2007). It is used

to determine the extent to which a scale measures a variable of interest. With this work, the entire construct were comprehensively looked at through the review of literature and related research for which the constructs are valid. Some M.Phil statistics students read through the questionnaire and made suggestions that were incorporated. It was further cross-checked and corrections made by the researcher's supervisor to ensure validity. To ensure validity and reliability of the instrument, the researcher personally gave the questionnaires to the pre-service teachers to fill with the help of few tutors who invigilated an exam the students had just written.

Reliability measures the degree to which a research instrument is consistent and for that matter the internal consistency checks of the research questionnaire have been considered. The Cronbachs' Alpha was adopted as a measure of the internal consistency of the research instrument. For the Cronbachs' Alpha to be considered reliable, its coefficient should normally range between zero (0) and one (1) of which the higher values indicate higher reliability (Hair et al., 2007). This means that the closer the Cronbachs' Alpha coefficient to 1.0, the greater the internal consistency of the individual items in the variables.

Table 3.1 shows Cronbachs' Alpha coefficient of each of the items of the four (4) variables in the research questionnaire used.

Table 3.1: Cronbachs' Alpha coefficient of each of the items

Variable	Number of items	Cronbachs' Alpha
Students' view on quantitative courses	11	0.817
Students' evaluation of Teaching (SET)	8	0.825
Students' attitudes towards English	13	0.812
Factors affecting students' performance	26	0.734

Source: Field Data

It could clearly be seen from table 3.1 that all the items in each of the four (4) variables in the research questionnaire have a good reliability. This is because, according to Cronbach (1951) and Nunnally (1978) a good reliable Cronbach alpha coefficient should be at least 0.60 and from table 3.1, all have more than the recommended Cronbachs' alpha value.

3.5 Research Statistical tool used for the data Analyses

Factor analysis and Multivariate Analysis of Variance (MANOVA) were used to explore the factors influencing the performance of students and also model the performance of students in the quantitative data collected from students pursuing Diploma in Basic education in both distance and regular modes in University of Cape Coast.

3.5.1 Factor Analysis

The model of the factor analysis applied is as below:

$$Y_1 = \lambda_{11} f_1 + \ldots \lambda_{1m} f_m + \psi_1 \varepsilon_1$$
$$Y_2 = \lambda_{21} f_1 + \ldots \lambda_{2m} f_m + \psi_2 \varepsilon_2$$
.
.
$$Y_p - \mu_p = \lambda_{p1} f_1 + \ldots \lambda_{pm} f_m + \varepsilon_p$$

Where Y_{ij} are the observable variables, $f(s)$ are the independent factors with ε the error term.

Factor Analysis is one of the multivariable statistical methods, which has a purpose of defining the core structure in a matrix of data. Factor analysis helps to analyze the structure of correlations among many variables by identifying a set of core dimensions, called factors (Ghauri & Gronhaug, 2010). In this study, Exploratory Factor Analysis (EFA) is used to explore the factors that affect pre-service teachers' performance in the DBE course. EFA is a data reduction technique used to reduce the number of items in the

questionnaire to a smaller set of factors by looking for 'clumps' or groups among the inter-correlations of a set of variables. There are three main steps in conducting factor analysis. These are; assessing the suitability of data for Factor Analysis (FA), factor extraction and factor rotation/interpretation. Two statistical measures are also generated to help assess the factorability of the data: Bartlett's test of sphericity and Kaiser Meyer-Olkin (KMO) Measure of Sampling Adequacy. Bartlett's test of sphericity should be significant $(p < 0.05)$ for factor analysis to be considered appropriate. The KMO index ranges from 0 to 1, with 0.6 suggested as the minimum value for a good FA (Tabachnick & Fidell, 2001). Factor extraction involves determining smallest number of factors that can be used to best represent the interrelationships among the set of variables. There is variety of approaches for factor extraction; the most commonly used approach is the principal components analysis which this study adopted. There are three techniques to aid in such decision; these are Kaiser's criterion, Scree plot and Parallel analysis. Kaiser's criterion use eigen value rule, only factors with an eigenvalue of 1.0 or more are retained for further investigation. The eigen value of a factor represents the amount of the total variance explained by that factor. Another approach that can be used is the Cattel's scree plot (Cattel 1966). This involves plotting each of the eigen values of the factors and inspecting the plot to find a point at which the shape of the curve changes direction and become horizontal. Cattel recommends retaining all factors above the elbow or break in the plot, as these factors contribute the most to the explanation of the variance in the data set. Only those eigen values that exceed the corresponding values from the random data set are retained. This approach to identifying the correct number of factors to retain has been shown to be the most accurate, with both Kaiser's criterion and Cattel's scree plot tending to overestimate the number of factors. After retaining the number of factors, they are then

rotated for better interpretation (Tabachnick and Fidell, 2001). In this research, Varimax orthogonal rotation was used.

3.5.2 Multivariate Statistics

"Multivariate" analysis consists of a collection of methods that can be used when several measurements are made on each individual or object in one or more samples. "Multivariate" statistics are more popular methods used for investigating dense data sets. They provide analysis when there are many Independent Variables (IVs) and more than one Dependent Variables (DVs) all correlated with one another to varying degrees (Tabachnick & Fidell, 2007)

3.5.2.1 Assumptions of the Model

With the use of the MANOVA, it follows that;

- The random samples from individual population are independent
- All populations have common covariance matrix
- Each population is multivariate normal

3.5.2.2 Test of Normality

Most of the statistical methods that we apply require the assumption that a variable or variables are normally distributed. With multivariate statistics with MANOVA to be precise, the assumption is that the combination of variables follows a multivariate normal distribution.

3.5.2.3 Evaluating Normality

- Both graphical and statistical methods can be used for evaluating normality.
- Graphical methods include the histogram and normality plot .

- Statistical methods include diagnostic hypothesis tests for normality, and a rule of thumb that says a variable is reasonably close to normal if its skewness and kurtosis have values between –1.0 and +1.0.

3.5.3 Multivariate Test for Normality

The study adopted Mardia Multivariate Test for Normality. It measures the multivariate extension of skewness and kurtosis.

The skewness

$$\hat{\beta}_{1,q} = \frac{1}{m^2}\sum_{j=1}^{m}\sum_{1=}^{m} n^3_{ji} \qquad (3.1)$$

Kurtosis as

$$\hat{\beta}_{2,q} = \frac{1}{m}\sum_{j=1}^{m} n^2_{ij} \qquad (3.2)$$

Where $n_{ij} = \left(X_i - \bar{X}\right)^1 S^{-1}\left(X_i - \bar{X}\right)$ is the squared mahalanobis distance and q is the number of variables.

The test statistics for skewness

$$\left(n/6\right)\hat{\beta}_{1,q} \sim \chi^2_{q(q+1)(q+2)/6}$$

(3.3)

The test statistics for skewness

$$\beta_{2,q} \sim N\left(q(q+2), \frac{sp(p+2)}{n}\right)$$

(3.4)

The decision rule is that, the data set is multivariate normal

3.5.3.1 Mardia Multivariate Test for Normality

As seen from the results given in table 3.2, both the skewness ($\beta_{1,p}$ = 1.29915, 0.133) and kurtosis ($\beta_{2,p}$ = 62.4,1 p= 0.577) estimated indicate multivariate normality. Therefore, according to Mardias' MVN test, the data set follows a multivariate normal distribution.

Table 3.2: Multivariate Test for Normality

Mardia test	
G1p	1.299154
chi.skew	98.5192
p.value.skew	0.133022
g2p	62.41344
z.kurtosis	-0.55732
p.value.kurt	0.57731
chi.small.skew	99.33215
p.value.small	0.12131

3.6 Multivariate Analysis of Variance (MANOVA) Model for Comparing Several Population "Mean Vectors"

Multivariate Analysis of Variance (MANOVA) is used to examine whether the population "mean vectors" are the same, and if not which mean components differ significantly.

3.6.1 One- Way Multivariate Analysis of Variance (MANOVA) Model

Multivariate Analysis of Variance (MANOVA) evaluates differences among composite means for a set of Dependent Variables (DVs) when there are two or more levels of an Independent Variables (IV) groups. The model is given below:

$$X_{ij} = \mu + \tau_{\ell} + \ell_{ij}, \quad j = 1, 2, ..., n_{\ell} \text{ and } i = 1, 2, ..., g \qquad (3.5)$$

Where ℓ_{ij} are independent $N_p(0, \Sigma)$ variables. The parameter vector μ is an overall mean and τ_i represent the ℓ^{th} interaction effect with

$$\sum_{\ell=1}^{g} n_\ell \tau_\ell = 0$$

$$j$$

$$X_{ij} = \bar{X} +$$

$$\left(\bar{X}_{\ell j} - \bar{X}_\ell\right)\left(\bar{X}_{\ell j} - \bar{X}_\ell\right)' + \left(\bar{X}_{\ell j} - \bar{X}_\ell\right)\left(\bar{X}_{\ell j} - \bar{X}\right)' + \left(\bar{X}_\ell - \bar{X}\right)\left(\bar{X}_{\ell j} - \bar{X}_\ell\right)' + \left(\bar{X}_\ell - \bar{X}\right)\left(\bar{X}_\ell - \bar{X}\right)'$$

$$\left(\bar{X}_{\ell j} - \bar{X}\right)\left(\bar{X}_{\ell j} - \bar{X}\right)' = \left[\left(\bar{X}_{\ell j} - \bar{X}_\ell\right) + \left(\bar{X}_\ell - \bar{X}\right)\right]\left[\left(\bar{X}_{\ell j} - \bar{X}_\ell\right) + \left(\bar{X}_\ell - \bar{X}\right)\right]' =$$

$$(Observation) = \begin{pmatrix} overall \\ sample \\ mean \\ \hat{\mu} \end{pmatrix} + \begin{pmatrix} estimated \\ \text{int}eraction \\ effect \\ \hat{\tau}_\ell \end{pmatrix} + \begin{pmatrix} residual \\ \hat{\ell}_{ij} \end{pmatrix}$$

A vector of observations may be decomposed as below:

$$X_{ij} = \bar{X} + \left(\bar{X}_\ell - \bar{X}\right) + \left(\bar{X}_{\ell j} - \bar{X}\right) \qquad (3.6)$$

$$(Observation) = \begin{pmatrix} overall \\ sample \\ mean \\ \hat{\mu} \end{pmatrix} + \begin{pmatrix} estimated \\ \text{int}eraction \\ effect \\ \hat{\tau}_\ell \end{pmatrix} + \begin{pmatrix} residual \\ \hat{\ell}_{ij} \end{pmatrix}$$

The decomposition in the equation above leads to the multivariate analogue of the univariate sum of squares.

Thus the product $\left(\bar{X}_{\ell j} - \bar{X}\right)\left(\bar{X}_{\ell j} - \bar{X}\right)'$ can be written as

$$\left(\bar{X}_{\ell j} - \bar{X}\right)\left(\bar{X}_{\ell j} - \bar{X}\right)' = \left[\left(\bar{X}_{\ell j} - \bar{X}_\ell\right) + \left(\bar{X}_\ell - \bar{X}\right)\right]\left[\left(\bar{X}_{\ell j} - \bar{X}_\ell\right) + \left(\bar{X}_\ell - \bar{X}\right)\right]' = \qquad (3.7)$$

$$\left(\bar{X}_{\ell j} - \bar{X}_\ell\right)\left(\bar{X}_{\ell j} - \bar{X}_\ell\right)' + \left(\bar{X}_{\ell j} - \bar{X}_\ell\right)\left(\bar{X}_{\ell j} - \bar{X}\right)' + \left(\bar{X}_\ell - \bar{X}\right)\left(\bar{X}_{\ell j} - \bar{X}_\ell\right)' + \left(\bar{X}_\ell - \bar{X}\right)\left(\bar{X}_\ell - \bar{X}\right)'$$

The sum of j of the middle two expressions is the zero matrix, because

$$\sum_{j=1}^{n\ell} (\mathrm{X}_{\ell j} - \bar{X}_\ell) = 0 \qquad (3.8)$$

Hence summing the cross product over ℓ and j yields.

$$\sum_{\ell=1}^{g}\sum_{j=1}^{n_\ell}(X_{\ell j}-\bar{X})(X_{\ell j}-\bar{X})' = \sum_{\ell=1}^{g} n_\ell(\bar{X}_\ell-\bar{X})(\bar{X}_\ell-X)' + \sum_{\ell=1}^{g}\sum_{j=1}^{n_\ell}(X_{\ell j}-\bar{X}_\ell)(X_{\ell j}-\bar{X}_\ell)' \quad (3.9)$$

$$\begin{bmatrix}\text{total(corrected) sum}\\ \text{of squares and}\\ \text{cross products}\end{bmatrix} = \begin{bmatrix}\text{interaction(Between)}\\ \text{sum of squares and cross}\\ \text{products}\end{bmatrix} + \begin{bmatrix}\text{residual(Within)}\\ \text{sum of squares and}\\ \text{cross products}\end{bmatrix}$$

The within sum of squares and cross products matrix can be expressed as

$$W = \sum_{\ell=1}^{g}\sum_{j=1}^{n_\ell}(X_{\ell j}-\bar{X})(X_{\ell j}-X_\ell) = (n_1\text{-}1)S_1 + (n_2\text{-}1)S_2 + \ldots\ldots + (n_g-1)S \quad (3.10)$$

Where S_ℓ is the sample covariance matrix for the ℓ^{th} sample.

To test for interaction effects:

H_o: all $\tau_i = 0$

$H_{a:}$ not all τ_i equal zero

The calculation leading to the test statistic in a MANOVA can be summerised below:

Table 3.3: MANOVA Table for comparing Population Mean Vectors

Source of variation	Matrix of sum of squares and cross products(sscp)	Degree of freedom (df)
Treatment	$B = \sum_{\ell=1}^{g} n_\ell(\bar{X}_\ell-\bar{X})(\bar{X}_\ell-\bar{X})'$	g-1
Residual (Error)	$W = \sum_{\ell=1}^{g}\sum_{j=1}^{n_\ell}(X_{\ell j}-\bar{X})(X_{\ell j}-X_\ell)$	$\sum_{\ell=1}^{g} n_\ell - g$
Total (corrected for the mean)	$B+W = \sum_{\ell=1}^{g}\sum_{j=1}^{n_\ell}(X_{\ell j}-\bar{X})(X_{\ell j}-\bar{X})'$	$\sum_{\ell=1}^{g} n_\ell - 1$

3.6.2 Two-way Multivariate Analyses of variance (MANOVA) Model

For Multivariate Two – Way Fixed – Effect with Interaction, the model is given below:

$$X_{\ell kr} = \mu + \tau_\ell + B_k + Y_{\ell k} + \ell_{\ell kr} \quad 3.11)$$

ℓ = 1,2,……, g $\Leftrightarrow$ levels of factor X

k =1,2,……, b $\Leftrightarrow$ levels of factor Y

r =1,2,……, n $\Leftrightarrow$ independent observations ie we have gb combinations of levels where

$$\sum_{\ell=1}^{g}\tau_{\ell}=\sum_{k=1}^{b}B_{k}=\sum_{\ell=1}^{g}Y_{\ell k}=\sum_{k=1}^{b}Y_{\ell k}=0 \qquad (3.12)$$

The vectors are all of order px1and the $e_{\ell kr}$ independent $N_p(O,\Sigma)$ random vectors. Thus the responses consist of p measurement replicated n times of each of the possible combinations of levels of factors X and Y where

μ = overall level

τ_{ℓ} = fixed effect of factor 1

B_k = fixed effect of factor2

$Y_{\ell k}$ = Interaction between factor 1 and factor 2

The decomposition is as follows:

$$X_{\ell kr}=\bar{X}+(\bar{X}_{\ell}-\bar{X})+(\bar{X}_{k}-\bar{X})+(\bar{X}_{\ell k}-\bar{X}_{\ell}-\bar{X}_{k}+\bar{X})+(X_{\ell kr}-\bar{X}_{yk}) \qquad (3.13)$$

Where

$\bar{X}$ is overall average of the observation

$\bar{X}_{\ell}$ is the average of the observation vectors at the ℓ^{th} level of factor 1

$\bar{X}_{k}$ is the average of the observation vectors at the k^{th} level of factor 2

$\bar{X}_{\ell k}$ is the average of the observation vectors at the ℓ^{th} level of factor 1 and k^{th} level of factor 2.

To test whether or not the two factors interact:

H_o: all $Y_{\ell k}=0$

H_a: not all $Y_{\ell k}=0$

The breakups of the "sum of squares" and "cross product" and degrees of freedom of the Fixed- Effects Model with Interaction are:

$$\sum_{\ell=1}^{g}\sum_{k=1}^{b}\sum_{r=1}^{n}(X_{\ell kr}-\bar{X})(X_{\ell kr}-\bar{X})' = \sum_{\ell=1}^{g} bn(\bar{X}_{\ell}-\bar{X})(\bar{X}_{\ell}-\bar{X})' + \sum_{k=1}^{b} gn(\bar{X}_{k}-\bar{X})(\bar{X}_{k}-\bar{X})'$$

$$+\sum_{\ell=1}^{g}\sum_{k=1}^{b} n(\bar{X}_{\ell k}-\bar{X}_{\ell}-\bar{X}_{k}+\bar{X}) \quad (\bar{X}_{\ell k}-\bar{X}_{\ell}-\bar{X}_{k}+\bar{X})' + \sum_{\ell=1}^{g}\sum_{k=1}^{b}\sum_{r=1}^{n}(X_{\ell rk}-\bar{X}_{\ell k})(X_{\ell kr}-\bar{X}_{\ell k})' \quad (3.14)$$

The breakdown of sum of squares and cross products and degrees of freedom in a MANOVA for comparing factors are as follows;

Table3.2 MANOVA Table for Comparing Factors and Their Interaction

Source Variation	**Matrix of sum of squares and cross product(sscp)**	**Degrees of Freedom(d.f)**
Factors 1	$SSP_{fac1}= \sum_{\ell=1}^{g} bn(\bar{X}_{\ell}-\bar{X})(\bar{X}_{\ell}-\bar{X})'$	g - 1
Factors 2	$SSP_{fac2}= \sum_{k=1}^{b} gn(\bar{X}_{k}-\bar{X})(\bar{X}_{k}-\bar{X})'$	b-1
Interaction	$SSP_{int} = \sum_{\ell=1}^{g}\sum_{k=1}^{b} n(\bar{X}_{\ell k}-\bar{X}_{\ell}-\bar{X}_{k}+\bar{X})$ x $(\bar{X}_{\ell k}-\bar{X}_{\ell}-\bar{X}_{k}+\bar{X})'$	(g-1)(b-1)
Residual(error)	$SSP_{res}= \sum_{\ell=1}^{g}\sum_{k=1}^{b}\sum_{r=1}^{n}(X_{\ell kr}-\bar{X}_{\ell k})(X_{\ell kr}-\bar{X}_{\ell k})'$	gb(n – 1)
Total Corrected	$SSP_{cor} = \sum_{\ell=1}^{g}\sum_{k=1}^{b}\sum_{r=1}^{n}(X_{\ell kr}-\bar{X})(X_{\ell kr}-\bar{X})'$	gbn - 1

3.6.3 Statistics for testing the multivariate Hypothesis

There are several test statistics available but the one that is mostly used is the Wilks' Lamda (Λ) given by:

$$\Lambda = \frac{|W|}{|B+T|} = \frac{|W|}{|T|}, 0 \leq \Lambda \leq 1 \qquad (3.15)$$

Where $|W|$ and $|T|$ are the determinants of the within and total sum of squares and cross product matrices.

Wilks' Lamda (Λ) is the statistic for determining whether there is a significant association between dependent variables and predictors.

For Multivariate analyses of Variance, (MANOVA), the corresponding analogue holds:

$$T = B + W \qquad (3.16)$$

The sum of squares and cross product Matrix is equal to Between Sum of squares and cross product Matrix plus Within Sum of squares and cross product Matrix. In analyses, the smaller the value of the Lamda as in closer to zero, the higher the evidence of treatment effects (between group associations). If Lamda approaches one, then there is the evidence of less treatment effect. When the Between (B) equals zero, then:

$$\frac{|W|}{|0+W|} = 1 \qquad (3.17)$$

Two approximations of Wilks' Lamda(Λ)sampling distribution are available(Stevens, 2009).

a. Rao's F. Bartlett's χ^2, is given by

$$\chi^2 = -\left[(N-1) - 5(P+K)\right] \ln \Lambda (K-1) \text{ degrees of freedom} \qquad (3.18)$$

Where N is the total sample size, P is the number of dependent variables, and K is the number of groups.

b. Batlett's χ^2 is given by:

$$-\left(n - 1 - \frac{(p+g)}{2}\right) \ln \Lambda = -\left(n - 1 - \frac{(p-g)}{2}\right) \ln \left(\frac{|W|}{|B+T|}\right) \qquad (3.19)$$

For smaller sample size, Rao's F is a better approximation and for moderate sizes, Batlett's χ^2 approximation is good(Lohnes, 1961). Generally, the two statistics will lead to the same decision on H_o.

According to Johnson and Wichern (2007), Bartlett has shown that if H_o is true, and $\sum n\ell = n$ is large,

$$-\left(n-1-\frac{(p+g)}{2}\right)\ln\Lambda = -\left(n-1-\frac{(p-g)}{2}\right)\ln\left(\frac{|W|}{|B+T|}\right)$$

Has approximately a chi-square distribution with $p(g-1)$ degrees of freedom.

Consequently, for $\sum n\ell = n$ large, we reject H_o at significant level α if:

$$-\left(n-1-\frac{(p+g)}{2}\right)\ln\left(\frac{|W|}{|B+T|}\right) > \chi^2 p(g-1)\alpha \qquad (3.21)$$

3.6.3.1 Blocking as Alternative to Covariance Analysis

As covariates are normally quantitative variables in multivariate Analysis of covariance (MANCOVA), at times blocking specifically Randomised Block Design with the blocks formed by means of the concomitant variables applied (Kutner et al., 2005). The reasons for this include:

(i) If the regression between the response variable and the concomitant(blocking) variable is linear, a randomized block design and covariance analysis are about equally efficient

(ii) Randomised Block Designs are essentially free of assumptions about the nature of the relationship between the blocking variable and the response variable, while covariance analysis assumes a definite form of relationship.

(iii) Randomised Block Designs have somewhat fewer degrees of freedom available for experimental error than with covariance analysis.

3.6.3.2 Complete Block Design

The design in which each treatment is included once in each block is called Randomised Complete Block Design. The key objective in blocking the experimental units is to make them as homogeneous as possible within blocks with respect to the response variable under the study , and to make the different blocks as heterogeneous as possible with respect to the response variable.

A linear statistical model for the response is:

$$Y = \begin{bmatrix} Overall \\ \text{Constant} \end{bmatrix} + \begin{bmatrix} Treatment \\ Effect \end{bmatrix} + \begin{bmatrix} Block \\ Effect \end{bmatrix} + \begin{bmatrix} Experimental \\ Error \end{bmatrix} \quad (3.22)$$

3.6.3.3 Model for Randomised Complete Block Design

The model forRandomised Complete Block Design containing the assumption of no interaction effects, when both the block and the treatment are fixed and there are no blocks (replications) and the treatment is given below:

$$Y_{ij} = \mu + \rho_i + \tau_j + \varepsilon_{ij} \quad (3.23)$$

Where

μ is a constant

ρ_i are constants for the block(row) effects, subject to the restriction $\sum \rho_i = 0$

τ_j are constants for treatment effects, subject to the restriction $\sum \tau_i = 0$

ε_{ij} are independent $N\left(0, \sigma^2\right)$

$i = 1, \ldots n_{b,} \; j = 1, \ldots, r$

The responses Y_{ij} with randomized block model above are independent and normally distributed with mean:

$$E\left(Y_{ij}\right) = \mu.. + \rho_i + \tau_j \quad (3.24)$$

and constant variance :

$$\sigma^2\left(Y_{ij}\right)=\sigma^2 \tag{3.25}$$

3.6.4 Analysis of Variance and Tests

3.6.4.1 Fitting of Randomised Complete Block Design Model

The least squares and maximum likelihood estimators of the parameters in randomized block model are shown below:

Table 3.4: anova table for a randomised block design

Parameter	**Estimator**
$\mu\ldots$	$\hat{\mu}\ldots=\bar{Y}\ldots$
ρ_i	$\hat{\rho}_i=\bar{Y}_i - \bar{Y}\ldots$
τ_j	$\hat{\tau}_j= \bar{Y}_j- \bar{Y}\ldots$

The fitted values therefore are:

$$\hat{Y}_{ij}=\bar{Y}...+\left(\bar{Y}_i-\bar{Y}...\right)+\left(\bar{Y}_j-\bar{Y}...\right)=\bar{Y}_i+\bar{Y}_j-\bar{Y}... \tag{3.26}$$

and the residuals are:

$$e_{ij}=Y_{ij}-\hat{Y}_{ij}=Y_{ij}-\bar{Y}_i-\bar{Y}_j+\bar{Y}... \tag{3.27}$$

3.6.4.2 Analysis of Variance (ANOVA)

Analysis of Variance (ANOVA) table for a randomized complete block design is as shown in the Table

Table 3. 5: ANOVA table for a randomized complete block design

Source of variation	*SS*	*df*	*MS*	*E{MS}*
Blocks	SSBL	n_b - 1	MSBL	$\sigma^2+r\frac{\sum\rho_i^2}{nb-1}$
Treatments	SSTR	r - 1	MSTR	$\sigma^2+ n_b\frac{\sum\tau_i^2}{r-1}$
Error	SSBL.TR	$(n_b - 1)(r - 1)$	MSBL.TR	σ^2
Total	SSTO	n_b r - 1		

Where:

$$SSBL = r\sum_{i}(\bar{Y}_i - \bar{Y})^2 \quad (3.28)$$

$$SSTR = n_b\sum_{j}(\bar{Y}_j - \bar{Y})^2 \quad (3.29)$$

$$SSBL.TR = \sum_{i}\sum_{j}(Y_{ij} - \bar{Y}_i - \bar{Y}_j + \bar{Y})^2 = \sum_{i}\sum_{j}e^2_{ij} \quad (3.30)$$

SSBL denotes the sum of squares for blocks

SSTR denotes the treatment sum of squares

SSBL.TR denotes the interaction sum of squares between blocks and treatments.

To test for interaction effects:

$$H_o : all\,\tau_j = 0 \quad (3.31)$$

$$H_a : \text{not}\, all\,\tau_j = 0 \quad (3.32)$$

The test statistic is

$$F^* = \frac{MSTR}{MSBL.TR} \quad (3.33)$$

The decision rule is :

If $F^* \geq F[1-\alpha; r-1, (n_b-1)(r-1)]$ (3.34)

Conclude H_o thus there is difference in treatment effects.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.0 Overview

This research sought to develop an in-depth understanding of pre-service teachers perception and performance in Mathematics, English and Science with regards to their learning modes (regular and distance) in the University of Cape Coast.

In order to answer the stated research questions, Statistical Package for Social Science (SPSS) and R were used to analyse the data by applying Multivariate Analyses of Variance (MANOVA) and factor analysis. Descriptive was run on the data to ascertain the number of distance and regular students, male and female and the ratings from the sample on other variables from the questionnaires.

Since most of the variables on the data collected from the questionnaires were qualitative, they were coded and treated as concomitant variables. The coding was necessary for efficient analysis of data. For this research work, coding decisions were taken at the designing stage of the questionnaire. The response categories in Likert scales have a rank order and therefore could be referred to as ordinal because ordinal scale of measurement is one that conveys order

Randomised blocked design was applied to find out the effects of some of the random variables on the data collected. To be optimistic of explaining the effects of the covariates, factor analysis was run to check the factor loadings and ascertain the factors that affect pre-service teachers' performance in the DBE course.

This chapter therefore entails the data analysis and results of the data collected to respond to the objectives set. All the results gotten were from the research questionnaire used and

the raw scores (marks) of the pre-service teachers in Mathematics, English language and Science retrieved from university of Cape Coast.

4.1 Preliminary Data Analysis

A summary of the frequencies and descriptive statistics of the results is presented as follows;

Frequencies of study modes

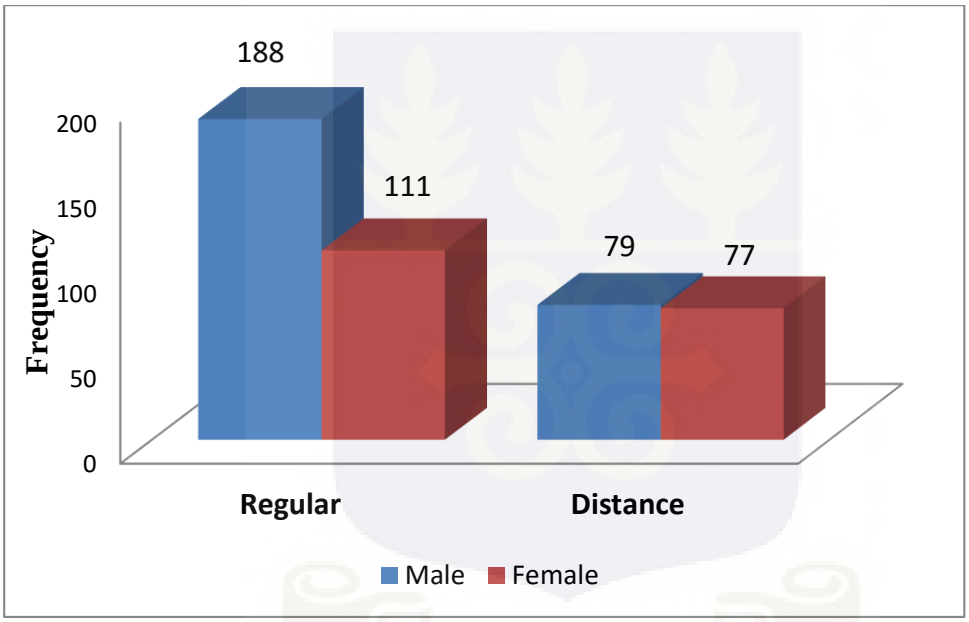

Figure 4.1: Bar graph showing modes of learning

The total sample size was 455 with Regular students constituting 299 and Distance students constituting 156 respondents. There were 188 and 111 male and female students respectively in regular whilst 79 and 77 for male and female students respectively with distance.

4.1.1 Descriptive Statistics of scores for male and female students in Regular mode

Table 4.1 shows the descriptive statistics of mean scores for male and female students in Regular mode. It could be seen that, the score for English content was 55.45 and 56.69 for male and female respectively, showing that the females performed a little better in the English content than the males. The mean scores for male and female students in Mathematics content recorded 61.64 and 58.65 respectively, also showing that the males performed a little better in the Mathematics content than the males. In Science content, it recorded 62.65 and 65.63 for male and female students respectively. With the methodology courses in English Language, Mathematics and Science, males recorded 63.12, 70.57, 54.81 respectively whilst the females recorded 64.89, 69.50, 54.17 respectively.

Table 4.1: Descriptive Statistics of mean scores for male and female students in Regular mode

		English content	Maths content	Science content	English methods	Maths methods	Science methods
Male	Mean	55.45	61.64	62.65	63.12	70.57	54.81
	Std. Dev.	10.48	12.45	11.25	9.70	8.08	10.39
Female	Mean	56.69	58.65	65.63	64.89	69.50	54.17
	Std. Dev.	10.68	13.18	9.44	9.87	9.44	9.96

Source: End of semester Results

4.1.2 Descriptive Statistics of mean scores for male and female students in Distance mode

Table 4.2 shows the descriptive statistics of mean scores for male and female students in Regular mode. It could be seen that, the score for English content was 57.95 and 59.87 for male and female respectively, showing that the females performed a little better in the English content than the males. The mean scores for male and female students in Mathematics content recorded 54.93 and 56.36 respectively, also showing that the males

performed a little better in the Mathematics content than the males. In Science content, it recorded 54.67 and 54.45 for male and female students respectively. With the methodology courses in English Language, Mathematics and Science, males recorded 60.06, 48.73, and 60.49 respectively whilst the females recorded 58.31, 48.10 and 60.05 respectively. From table 4.2, the females had a higher standard deviation in mathematics content showing that some of the females had higher marks whilst others also had very low marks. It could also be seen that in English language, the standard deviations were almost the same showing almost the same variations.

Table 4.2: Descriptive Statistics of scores by sex of students in Distance mode

		English content	Maths content	Science content	English methods	Maths methods	Science methods
Male	Mean	57.95	54.93	54.67	60.01	48.73	60.49
	Std. Dev.	15.24	13.82	15.41	12.64	17.55	12.31
Female	Mean	59.87	56.36	54.45	58.31	48.10	60.05
	Std. Dev.	14.43	15.94	13.71	15.56	16.68	12.41

Source: End of semester Results

4.1.3 Descriptive Statistics of scores for male and female students in the two modes together

Table 4.3 shows the descriptive statistics of general mean scores for male and female students in both regular and distance modes. Generally, the mean scores in English Language, Mathematics and Science content for males recorded 56.19, 59.66 and 60.3 respectively whilst for females; it recorded 57.99, 57.72 and 61.05. In the methodology courses for English Language, Mathematics and Science, the mean scores recorded for males were 62.21, 64.12 and 56.5 whilst the females recorded 62.20, 60.74 and 56.58.

Table 4.3: Descriptive Statistics of scores of students by sex the two modes together

		English content	Maths content	Science content	English methods	Maths methods	Science methods
Male	Mean	56.19	59.66	60.3	62.21	64.12	56.5
	Std. Dev.	12.11	13.21	13.11	10.73	15.37	11.28
Female	Mean	57.99	57.72	61.05	62.20	60.74	56.58
	Std. Dev.	12.42	14.38	12.62	12.90	16.64	11.38

Source: End of semester Results

4.1.4 Descriptive Statistics of the scores for students who did Additional Mathematics or not at Regular mode

Table 4.4 shows the descriptive statistics of the mean scores for students who did Additional Mathematics in their Senior High School education at Regular mode. The mean score for those who responded 'yes' was 70.85 whilst those who responded 'no' was 70.01. It could clearly be seen that there is no much difference in their mean scores. From the table, mathematics methods had a very high standard deviation showing a high variation between the scores. It could also be seen that Science methods had a comparatively lower standard deviation.

Table 4.4: Descriptive Statistics of the scores for students who did Additional Mathematics at Regular mode

	Additional Mathematics or Not	
	Yes	No
Mean	70.85	70.01
Std. Dev.	10.69	8.03
Total(n)	60	239

Source: End of semester Results

4.1.5 Descriptive Statistics of the scores for students who did Additional Mathematics at Distance mode

Table 4.5 shows the descriptive statistics of the mean scores for students who did Additional Mathematics in their Senior High School education at Distance mode. The mean score for those who responded 'yes' was 55.54 whilst those who responded 'no' was 47.56. It could clearly be seen that there is some differences in their mean scores. From the table, those who did additional mathematics had a lower standard deviation showing a low variation between the scores. Those who did not do additional mathematics comparatively had higher standard deviation showing high variations in their scores.

Table 4.5: Descriptive Statistics of the scores for students who did Additional Mathematics at Distance mode

	Additional Mathematics or Not	
	Yes	No
Mean	55.54	47.56
Std. Dev.	13.38	17.70
Total(n)	37	119

Source: End of semester Results

4.1.6 Descriptive Statistics of the scores for Regular and Distance modes

From table 4.6, the mean scores in English content are 55.91 and 58.90 for Regular and Distance respectively. The means scores in mathematics content are 60.54 and 55.64 for Regular and Distance respectively. Similarly, the means scores in Science content are 63.76 and 54.56 for Regular and Distance respectively. In the methodology courses for the English, Mathematics and Science, the mean scores recorded for Regular are 63.78, 70.18 and 54.58 respectively, whilst for distance, it recorded 59.17, 48.42 and 60.28 respectively. From table 4.5, Distance Education pre-service teachers had very high

standard deviations showing high variations between their scores. This indicates that the regular pre-service teachers had their scores with comparatively lower variations.

All other results of descriptive statistics related to this research are presented in appendix B

Table 4. 6: Descriptive Statistics of the scores for Regular and Distance modes

Learning mode		English content	Maths content	Science content	English methods	Maths metods	Science methods
Regular	Mean	55.91	60.54	63.76	63.78	70.18	54.58
	Std. Dev.	10.56	12.79	10.70	9.79	8.62	10.23
Distance	Mean	58.90	55.64	54.56	59.17	48.42	60.28
	Std. Dev.	14.83	14.88	14.55	14.14	17.08	12.33
Total	Mean	56.93	58.86	60.61	62.20	62.72	56.53
	Std. Dev.	12.26	13.73	12.90	11.66	15.98	11.31

Source: End of semester Results

4.2 Students' Evaluation on Teaching (SET)

Students' Evaluation on Teaching (SET) on tutors knowledge of subject matter and tutors ability to organize instruction (lesson) for both Regular and Distance modes in the DBE course.

4.2.1 Percentage distribution of Tutors' knowledge of subject matter

Table 4.7 shows the Students Evaluation on Teaching (SET) on Tutors' knowledge of subject matter in teaching both DBE courses for both regular and distance learning modes.

Looking at the rating scales for the two learning modes, they both rated the tutors almost the same with a little varying percentages. For Tutors' knowledge of subject matter in teaching as good, regular students recorded 87 out of 299 whilst the distance students recorded 44 out of 156 representing 29.10 and 28.21 respectively which are almost the same. In contrary, rating Tutors' knowledge of subject matter in teaching both DBE

courses for both regular and distance learning modes as tutors needing improvement, regular students recorded 43 out of 299 whilst the distance students recorded 1 out of 156 representing 14.38 and 0.64 respectively which are far apart.

Table 4.7: Percentage distribution of Tutors' knowledge of subject matter by students

	Learning Mode	
Rating Scale	Regular	Distance
Poor	2(0.67)	1(0.64)
Needs improvement	43(14.38)	1(0.64)
Satisfactory	98(32.78)	14(8.97)
Good	87(29.10)	44(28.21)
Excellent	69(23.07)	96(61.54)
Total	299(100)	156(100)

Source: Field Data

4.2.2 Percentage distribution of Tutors' organization of Lessons

Table 4.8 shows the Students Evaluation on Teaching (SET) on Tutors' organization of Lessons in teaching both DBE courses for both regular and distance learning modes.

Looking at the rating scales for the two learning modes, they both rated the tutors according to their individual observations with a little varying percentage. For Tutors' organization of Lessons in teaching as excellent, regular students recorded 40 out of 299 whilst the distance students recorded 43 out of 156 representing 17.47 and 27.56 respectively. In rating Tutors' organization of Lessons in teaching both DBE courses for both regular and distance learning modes as good, regular students recorded 132 out of 299 whilst the distance students recorded 71 out of 156 representing 44.15 and 45.51 respectively which are very close.

Table 4.8: Percentage distribution of Tutors' organization of Lessons

	Learning Mode	
Rating Scale	Regular	Distance
Poor	5(1.67)	1(0.64)
Needs improvement	53(17.73)	1610.25)
Satisfactory	69((23.08)	26(8.70)
Good	132(44.15)	71(45.51)
Excellent	40(17.47)	43(27.56)
Total	299(100)	156(100)

Source: Field Data

4.3 Communications and fairness in evaluation (providing students with constructive feedback about their performance)

Table 4.9 shows the Students Evaluation on Teaching (SET) on Tutors' Communications and fairness in evaluation i.e. providing students with constructive feedback about their performance in teaching both DBE courses for both regular and distance learning modes. Looking at the rating scales for the two learning modes, For Tutors' Communications and fairness in evaluation i.e. providing students with constructive feedback about their performance in teaching as satisfactory, regular students recorded 119 out of 299 whilst the distance students recorded 32 out of 156 representing 39.8 and 20.1 respectively. In rating Tutors' Communications and fairness in evaluation i.e. providing students with constructive feedback about their performance in teaching both DBE courses for both regular and distance learning modes as good, regular students recorded 54 out of 299 whilst the distance students recorded 64 out of 156 representing 18.1 and 41.0 respectively which are very far apart.

Table 4.9: Communications and fairness in evaluation (providing students with constructive feedback about their performance)

	Learning Mode	
Rating Scale	Regular	Distance
Poor	18(6.0)	12(7.7)
Needs improvement	52(17.4)	9(5.8)
Satisfactory	119(39.8)	32(20.1)
Good	54(18.1)	64(41)
Excellent	56(18.7)	39(25)
Total	299(100)	156(100)

Source: Field Data

4.3.1 Students' views on Quantitative related courses

Quantitative related courses are seen to be Sciences. In the basic schools in Ghana, the quantitative courses are mathematics and science. There have been a lot of complaints and report from chief examiners on the poor performance of students at both BECE and WASSE levels in these Quantitative courses. Does the basic school teacher has the flair in teaching them or what are their views in learning to teach them even in training school?

4.3.1.1 Percentage Distribution of students' Views on Quantitative Related Courses;

Watching a teacher solve a problem in mathematics makes me feel uncertain

Table 4.10 shows the perception of male and female students pursuing the DBE course in both regular and distance modes on quantitative related courses; watching a teacher solve a problem in mathematics makes me feel uncertain. Out of 188 regular students 99 representing 52.65 disagreed. No male regular student agreed representing zero percent. 30 male distance students disagreed representing 37.97 percent and only 2 of them representing 2.53 percent agreed.

With regards to the female students, out of 111 female regular students, 53 representing 47.75 disagreed whilst 3 representing 2.70 agreed. Out of 77 female distance students, 30 representing 38.96 disagreed and 2representing 2.60 agreed.

Table 4.10: Percentage Distribution of students' Views on Quantitative Related Courses; watching a teacher solve a problem in mathematics makes me feel uncertain

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	31(16.49)	24(30.38)
	Disagree	99(52.65)	30(37.97)
	Neutral	50(26.60)	20(25.32)
	Agree	8(4.26)	3(3.80)
	Strongly Agree	0(0.00)	2(2.53)
Female	Strongly Disagree	27(24.32)	10(12.99)
	Disagree	53(47.75)	30(38.96)
	Neutral	28(25.23)	29(37.67)
	Agree	3(2.70)	2(2.60)
	Strongly Agree	0(0.00)	8(10.39)

` *Source: Field Data*

4.3.1.2 Picking up any quantitative subject like mathematics or science text book to begin work on homework is stressful

Table 4.11 shows the perception of male and female students pursuing the DBE course in both regular and distance modes on quantitative related courses; Picking up any quantitative subject like mathematics or science text book to begin work on homework is stressful. Out of 188 regular male students 66 representing 35.11disagreed. 23 male

regular students agreed representing 12.23 percent. 27 male distance students disagreed representing 34.18percent and 6 of them representing 7.59 percent agreed.

With regards to the female students, out of 111 female regular students, 41 representing 42.34 disagreed whilst 20 representing 18.02 agreed. Out of 77 female distance students, 16 representing 20.78 disagreed and 15 representing 19.48 agreed.

From the table, it could be seen that more females agreed with "Picking up any quantitative subject like mathematics or science text book to begin work on homework is stressful" than males. But on average, there is no much difference in the response of the males and the females. All the results relating to students' views on quantitative related courses are presented in appendix B.

Table 4.11; Picking up any quantitative subject like mathematics or science text book to begin work on homework is stressful

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	25(13.30)	24(30.38)
	Disagree	66(35.11)	27(34.18)
	Neutral	72(38.30)	7(8.86)
	Agree	23(12.23)	6(7.59)
	Strongly Agree	2(1.06)	2(2.53)
Female	Strongly Disagree	11(9.91)	25(32.47)
	Disagree	41(42.34)	16(20.78)
	Neutral	39(35.13)	9(11.69)
	Agree	20(18.02)	15(19.48)
	Strongly Agree	0(0)	12(15.58)

Source: Field Data

4.3.2 Students' views on learning English Language

There have been a lot of complaints and report from chief examiners on the poor performance of students at both BECE and WASSE levels in English language. The question therefore is; Does the basic school teacher has the flair in teaching English Language or what are their views in learning to teach English Language even in training school? Below are some of the responses of student pursuing the DBE course both with Regular and Distance modes.

4.3.2.1 Gets nervous when answering a question in English class

From table 4.12shows the perception of male and female students pursuing the DBE course in both regular and distance modes on English Language. Responding to "I get nervous when I have to answer a question in my English class".

Out of 188 regular male students 39 representing 20.74 disagreed. 58 of them representing 30.85 remained neutral.44 male regular students agreed representing 23.40 percent. 28 male distance students disagreed representing 35.44% and 6 of them representing 7.59% agreed.

With regards to the female students, out of 111 female regular students, 25 representing 22.52 disagreed whilst 24 representing 21.62 agreed. Out of 77 female distance students, 23 representing 29.87 disagreed and 12 representing 19.48 agreed.

Table 4.12: Gets nervous when answering a question in English class

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	22(11.70)	23(29.11)
	Disagree	39(20.74)	28(35.44)
	Neutral	58(30.85)	14(17.72)
	Agree	44(23.40)	6(7.59)
	Strongly Agree	25(13.30)	8(7.59)
Female	Strongly Disagree	25(22.52)	25(32.47)
	Disagree	21(18.92)	23(29.87)
	Neutral	38(34.23)	12(11.69)
	Agree	24(21.62)	12(19.48)
	Strongly Agree	14(12.61)	5(15.58)

Source: Field Data

4.3.2.2 I do not like studying English

From table 4.13 shows the perception of male and female students pursuing the DBE course in both regular and distance modes on English Language. Responding to "I do not like studying English", Out of 188 regular male students 53 representing 28.19 disagreed. 55 of them representing 29.26 remained neutral.42 male regular students agreed representing 22.34 percent. 26 male distance students disagreed representing 32.91 percent and 9 of them representing 11.39 percent agreed.

With regards to the female students, out of 111 female regular students, 25 representing 22.52 disagreed whilst 20 representing 18.02 agreed. Out of 77 female distance students, 26 representing 33.77 disagreed and 9 representing 11.69 agreed.

Table 4.13: I do not like studying English

		Learning Mode	
Sex	Rating Scale	Regular	Distance
	Strongly Disagree	20(10.64)	36(45.57)
Male	Disagree	53(28.19)	26(32.91)
	Neutral	55(29.26)	1(1.27)
	Agree	42(22.34)	9(11.39)
	Strongly Agree	18(9.57)	7(8.86)
	Strongly Disagree	13(6.91)	26(33.77)
Female	Disagree	25(22.52)	26(33.77)
	Neutral	20(18.02)	8(10.39)
	Agree	20(18.02)	9(11.69)
	Strongly Agree	13(11.72)	8(10.39)

Source: Field Data

4.3.2.3 Looking forward to studying more English in the future

From table 4.14 shows the perception of male and female students pursuing the DBE course in both regular and distance modes on English Language. Responding to "I look forward to studying more English in the future". Out of 188 regular male students 32 representing 17.02 disagreed. 58 of them representing 30.85 remained neutral. Coincidentally, 58 male regular students agreed representing 30.85 percent. 11 male distance students disagreed representing 13.92 percent and23 of them representing 23.11 percent agreed.

From the table, it could be seen that more females agreed with "I look forward to studying more English in the future" than males with the Distance group but with the regular group it was vice versa. Looking at the table critically, there is no much difference in the

response of the males and the females. All the results relating to students' views on learning English Language are represented at appendix B.

Table 4.14: looking forward to studying more English in the future

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	12(6.38)	11(13.92)
	Disagree	32(17.02)	11(13.92)
	Neutral	58(30.85)	8(10.13)
	Agree	58(30.85)	23(29.11)
	Strongly Agree	28(14.89)	26(32.91)
Female	Strongly Disagree	12(10.81)	12(15.58)
	Disagree	25(22.52)	12(15.58)
	Neutral	33(29.73)	9(11.69)
	Agree	26(23.42)	26(33.7)
	Strongly Agree	15(13.51)	18(23.37)

Source: Field Data

4.4 Factors that Affect Pre-service teachers' Academic Performance

So many factors affect students' academic performance whether they are with the regular or the distance modes. Table 4.15 present the KMO test. KMO measures the "ratio of the squared correlation" between variables to the squared "partial correlation". For an appropriate data, the value should exceed 0.6.Bartlett's test tests if the "correlation matrix" is an "identity matrix". However, we want to have correlated variables, so the off-diagonal elements should not be zero (0). Thus, the test should be significant

Table 4. 15: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.682
Bartlett's Test of Sphericity	Approx. Chi-square	4526.447
	P-value	0.001

From Table 4.15, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value is 0.682, and the "Bartlett's test" is significant ($p-value=0.001$). This is indicates that the sampled factors was adequate for the factor analysis.

The study further explored the number of factors to be retained. In determining how many components to extract, Kaiser's criterion was used. Here the study was interested in components with eigen values greater than 1. The result is presented in Table 4.17.

4.4.1 Total Variance Explained with regards to factors affecting performance of Pre-service teachers

From Table 4.16, the first seven components recorded eigen values above 1. These seven components explained a total of 64.044 percent of the variance observed in students' performance.

Table 4.16: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	4.195	16.133	16.133	4.195	16.133	16.133
2	3.356	12.907	29.040	3.356	12.907	29.040
3	2.564	9.861	38.901	2.564	9.861	38.901
4	1.978	7.607	46.508	1.978	7.607	46.508
5	1.708	6.567	53.076	1.708	6.567	53.076
6	1.671	6.426	59.502	1.671	6.426	59.502
7	1.181	4.542	64.044	1.181	4.542	64.044
8	0.985	3.787	67.831			
9	0.866	3.330	71.161			
10	0.806	3.100	74.261			
11	0.742	2.854	77.115			
12	0.680	2.615	79.730			
13	0.620	2.384	82.114			
14	0.599	2.303	84.417			
15	0.479	1.841	86.258			
16	0.471	1.810	88.069			
17	0.440	1.694	89.763			
18	0.415	1.597	91.360			
19	0.398	1.530	92.890			
20	0.366	1.409	94.299			
21	0.317	1.220	95.519			
22	0.296	1.139	96.658			
23	0.258	.994	97.652			
24	0.219	.841	98.493			
25	0.204	.783	99.277			
26	0.188	.723	100.000			

Source: Field Data

However, the number of factors retained by this criterion is many. The scree plot was examined to cut down the number of retained factors. The scree plot is depicted in Figure 4.2.

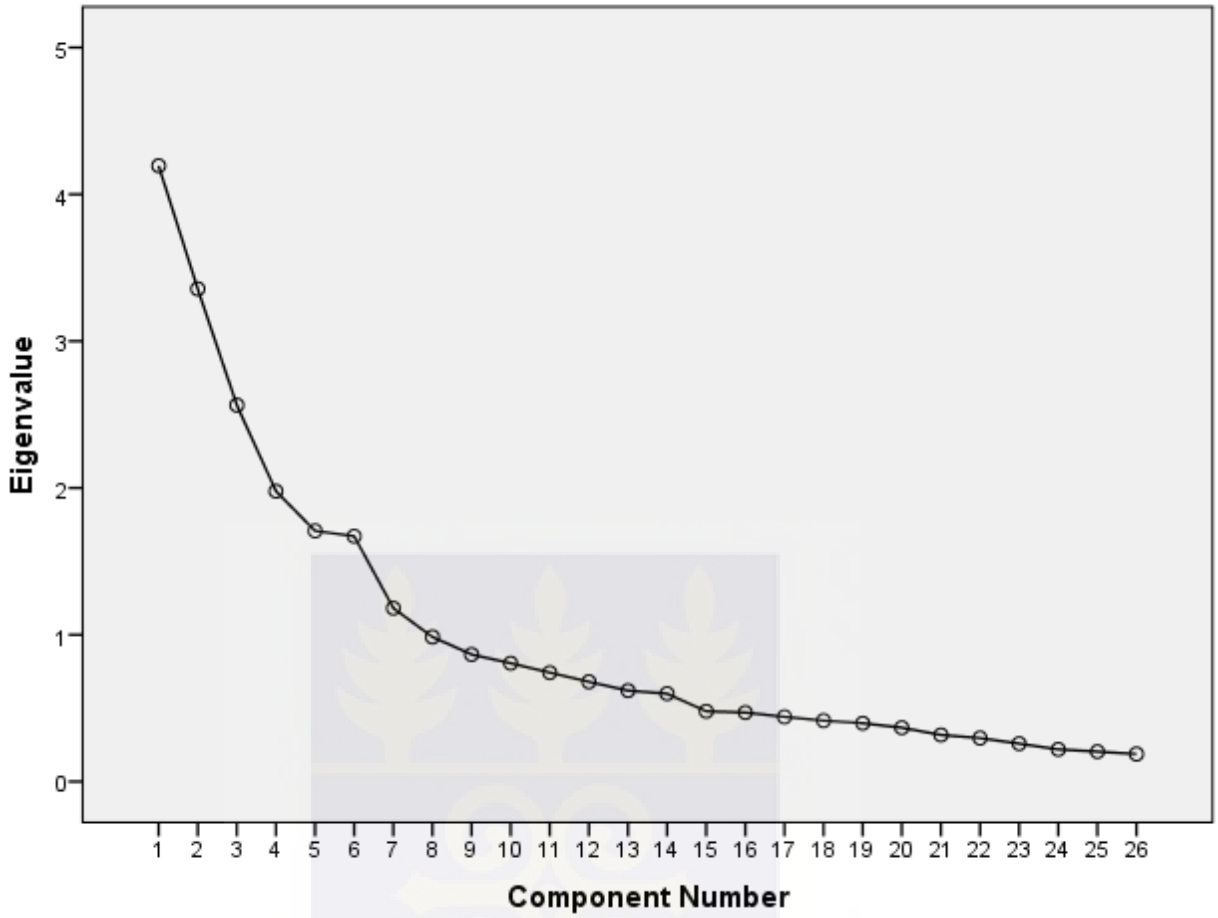

Figure 4.2: Scree plot criteria for retaining factors.

From Figure 4.2, the screeplot showed that five components were above the point where the elbow bends. From components 7 onwards, the curve appears to be on a horizontal band. Thus, 5 components were retained. The 5 retained Components explained about 53% of the variance.

The retained components are presented in Table 4.17.

4.5 Rotated Component Matrix

From Table 4.17, teachers' impact on students' academic performance loaded very high in factor one. The factor was made up of the variables; teacher discuss many topic in a short period of time, teacher gives a lot of memory work, teacher uses lecture method only,

teacher always scolds students, teacher is frequently absent from class, and teacher is always late. These are major concerns that constitute one factor that influences students' performance. Factor two was as a result of personal challenges towards studies. These included; difficulty in seeing, I Study only when there is a quiz or class test, I am disturbed when studying, I study when I like, I have no time to study at home, and I don't have a comfortable place to study.

Table 4. 17: Rotated Component Matrix

	Component				
	1	2	3	4	5
"Feeling sleepy in class"			-0.39		
"Feeling hungry in class"			-0.44		
"Difficulty in seeing"		0.50			
"I Study only when there is a quiz or class test"		0.66			
"I am disturbed when studying"		0.68			
"I study when I like"		0.76			
"I have no time to study at home"		0.76			
"I don't have a comfortable place to study"		0.57			
"I Live far from school"					0.75
"I don't live with my parent"					0.58
"Both my parents are working"			0.57		
"Classroom is comfortable enough"			0.66		
"There is fast internet access on campus"			0.74		
"There is enough space in the library"			0.72		
"Teacher has mastery of the subject matter"			0.56		
"Teacher discuss many topic in a short period of time"	0.62				
"Teacher gives a lot of memory work"	0.51				
"Teacher uses lecture method only"	0.72				
"Teacher always scolds students"	0.74				
"Teacher is frequently absent from class"	0.74				
Teacher is always late	0.63				
"I am satisfied with the amount of time required for this" course				0.59	
"Materials for the course are readily available"				0.72	
"Past questions for the course are easy to obtain"				0.71	
"Discussion on assignments were easy to follow"				0.77	
"I am very satisfied with this course"				0.67	

Also from Table 4.17, the third key factor was about availability of facilities both at home and school. For instance; my parents are working, classroom is comfortable enough, there is fast internet access on campus, there is enough space in the library, and teacher has mastery of the subject matter. The fourth factor observed addressed the adequacy and satisfaction of course content. It constituted; I am satisfied with the amount of time required for this course, materials for the course are readily available, past questions for the course are easy to obtain, discussion on assignments were easy to follow, and I am very satisfied with this course. Finally, the fifth factor touched on the accommodation of the student. The factor captured; I Live far from school and I don't live with my parent. Therefore, the key factors influencing students' academic performance can be summaries as (1) Teacher impact, (2) students' personal challenges towards studies, (3) facilities, (4) adequacy and satisfaction of the course content, and (5) students' accommodation.

4.5.1 "Multivariate Data Analysis"

Multivariate Analysis of variance (MANOVA) was used to run the full model of the data gathered to see which of the variables are actually statistically significant. As already shown in the preliminary analysis, there were differences in means of English Language, mathematics and science both in content and methodology courses with regard to gender in both learning modes-regular and distance. In addition, there were also some differences in means of quantitative courses as far as prior knowledge in mathematics is concerned, thus there were differences in means of the scores of the above named courses between students who did elective/additional mathematics at Senior High level and those who did not do elective/additional mathematics at Senior High level.

As a result, Multivariate Analysis of Covariance (MANCOVA) was to be conducted to assess the effects of the Covariates (CVs) after their differences that might have associated with the Independent Variable(s) (IVs) have been removed. Looking at the data set for this

research, all the variables that have the potential to be treated as Covariates (CVs) were discrete and as a result blocking as the alternative to Covariance Analysis as recommended by (Kutner et al., 2005) was applied.

4.5.2 Coding

For the simplicity of the factors used in the gathering of the information, question codes were given to the individual independent variables as explained in table 4.18

Table 4. 18: Items and their Interpretations

Item	Interpretation
Q1	Gender
Q2	Age
Q3	Marital Status
Q4	Nationality
Q5	Employment status
Q6	Category of learning mode, thus regular or distance
Q7	Prior knowledge in mathematics, thus whether a Student did elective/additional mathematics at Senior High level or not
Q8	Type of sponsorship
Q9	Students' view on quantitative courses
Q10	Students' evaluation on Teaching
Q11	Students' attitudes towards English
Q12	Factors affecting students' performance

The full model of the Dependent variables with the covariate were input and run using an SPSS package. It was realized that with the MANOVA, the mode of learning was significant. Some of the covariates were used as concomitant (blocking) variables to check the main effects of the significance.

4.5.3 Multivariate Analysis Results (mathematics) of Respondents: Full Model

As can be seen in table 4.19 the differences in final scores of mathematics content and mathematics methodology with regard to gender were not statistically significant. The p-values are 0.896 and 0.765 for mathematics content and mathematics methodology respectively. This means that the differences in final scores of mathematics content and mathematics methodology for male and female students were not significant.

For the final scores of mathematics content and mathematics methodology in connection with category of learning mode, thus regular and distance, it can be seen that differences in scores were statistically significant with the following p-values: 0.02 and 0.01 for mathematics content and mathematics methodology respectively. This is to say that, there were significant differences in final scores between regular and distance learning modes.

In the same way, it can also be seen in table 4.19 that considering the final scores of mathematics content and mathematics methodology with regards to students with prior knowledge in mathematics, thus those who did elective/additional mathematics at Senior High level and those who did not do elective/additional mathematics at Senior High level, differences in final scores for both courses were not statistically significant with p-values of 0.298 and 0.62 for mathematics content and mathematics methodology respectively.

As shown in 4.5and4.6, students who did elective/additional mathematics at Senior High level performed better than those who did not do elective/additional mathematics at Senior High level.

Table 4.19: Multivariate Analysis Results (mathematics) of Respondents: Full Model

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SMC	1	871596.4	4756.199	0.00
	SMM	1	940205.3	6300.731	0.00
Q6	SMC	1	998.961	5.451	0.02*
	SMM	1	32116.39	215.226	0.01*
Q1	SMC	1	3.122	0.017	0.896
	SMM	1	13.341	0.089	0.765
Q7	SMC	1	199.042	1.086	0.298
	SMM	1	36.656	0.246	0.62
Q6*Q1	SMC	1	77.637	0.424	0.515
	SMM	1	152.433	1.022	0.313
Q6*Q7	SMC	1	22.995	0.125	0.723
	SMM	1	18.541	0.124	0.725
Q1*Q7	SMC	1	16.074	0.088	0.767
	SMM	1	115.078	0.771	0.38
Q6*Q1*Q7	SMC	1	183.598	1.002	0.317
	SMM	1	397.493	2.664	0.103

4.5.4 Multivariate Analysis Results (mathematics) of Respondents: Full Model

As can be seen in table 4.20, the differences in final scores of mathematics content and mathematics methodology with regard to age were not statistically significant. The p-values are 0.71 and 0.37 for mathematics content and mathematics methodology respectively. This means that the differences in final scores of mathematics content and mathematics methodology for the various age groups of students were not significant.

For the final scores of mathematics content in connection with category of learning mode, thus regular and distance, it can be seen that differences in scores were not statistically significant with the p-values: 0.79 but was significant for mathematics methodology with p-value 0.01. This is to say that, there were significant differences in final scores between regular and distance learning modes regarding mathematics methodology.

Table 4.20: Multivariate Analysis Results (mathematics) of Respondents: Full Model

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SMC	1	140843.60	774.98	0.00
	SMM	1	150722.00	1017.25	0.00
Q6	SMC	1	12.63	0.07	0.79
	SMM	1	2397.24	16.18	0.01*
Q1	SMC	1	349.28	1.92	0.16
	SMM	1	306.00	2.07	0.15
Q2	SMC	3	83.11	0.46	0.71
	SMM	3	153.19	1.03	0.37
Q6*Q1	SMC	1	18.15	0.10	0.75
	SMM	1	280.37	1.89	0.17
Q6*Q2	SMC	2	143.05	0.79	0.45
	SMM	2	272.60	1.84	0.16
Q1*Q2	SMC	3	278.24	1.53	0.20
	SMM	3	297.43	2.01	0.11
Q6*Q1*Q2	SMC	1	61.65	0.34	0.56
	SMM	1	169.25	1.14	0.28

Source: End of semester Results

4.5.5 Multivariate Analysis Results (science) of Respondents: Full Model

From table 4.21 the differences in final scores of Science content with regards to gender was significant with p-value of 0.01 but with Science methodology, it was not statistically significant with regard to gender with p-value of 0.96. This means that the differences in final scores of Science content was significant for male and female whist Science content for male and female students was not significant.

For the final scores of Science content and Science methodology in connection with category of learning mode, thus regular and distance, it can be seen that differences in scores was also statistically significant for the Science content with the p-value: 0.03.Just like with gender, Science methodology, was not significant by recording a p-value of 0.56. This is to say that, there were significant differences in final scores between regular and distance learning modes with regards to Science content.

Table 4.21: Multivariate Analysis Results (science) of Respondents: Full Model

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SSC	1	139096.10	962.62	0.00
	SSM	1	136854.80	1115.72	0.00
Q6	SSC	1	17.89	0.12	0.73
	SSM	1	608.31	4.96	0.03*
Q1	SSC	1	50.11	0.35	0.56
	SSM	1	40.54	0.33	0.57
Q2	SSC	3	590.22	4.09	0.01*
	SSM	3	12.38	0.10	0.96
Q6*Q1	SSC	1	222.27	1.54	0.22
	SSM	1	16.87	0.14	0.71
Q6*Q2	SSC	2	565.46	3.91	0.02*
	SSM	2	63.23	0.52	0.60
Q1*Q2	SSC	3	304.96	2.11	0.10
	SSM	3	72.14	0.59	0.62
Q6*Q1*Q2	SSC	1	82.77	0.57	0.45
	SSM	1	11.68	0.10	0.76

4.5.6 Multivariate Analysis of respondents: Gender was used as a blocking variable.

Table 4.22 depicts the differences in final scores of Science content and Science methodology with regard to category of learning mode and age after the effects of gender have been removed. As indicated in Table 4.19 differences in final scores of Science content with regard to category of learning mode and age was statistically significant with (p – value < 0.009). However, differences in Science methodology with regard to gender, was still not statistically significant with (p – value < 0.06)

Table 4.22: Multivariate Analysis of respondents: Gender was used as a blocking variable.

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SSC	1	161927.85	1113.63	0.00
	SSM	1	148538.16	1219.44	0.00
Q2	SSC	3	507.10	3.49	0.02*
	SSM	3	50.69	0.42	0.74
Q6	SSC	1	101.70	0.70	0.40
	SSM	1	896.06	7.36	0.01*
Q2*Q6	SSC	2	179.39	1.23	0.29
	SSM	2	84.82	0.70	0.50
Q1	SSC	1	416.48	2.86	0.09
	SSM	1	33.09	0.27	0.60

Source: End of semester Results

4.5.7 Multivariate Analysis Results (Science) of Respondents: Full Model

As can be seen in table 4.23, the differences in final scores of Science content with regards to age was significant with (p – value < 0.02)but with Science methodology, it was not statistically significant with regard to age with (p – value < 0.40). This means that the differences in final scores of Science content was significant for male and female whist Science content for male and female students was not significant.

For the final scores of Science content and Science methodology in connection with category of learning mode, thus regular and distance, it can be seen that differences in scores was also statistically significant for the Science content with (p – value < 0.02). Considering Science content and Science methodology with regards to the student having

a background of doing elective/additional mathematics in the senior high school, it was seen that it was not significant by recording a p-value of 0.18 and 0.20 respectively. This is to say that, there were not significant differences in final scores between Science content and Science methodology as to whether the student did elective/additional mathematics in the senior high school or not.

Table 4.23: Multivariate Analysis Results (Science) of Respondents: Full Model

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SSC	1	136236.51	927.77	0.00
	SSM	1	116852.70	962.32	0.00
Q6	SSC	1	325.34	2.22	0.14
	SSM	1	530.67	4.37	0.04*
Q7	SSC	1	266.51	1.82	0.18
	SSM	1	200.22	1.65	0.20
Q2	SSC	3	501.04	3.41	0.02*
	SSM	3	120.22	0.99	0.40
Q6*Q7	SSC	1	93.38	0.64	0.43
	SSM	1	160.15	1.32	0.25
Q6*Q2	SSC	2	114.61	0.78	0.46
	SSM	2	48.11	0.40	0.67
Q7*Q2	SSC	2	108.86	0.74	0.48
	SSM	2	101.57	0.84	0.43
Q6*Q7*Q2	SSC	1	35.84	0.24	0.62
	SSM	1	49.56	0.41	0.52

Source: End of semester Results

4.5.8 Multivariate Analysis of respondents: age was used as a blocking variable.

Table 4.24 depicts the differences in final scores of Science content and Science methodology with regard to category of learning mode and gender after the effects of age have been removed. As indicated in table 4.24 differences in final scores of Science content with regard to category of learning mode and age was not statistically significant with (p – value < 0.27). However, differences in Science methodology with regard to age, was still statistically significant as was seen from the preliminary analyses with (p – value < 0.05).

Table 4.24: Multivariate Analysis of respondents: age was used as a blocking variable in Science.

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SSC	1	178064.13	1223.99	0.00
	SSM	1	166066.52	1362.24	0.00
Q1	SSC	1	274.84	1.89	0.17
	SSM	1	21.32	0.18	0.68
Q6	SSC	1	7350.23	50.52	0.01*
	SSM	1	3081.89	25.28	0.01*
Q1*Q6	SSC	1	180.46	1.24	0.27
	SSM	1	3.93	0.03	0.86
Q2	SSC	3	374.06	2.57	0.05
	SSM	3	24.29	0.20	0.90

Source: End of semester Results

4.5.9 Multivariate Analysis of respondents: age was used as a blocking variable.

Table 4.25 depicts the differences in final scores of Mathematics content and Mathematics methodology with regard to category of learning mode and gender after the effects of age

have been removed. As indicated in table 4.25, differences in final scores of Mathematics content and Mathematics methodology with regard to category of learning mode and age was not statistically significant with (p – value < 0.55).

Table 4.25: Multivariate Analysis of respondents: age was used as a blocking variable in mathematics.

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SMC	1	178232.89	973.85	0.00
	SMM	1	191335.31	1280.57	0.00
Q1	SMC	1	107.76	0.59	0.44
	SMM	1	55.02	0.37	0.54
Q6	SMC	1	1671.31	9.13	0.01*
	SMM	1	41722.41	279.24	0.01*
Q1*Q6	SMC	1	368.33	2.01	0.16
	SMM	1	6.63	0.04	0.83
Q2	SMC	3	125.39	0.69	0.56
	SMM	3	104.15	0.70	0.55

Source: End of semester Results

4.5.10 Multivariate Analysis of respondents: prior knowledge in mathematics was used as a blocking variable.

Table 4.26 shows the differences in final scores of Mathematics content and Mathematics methodology with regard to category of learning mode and gender after the effects of prior knowledge in mathematics have been removed. As indicated in table 4.26 differences in final scores of Mathematics content and Mathematics methodology was still significant with p-values of 0.01 and 0.02.

Table 4.26: Multivariate Analysis of respondents: prior knowledge in mathematics was used as a blocking variable.

Source of Variation	Dependent Variable	Degrees of freedom (d.f)	Mean Square	F-Ratio	Sig.
Intercept	SMC	1	165427.49	899.60	0.00
	SMM	1	179171.89	1198.12	0.00
Q1	SMC	1	1014.39	5.52	0.02*
	SMM	1	31107.05	208.01	0.01*
Q6	SMC	1	190.10	1.03	0.31
	SMM	1	11.26	0.08	0.78
Q1*Q6	SMC	1	56.61	0.31	0.58
	SMM	1	9.38	0.06	0.80
Q7	SMC	3	118.82	0.65	0.59
	SMM	3	101.03	0.68	0.57

Source: End of semester Results

4.6 Discussion

The main objective of this study was to examine the differences, if any that exist between the students' performance with regards to regular and distance learning modes in the University Cape Coast. Regular students of Accra College of Education and distance students of College of Distance Education at Papa Fio Hills were selected for the study of this research.

Reliability analyses demonstrated that all scales met acceptable levels of reliability as Cronbach's alpha was 0.6 or higher for each, as required for an exploratory research (Robinson et al. 1991). Table 4.1 lists the items associated with each scale and the corresponding factor loading values and Cronbach's alpha coefficients

On running the full model of the data collected using MANOVA , it was realized that a lot of the covariates were not significant to the differences in performance of students in both the regular and the distance modes of learning.

From the analyses, it could be seen that, the mean score for females in both English content and methodology were somehow higher than that of the males showing that the

females performed a little better in the English than the males. Contrarily, the opposite occurred in the quantitative subjects like mathematics and science. It was also surprising to realise that students' prior knowledge in mathematics at the Senior High level did not bring much differences in mean scores of the quantitative courses like mathematics and science at the two learning modes.

This research has also provided evidence that the methods by which lessons are delivered at the regular learning situations is a little better than that of the distance based on how regular and distance students rated tutors in the evaluation of teaching. This might be as a result of the fact that in the regular learning situations, students have course tutors with them throughout the semester and could ask them of clarification of misunderstanding of a topic if any. At the distance learning situations students have six (6) times face-to-face meetings with tutors per course within each semester. As results have shown, regular students significantly performed better than distance students in the almost all the courses. This might be as a result of the fact that distance students receive fewer face-to-face meetings for teaching than regular students but that notwithstanding, there were some individual distance students who performed far better than some of the regular students.

CHAPTER 5

SUMMARY, CONCLUSSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter gives the summary of the results and discussions of findings. It also has the conclusions drawn which reflect the objectives of the research and recommendations with regards to the findings.

5.1 Summary

This research intended to develop a statistical model of performance at the regular and distance learning modes in the University of Cape Coast. Multivariate Analysis of Variance (MANOVA) was used as a statistical technique for analysis of this research. Raw scores of English content, English Methodology, Mathematics content, Mathematics methodology, Science content and science methodology were considered as dependent variables whereas category of learning mode with two levels-regular and distance, was treated as the main independent variable. Variables like gender, age, prior knowledge in mathematics at Senior High level and others were treated as concomitant (blocking) variables.

Taking into account the method of delivery at regular and distance learning modes, Students' Evaluation of Teaching (SET), Students' view on quantitative courses, Students' attitudes towards English Language, and Factors affecting students' performance were considered in this research.

5.2 Observations

Findings from this research have shown that differences in means of English content, English methodology, Mathematics content, Mathematics methodology, Science content and Science methodology with regard to category of learning mode were statistically significant. After running "Multivariate Analysis of Covariance" (MANCOVA) of which gender and prior knowledge in mathematics at Senior High level were treated as "concomitant" (blocking) variable, it was discovered that none of them had influence on the differences in means of English content, English methodology, Mathematics content, Mathematics methodology, Science content and Science methodology as far as category of learning mode is concerned. Though, it has been known from the findings that female students on average performed better than male students in English language, the males averagely performed better in all the three subjects. It was also observed that majority of students did not do elective/additional mathematics at Senior High level. (See appendix C for other results of multivariate analysis of covariance)

5.2.1 Students' Evaluation of Teaching (SET)

Taking into account the methods by which lessons are delivered, it was discovered in the research that comparatively regular students rated tutors better than the distance students. This might be as a result of the fact that course tutors who always have face-to-face meetings with the distance students do not present effective teaching considering the short time within which they are to deliver a whole lot of topics at a time

5.2.2 Students' View on Quantitative Related Courses

Findings of this research have shown that comparatively, female students have more negative perception about quantitative related courses especially mathematics than male students.

5.2.3 Students Views on English Language

Findings of this research have shown that comparatively, female students have more positive perception about English Language courses than male students. With looking forward to teach English language in the basic school, few males were enthusiastic as compared to the females.

5.2.4 Factors Affecting Students' Academic Performance

There are five key factors influencing students' academic performance. They are (1) Teacher impact, (2) students' personal challenges towards studies, (3) facilities, (4) adequacy and satisfaction of the course content, and (5) students' accommodation. Teachers' impact on students' academic performance loaded very high in factor one. The factor was made up of the variables; teacher discusses many topics in a short period of time, teacher gives a lot of memory work. These were major concerns that constituted one factor that influences students' performance. Factor two was as a result of personal challenges towards studies which included difficulty in seeing, "I study only when there is a quiz or class test", "I am disturbed when studying". The third key factor was about availability of facilities both at home and school. For instance; "my parents are working", "classroom is comfortable enough", and "there is fast internet access on campus", were some of the variables. The fourth factor observed addressed the adequacy and satisfaction of course content. It constituted; "I am satisfied with the amount of time required for this course", "materials for the course are readily available". Finally, the fifth factor touched on the accommodation of the student. The factor captured; "I live far from school" and "I don't live with my parent". This very factor affects the distance learners the most since they don't stay on campus but at their individual places of abode.

5.3 Conclusions

A good number of literature have concluded that distance education courses are as effective as the traditional face –to face courses (Allen at al., 2002; Bernard et al., 2004; Cavanaugh, 2001; Machtmes & Asher, 2000; Mayzer & Dejong, 2003; Murphy, 2000; Phipps & Merisotis, 1999; Ramage, 2002; Russel, 1999; Schulman & sims,1999;Zhao et.al,2004).Some of the studies have also asserted that students' achievement in distance education settings will have a more positive trend than in the traditional face- to – face settings in the near future (Machtmes & Asher, 2000; Zhao et.al et al., 2004)

This research has provided evidence that regular students performed statistically better than distance students as far as DBE courses are concerned with particular emphasis on English content, English methodology, Mathematics content, mathematics methodology, Science content and science methodology. This may be because most of the tutors who teach the Regular students are the same tutors who teach the Distance students during weekends.

Findings have also shown that, taking into account the methods by which lessons are delivered, regular students receive better tutorials as compared to that of distance students. This could be because the regular students get more sessions of meeting with tutors than the distance the group. This has brought to the conclusion that regular learning environment (situation) is considered to be the optimal mode of delivery as far as teaching DBE courses in the Colleges of Education is concerned.

In the study by Cybinsky and Selvanathan (2005) to investigate students' performance in an introductory statistics in two (2) learning modes(traditional and flexible learning environments), discovered and concluded that despite these differences in prior knowledge of mathematics in the two (2) learning groups, there were no differences in performance

outcomes between the two learning modes. In the same vein from the analysis of this study, it has also been discovered from the findings that there was no "significant difference" in the scores of students who did elective/additional mathematics at Senior High level as compared to those who did not do elective/additional mathematics at Senior High level at regular. On English Language, more females were enthusiastic at looking forward in teaching the subject as compared to the males.

5.4 Recommendations

5.4.1 Policy Formulation

Based on the findings of this research, it is recommended that:

(i) Policy makers give similar attention if not the same to distance education just as it is done to the regular colleges of Education, so that, as this research found out that though there were differences in performance but not that huge, the gap can be closed in the near future.

(ii) The Ministry of Education re-visit the national policy on science and mathematics education for females initiated by the Government of Ghana so as to motivate female students to develop interest in quantitative courses like mathematics and science right from the basic level.

5.4.2 Future Studies

It is recommended that:

(i) Students family background is investigated in future studies. This will enable researchers to see whether or not, students from different family background influences performance.

(ii) The former schools of student from basic to senior high level should be taken into consideration in future related researches. This will help researchers to draw further conclusions whether or not differences in performance in DBE courses can be attributed to the type of Senior High School a student attended.

(iii) Two or more year-groups should be studied to examine the trend of differences in performance of students in English content, English methodology, Mathematics content, mathematics methodology, Science content and science methodology courses at regular and distance learning modes of teacher education.

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APPENDICES

Appendix A: Field Questionnaire

Please kindly provide your responses for this questionnaire for this study which aims at finding the optimal mode of delivery among the two learning environments (Regular and Distance)in "Diploma in Basic Education" Courses. The information provided is purely for academic work and measurers are already put in place to ensure that your confidentiality is protected.

Serial Number: | | | |

A. Biographical Information

1. Gender: a) Male [ ] b) Female : [ ]

2. Age:

a) Below 20years [ ] b) 20 – 29 [ ]

c) 30 – 39 [ ] d) 40 – 49 [ ] e) 50 years and above [ ]

3. Marital Status: a) Married [ ] b) Single [ ] c) Divorce [ ]

4. Nationality: Ghanaian [ ] Other (Please specify) ……..

5. Employment status: a) Employed [ ] b) Unemployed [ ]

6. Category of learning mode: a) Regular [ ] b) Distance [ ]

7. Did you do Additional/Elective Mathematics at the Senior High level?

a) Yes [ ] b) No [ ]

8. Type of Sponsorship:

a) Self [ ] b) Parents/ guardian [ ] c) Scholarship [ ]

B. **Student Perception**

9. The following are views and evaluation on learning in quantitative subjects. Tick as appropriate to show how closely you agree or disagree with each statement:

SD= Strongly Disagree**, D=**Disagre**e N**= Neutral **A**=Agree **A**=Strongly Agree

Statement	SD	D	N	A	SA
a. "Watching a teacher solve a problem in mathematics makes me feel uncertain"					
b. "Reading and interpreting graphs or charts is difficult for me"					
c. "Picking up any quantitative subject like mathematics or science text book to begin					

work on homework is stressful"					
d. "I get frustrated working with formulas for problem solving"					
e. "Hearing the word mathematics or science is very stressful"					
f. "I feel comfortable using calculator to do basic calculations"					
g. "I become worried more than usual when I am about to take a test in any quantitative course"					
h. "I feel tense getting ready to prepare for any quantitative course test in any quantitative course"					
i. "I feel pressured being given an "unannounced" Interim Assessment (I.A) or Quiz in any quantitative course"					
j. "Working with figures in a test distresses me"					
k. "I have to memorize formulas before I can use them in an examination"					

11. The following are the Student Evaluation of Teaching.

Use the rating scale below to assess a lecturer who teaches quantitative related courses in your department.

Excellent -- 5 Good -- 4 Satisfactory -- 3 Needs Improvement -- 2 Poor -- 1

Cognitive Goals	1	2	3	4	5
a. "Lecturer's knowledge of subject matter"					
b. "Organization of instruction (Lesson)"					
c. "Clarity of Expression"					
d. "Quality of Presentation of Lesson"					
Affective Goals					
e. "Instructor's interest in subject matter and degree to which student interest is promoted"					
f. "Student participation/ involvement and openness to ideas"					
g. "Interpersonal relations"					
h. "Communications and fairness in evaluation i.e. providing students with constructive feedback about their performance"					

C. Attitudes towards English Language

12. To what extent do you agree with the following items? The following items ask about your attitudes toward learning the English language. Use the scale below to answer the questionnaire items.

SD= Strongly Disagree D= Disagree N= Neutral A= Agree SA= Strongly Agree.

Note: Tick (√) only one option for each item in the questionnaire.

Item	SD	D	N	A	SA
a. "Studying English is important because it will make me more educated"					
b. "Being good at English will help me study other subjects well"					
c. "I feel excited when I communicate in English with others"					
d. "Speaking English anywhere makes me feel worried"					
e. "I like to give opinions during English lessons"					
f. "I look forward to studying more English in the future"					
g. "I get nervous when I have to answer a question in my English class"					
h. "I prefer studying in my mother tongue than any other foreign language"					
i. "I study English just to pass the exams"					
j. "I do not like studying English"					
k. "English language is difficult and complicated to learn"					
l. "Knowing English is an important goal in my life"					
m. "I do not feel enthusiastic to come to class when English is being taught"					

D. Factors Affecting Student Academic Performance

13. To what extent do you agree with the following items? The following items ask about factors that affect students' academic performance. Use the scale below to answer the questionnaire items.

SD= Strongly Disagree D= Disagree N= Neutral A= Agree SA= Strongly Agree.

Note: Tick (√) only one option for each item in the questionnaire.

SD= Strongly Disagree**, D=**Disagre**e N**= Neutral **A**=Agree**SA**=Strongly Agree

	SD	D	N	A	SA
"Feeling sleepy in class"					
"Feeling hungry in class"					
"Difficulty in seeing"					
"I Study only when there is a quiz or class test"					
"I am disturbed when studying"					
"I study when I like"					
"I have no time to study at home"					
"I don't have a comfortable place to study"					
"I Live far from school"					
"I don't live with my parent"					
"Both my parents are working"					
"Classroom is comfortable enough"					
"There is fast internet access on campus"					
"There is enough space in the library"					
"Teacher has mastery of the subject matter"					
"Teacher discuss many topic in a short period of time"					
"Teacher gives a lot of memory work"					
"Teacher uses lecture method only"					
"Teacher always scolds students"					
"Teacher is frequently absent from class"					
"Teacher is always late"					
"I am satisfied with the amount of time required for this course"					
"Materials for the course are readily available"					
"Past questions for the course are easy to obtain"					
"Discussion on assignments were easy to follow"					
"I am very satisfied with this course"					

Thank you

Appendix B1 descriptive statistics of the results.

Table B1.1Descriptive Statistics of mean scores of male and Female in both Regular and Distance in English Content

Englishcontent

	N	Mean	Std.Dev	Std. Error	min	max
Male	267	56.19	12.114	.761	19	85
Female	188	57.99	12.420	.922	25	87
Regular	299	55.91	10.559	.611	32	87
Distance	156	58.90	14.832	1.237	19	85
Total	455	57.04	12.538	.588	19	87

B1Descriptive Statistics of the Results.

Table B1.2Descriptive Statistics of mean scores of male and Female in both Regular and Distance in English methods

English methods

	N	Mean	Std. Dev	Std. Error	Min	Max
Male	267	62.2060	10.73006	.65667	26.00	90.00
Female	188	62.1968	12.90022	.95526	16.00	93.00
Regular	299	63.7826	9.78954	.56614	33.00	93.00
Distance	156	59.1731	14.14403	1.15180	16.00	90.00
Total	455	62.2022	11.66204	.55097	16.00	93.00

B1Descriptive Statistics of the Results.

Table B1.3Descriptive Statistics of mean scores of male and Female in both Regular and Distance in Science Content

Science content

	N	Mean	Std. Deviation	Std. Error	Min	Max
Male	267	60.2959	13.11454	.80924	18.00	95.00
Female	188	61.0532	12.61852	.92030	24.00	89.00
wRegular	299	63.7625	10.69594	.62468	29.00	95.00
Distance	156	54.5641	14.55188	1.16508	18.00	89.00
Total	455	60.6088	12.96738	.60792	18.00	95.00

B1Descriptive Statistics of the Results.

Table B1.4Descriptive Statistics of mean scores of male and Female in both Regular and Distance in English methods

Science methods

	N	Mean	Std. Deviation	Std. Error	Min	Max
Male	267	56.4981	11.28056	.68660	22.00	85.00
Female	188	56.5798	11.37635	.87011	28.00	87.00
Regular	299	54.5786	10.22645	.58282	22.00	85.00
Distance	156	60.2756	12.32860	1.03748	28.00	87.00
Total	455	56.5319	11.30780	.53946	22.00	87.00

Table B1. Descriptive Statistics of the Results.

Table B1.5 Descriptive Statistics of mean scores of male and Female in both Regular and Distance in Maths Content

Maths content

	N	Mean	Std.Dev	Std. Error	min	max
Male	267	59.6592	13.21198	0.81551	17	93
Female	188	57.7181	14.38179	1.0568	21	92
Regular	299	60.5351	12.79109	24.00	24	93
Distance	156	55.6410	14.87884	17.00	17	88
Total	455	58.8571	13.72526	17.00	17	93

Table B1.6 Descriptive Statistics of Percentage age of respondents Age of Respondents of distance

	Frequency	Percent
Below 20 years	2	1.3
20-29 years	118	75.6
30-39 years	28	17.9
40-49 years	8	5.1
Total	156	100

Table B1.6

Descriptive Statistics of Percentage Marital Status of distance respondents Marital Status of distance

	Frequency	Percent
Married	33	21.2
Single	122	78.2
Divorce	1	1.6
Total	156	100

APPENDIX B2 Descriptive Statistics of Percentage Employment status of distance respondents

Table B2.1: Employment status of distance

	Frequency	Percent
Employed	102	65.4
Unemployed	54	34.6
Total	156	100.0

Descriptive Statistics of Percentage of sponsorship status of distance respondents

Table B2.2: Type of sponsorship of distance

	Frequency	Percent
Self	100	64.1
Parents/guardian	56	35.9
Total	156	100

Descriptive Statistics of Percentage age of distance respondents

Table B2.3

Age of Respondents of regular

	Frequency	Percent

Below 20 years	5	1.7
20-29 years	289	96.7
30-39 years	5	1.7
40-49 years	0	0.0
Total	299	100

Descriptive Statistics of Percentage Marital Status of distance respondents

Table B2.4: Marital Status of Regular students

	Frequency	Percent
Married	8	2.7
Single	291	97.3
Divorce	0	0
Total	299	100

Descriptive Statistics of Percentage Employment status of distance respondents

Table B2.5: Type of sponsorship of Regular students

	Frequency	Percent
Self	39	13.0
Parents/guardian	251	83.9
Scholarship	9	3.0
Total	100	100

APPENDIX C 1 Picking up any quantitative subject like mathematics or science text book to begin work on homework is stressful

Table C1 .1

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	25(13.30)	24(30.38)
	Disagree	66(35.11)	27(34.18)
	Neutral	72(38.30)	7(8.86)
	Agree	23(12.23)	6(7.59)
	Strongly Agree	2(1.06)	2(2.53)
Female	Strongly Disagree	11(9.91)	25(32.47)
	Disagree	41(42.34)	16(20.78)
	Neutral	39(35.13)	9(11.69)
	Agree	20(18.02)	15(19.48)
	Strongly Agree	0(0)	12(15.58)

Table C1 .2: Communications and fairness in evaluation i.e. providing students with constructive feedback about their performance

	Learning Mode	
Rating Scale	Regular	Distance
Poor	18(6.0)	12(7.7)
Needs improvement	52(17.4)	9(5.8)
Satisfactory	119(39.8)	32(20.1)
Good	54(18.1)	64(41)
Excellent	56(18.7)	39(25)
Total	299(100)	156(100)

Table C1 .3: I Study only when there is a quiz or class test

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	31(16.49)	33(41.77)
	Disagree	46(24.47)	22(24.85)
	Neutral	65(34.57)	9(11.39)
	Agree	40(21.28)	10(12.66)
	Strongly Agree	6(3.19)	5(6.33)
Female	Strongly Disagree	18(16.22)	27(35.06)
	Disagree	32(28.83)	28(36.36)
	Neutral	34(30.63)	7(9.09)
	Agree	23(20.72)	9(11.69)
	Strongly Agree	4(3.60)	6(7.79)

Table C1 .4: Materials for the course are readily available

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	9(13.30)	15(30.38)
	Disagree	61(35.11)	15(34.18)
	Neutral	70(38.30)	10(8.86)
	Agree	27(12.23)	25(7.59)
	Strongly Agree	21(1.06)	14(2.53)
Female	Strongly Disagree	14(9.91)	11(32.47)
	Disagree	24(42.34)	12(20.78)
	Neutral	49(35.13)	18(11.69)

	Agree	13(18.02)	31(19.48)
	Strongly Agree	11(0)	5(15.58)

Table C1 .5: I am very satisfied with this course

		Learning Modes	
Sex	Rating Scale	Regular	Distance
Male	Strongly Disagree	14(13.30)	7(30.38)
	Disagree	44(35.11)	12(34.18)
	Neutral	60(38.30)	11(8.86)
	Agree	47(12.23)	36(7.59)
	Strongly Agree	23(1.06)	13(2.53)
Female	Strongly Disagree	15(9.91)	12(32.47)
	Disagree	21(42.34)	11(20.78)
	Neutral	34(35.13)	8(11.69)
	Agree	31(18.02)	40(19.48)
	Strongly Agree	10(0)	6(15.58)