Enhancing the Thinking Skills of Pre-service Teachers:
A Case Study of Komenda Teacher Training College

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ABSTRACT

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Since the Socratic era, there has been agitation for a shift from the traditional system of feeding learners with information to promoting intellectual development. This shift aims at developing the intellectual capacities of learners. The implication of this is that schools should have the development of thinking skills of learners at the core of their proceedings. In this age of technological challenges and multicultural world, good thinking is the key to success (Swartz and Parks, 1994). The development of the intellectual skills of learners begins with teachers. Unfortunately, most pre-service teacher institutions do not prepare their teachers adequately for this task (Wideen, Mayer-Smith & Moon, 1998). This qualitative single case study answers two major questions. These are

1. What factors have affected the enhancement of thinking skills in pre-service teacher education institutions (Teacher Training Colleges) in Ghana?

2. How can the thinking skills of pre-service teachers in initial teacher education institutions (Teacher Training Colleges) be improved?

The study investigated the problem at Komenda Teacher Training College in Ghana. The field strategies used included interviews, observations, and documents. The purposive sampling technique was used to select three teachers from science,
mathematics, and social studies and thirty students. The researcher used inductive and creative synthesis to analyze the data and the narrative-logic approach as the presentation strategy. I used content analysis approach to analyze the documents and descriptively presented it using the lower level thinking (knowledge and comprehension) - higher level thinking (application, analysis, synthesis and evaluation) dichotomy.

The study revealed that enhancing thinking skills of learners is a secondary concern in pre-service teacher training. It was found that teaching strategies employed by teacher trainers, classroom environment, administrative issues like students’ recruitment, large class sizes, staff development, and examinations, nature of the school system school/culture of the society, and documents do not support the enhancement of the thinking skills of pre-service teachers. To ensure that pre-service teachers are trained in the art of thinking for themselves and extending this to their students, the study found that there should be a collaborative effort among all who are involved in the preparation of pre-service teachers.

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CHAPTER ONE
INTRODUCTION

“All which the school can or need do for pupils, so far as their minds are concerned...is to develop their ability to think.”
John Dewey (1916)

1.0 Introduction

This chapter is an introduction to the entire research work. It deals with the background to the study, a summary of the design of the study, methodology, and data collection sources. The statement of the problem, the purpose and significance of the research and definition of terms as used in the study are carefully looked at.

1.1 Background to the study

Since the 1980s, there has been agitation for a shift from the traditional system of feeding learners with information in the classroom to promoting intellectual development. The aim of this shift or movement is to develop thinking skills among learners. Fisher (1998, p. 5) for instance, states “The aim of this movement is to create a ‘thinking curriculum,’ placing the development of thinking skills at the heart of the educational process.” The implication of this is that schools should have the teaching of thinking at the core of their proceedings. The main purpose of any meaningful educational system should be to enhance the thinking skills of students. Governments, educational planners, employers, and educators support this priority. Swartz and Parks (1994) for example, think that in this age of technological challenges and multicultural world, good thinking is the key to success. They further reiterate that for our learners to achieve personal advancement, the school must prepare them to “exercise critical
judgment and creative thinking to gather, evaluate, and use information for effective problem solving and decision making in their jobs, in their professions, and in their lives” (p.1). This places great burden on the classroom teacher, who must help learners to acquire better thinking skills. The question we need to ask is “Have our pre-service teacher education institutions prepared the elementary classroom teacher adequately for such an intricate task?” Research has shown that most elementary school teachers are inadequately prepared, especially in developing countries like Ghana (Acheampong, 2001; Ministry of Education, 1994).

At the core of any educational reform is the teacher. The success or failure of any educational venture in general and in promoting thinking in schools in particular will undoubtedly depend on the caliber of teachers available. McLaughlin and Oberman (1996) for instance, support this assertion when they note that the teacher’s ability to execute a complex, far-reaching education reform agenda takes the center stage and that at the root of problems of any educational reform is a problem of teacher’s learning. The teacher holds the key to translating reforms and theories involved in any educational reform into effective educational experiences for all learners. The importance of teacher training in developing thinking skills of learners in schools cannot be over emphasized. Presseisen (1987) echoes

In order to build a sound thinking skills program, there is the need for teacher involvement as well as teacher acceptance in planning the program…If the central purpose of schooling is to help students think and learn better, and the primary agents of that instruction or mediation are teachers, thinking is the important raison d’être of a teacher’s competence. (p. 35).
The literature acknowledges the importance of developing thinking skills among learners. The primary essence of education is to empower learners to think for themselves and make informed decisions and judgments in life. This places immense burden on the teacher. Unfortunately, most teacher education programs deemphasize the developing of thinking skills of the student-teachers they prepare (Acheampong, 2001; Hill, 2000).

It is assumed that once teachers are given training in content and pedagogy they become skillful enough to teach to enhance the thinking skills of their learners, but as Magieri and Collins (1992; p. xi) in their introduction to Teaching Thinking: An Agenda in the twenty-first century note, “many teachers know little about thinking. It has not been part of their own education, and are unsure as to which content area owns thinking.” It is contended that since thinking does not belong to any particular discipline, then probably every teacher deals with a dimension of thinking. If this is true, it then becomes nobody’s business because what is everybody’s business becomes nobody’s business. The teaching of thinking skills is too complex and crucial to leave to chance. Conscious efforts and strategies in teaching thinking skills should be developed as part of the entire teacher preparation program of teacher training institutions. Ashton (1988) for example, states that for students’ performance on critical thinking tests to be improved, schools of education must step up teacher training and teach cognitive skills to pre-service teachers before training them to teach thinking skills in the classroom. There is an old adage that says, “You cannot fix it if you do not know how it works.” So it is with teaching thinking skills. Teachers cannot improve the thinking of their learners if they have no knowledge about thinking and how to enhance it. According to Beyer (1988), teachers should be
taught direct teaching of thinking skills in their preparation. Teaching skillful thinking must extend beyond practice and exercise. Beyer suggests that the teacher must be prepared to have an understanding of the skills to be taught and apply the appropriate rules and procedures. Teachers have a direct role to play in the development of thinking skills in schools.

Pre-service teacher education institutions should prepare teachers to act as agents of change and stability. They should be responsible for “preparing future teachers to promote meaningful, engaged learning for all students, regardless of their race, gender, ethnic heritage, or cultural background” (Yeh, 1998, p. 308). Pre-service teacher education should foster a shift in thinking. Unfortunately, this has not been the case in most countries including Ghana. Teacher education programs have been criticized as not preparing teacher trainees well enough for the classroom task ahead of them. Studies like *Achieving World Class Standards: The Challenge for educating teachers* (US Department of Education, 1992), *What Matters Most: Teaching for America’s Future* (National Commission on Teaching & America’s Future, 1996), and *Transforming the Way Teachers Are Taught* (American Council on Education, 1999) in the USA attest to the fact that there is the need for reform in teacher preparation education to reflect current trends in the education system. The reform should reflect the thinking reforms being pushed forward by educators in the 21st Century.

This phenomenon is not peculiar to the United States of America. Most nations including Ghana are saddled with the same problem, if not worse. Initial teacher education in Ghana has come under immense criticism in recent times. There are calls to
improve the qualities of teachers they train to reflect the current educational reforms in
the country. The Ministry of Education, Ghana (1994) indicates that

[Pre-service teacher education institutions] are inefficient in producing
effective teachers since the trainees and tutors have so little exposure to
actual classrooms, and academic content is taught and tested above
practical teaching methodology. (p. 23)

Teacher preparation in Ghana barely emphasizes thinking skills teaching. Stuart (1999),
in a comparative analysis study in primary teacher education curriculum in Ghana,
Lesotho, Malawi, South Africa, Trinidad and Tobago identified that tutors do not use
appropriate methods that enhance thinking skills. Sarason, Davidson, and Blatt (1986)
identified that critics see pre-service teacher education as producing teachers with limited
teaching skills to stimulate their learners to appreciate and become involved in
intellectual pursuits.

Teacher education programs emphasize knowing and understanding the content of
the subjects taught. The curriculum is silent or is not explicit on efforts made at
developing the thinking skills of learners. The objectives of both the pedagogy and
content areas do not stress the development of thinking skills of teacher trainees. The
emphasis on initial teacher education in Ghana reflects the “technical, or knowledge and
skill model” (Calderhead & Shorrock, 1997, p. 13). Teacher training in Ghana requires
the student-teacher to know and apply. The process presents teaching as delivering
knowledge in a mechanistic manner; a reflection of a transmission model (Jessop &
Penny, 1998).

Acheampong, Ampiah, Fletcher, and Sokpe (2000), in a study on curriculum
delivery in initial teacher training colleges in Ghana, identified that tutors told student-
teachers everything that they thought student-teachers need to know. Tutors hardly engage student-teachers in active participation in the learning process; lessons are teacher-led. Tutors in the initial teacher training college feel they are there to contribute to the student-teacher’s progress by transmitting what they know to them to make them effective teachers in the future. This phenomenon invariably does not promote the thinking skills of the teacher trainees.

Research shows that teachers teach the way they were taught (Britzman, 1991; Lortie, 1975). Muses (1998) states that “They [teachers] teach the way they were taught and the way their teachers were taught and the way their teachers’ teachers were taught” (p. 1). This statement may not be wholly true but it has some implications for teacher trainers. The implication of this is that it is more probable that if teacher institutions train their student-teachers with ideas in thinking and how to develop it in learners, they are likely to use the same skill and possibly improve upon it as teachers because they have been taught in the same way. Deemphasizing the teaching of thinking and thinking skills in teacher training institutions is a risky thing to do since it is likely to have negative repercussions on prospective teachers’ intellectual development and their ability to teach their learners to think.

The development of thinking skills is a forgotten phrase in the preparation of Ghanaian teachers and even in most so-called developed world. A critical review of ninety-three empirical studies on learning to teach by Wideen, Mayer-Smith, and Moon (1998), for instance, revealed that traditional teacher education programs do not engage their pre-service teachers in reflective thinking. Teacher education programs barely
scratch the surface of the pre-service teachers’ entrenched beliefs (Hill, 2000).

Acheampong (2001) in a study concerning curriculum in teacher training colleges in Ghana, found that external examinations have influenced college teachers’ instructional practices and willingness to engage student teachers in activities that will enrich teaching, learning, and thinking. Most teachers insist on students, conforming to certain methods of solving problems so that they can accurately answer questions asked in examinations. Insistence on standards and performances in teacher institutions does not encourage teaching for thinking. This kills the creative and critical ability of the student-teachers. Acheampong also noted that the Teacher Training colleges’ mathematics and science curriculum mostly emphasized lower order thinking questions and activities.

The “transmission” trend in teacher preparation in Ghana therefore needs to be reformed to reflect a more thinking skill oriented reflective type of training linked with the elementary schools to face reality in Ghanaian classrooms. The Ghanaian child needs to be taught in a way that he/she will be an active participant in the learning process and think for himself/herself. This can effectively be done by teachers who have been trained to possess and execute such skills. Recent reforms in teacher education have concentrated on infrastructural development, resources development, and structural changes. The process of preparing the student-teachers to empower them to be reflective teachers and thinkers is left to chance. In my opinion, preparing teachers for an information age that is fluid and flexible requires providing training in the critical and creative thinking skills that cut across all content and pedagogical knowledge to meet the challenges (Convention allacademic.com, 2004). As Mangieri and Collins (1992; p. xii) puts it “teacher
preparation programs are increasingly beginning to include content and pedagogical practices about the development of thinking in children and other learners”. This phenomenon is lacking in teacher preparation programs in Ghana.

This problem has been acknowledged by the Ministry of Education since 1994 and even earlier. The ministry notes that trained teachers lack the important skills and qualities that will make them better prepared to handle new directions of curriculum reform and practice. Though the important skills were not specified, as a teacher educator I presume thinking skills is one of the important skills. The problem has been recognized by both educators and even the layman in the Ghanaian street that our school children do not “think” and that teachers are the cause, but educational planners are not taking any steps to address the situation. The literature on teacher preparation in Ghana attests to the lack of thinking skills development among student-teachers leading to lack of effective intellectual development among the future leaders of the nation, but little or no effort is made in the literature as to how this problem can be addressed in the initial teacher training institution. There is no dispute that the teacher’s role in developing the thinking skills of learners is crucial and paramount, but it is the most overlooked area in the teacher preparation programs in Ghana. It is against this background that the researcher wants to find out the factors that have affected the development of thinking skills in the initial teacher training college in the preparation of its student-teachers and how the problem can be ameliorated.
1.2 Design of study

This study employed the qualitative case study approach. It employed three qualitative data collection strategies namely interview, observation, and documents analysis. The researcher used purposive sampling technique to select participants for the study. There were two groups of participants; tutors and students of the Komenda teacher training college who were interviewed and observed. Three tutors were selected from mathematics, science, and social studies purposefully for the interview and class observation. Thirty students were selected to form three focus groups of ten each for the interview. Students in the classes where the selected teachers taught became part of the observation process.

1.3 Research Methodology

This study sought to begin a discourse on making thinking skills development among learners an essential component of teacher education in Ghana. The study sought to understand the factors that have impeded the enhancement of thinking skills in pre-service teacher institutions and how the thinking skills of pre-service teachers can be enhanced. To ensure that the goal of the study is achieved, the researcher used qualitative data collection single-case study approach. This decision was made at the design stage of the study. The use of single-case study allowed me to get the complexities often associated with teacher preparation research. It also helped me get the important features of a complex organization structures (Stake, 1995). This approach meant getting into direct contact with the participants in their real setting. Actual contact was the best
approach but in doing this the researcher was cognizant of the academic confidentiality of the participants.

This method helped the researcher to get a wealth of detailed information from a small sample and increase the depth of understanding of the situation being studied (Patton, 2002). The use of this methodological approach also enabled me to use direct quotes, and to portray a complete picture of the setting where the research was conducted to my readers. Such an approach allowed me to get closer to the site and situation of the study, captured what the people actually said, and helped me to include a great deal of description of people involved in the study, activities, interactions, and settings (Patton, 2002).

1.4 Methods of data collection

The study used three main primary data collection methods which included interview, documents, and observation. The interviews and observation were used as data collection strategies so that the researcher could understand the situation better by listening to the participants and observing them in the actual setting. To gain further insight into the situation, documents were analyzed and described to see how they reflect thinking. This meant triangulating these data collection sources to make the study more credible. The interview was a semi-structured type for both teachers and students. The individual interview was used for teachers while the focus group approach was employed in the case of the students. The observation strategy was the direct observation type where the researcher was a complete observer to be able to catch what exactly happened in the process. The documents that were used in the study included curriculum of teacher
training college mathematics, science, and social studies, test items, textbooks, and handouts. The use of these three data collection strategies allowed the research to capture data from three sources: persons, situations and contexts, and time (Denzin, 1989).

1.5 Statement of the problem

The promotion of thinking skills among learners is becoming more prevalent in schools because it is very essential in learning. According to Beyer (1997, p. xv), “The most important goal of schooling is learning. And learning…is a consequence of thinking. Our students’ success in school is heavily dependent on their inclinations as well as their abilities to think skillfully.” Promoting thinking skills among learners has attracted the attention of educators with different perspectives on how it should be promoted in school. A review of the literature on thinking skills has mostly concentrated on developing thinking skills programs, what the teacher needs to do in the classroom to ensure that thinking among learners is encouraged and developing curriculum that has the development of thinking skills at its core. However, little attention is given to how teachers should be trained to make this endeavor a reality. There has not been any formal research - qualitative and/or quantitative in Ghana to ascertain how teacher training colleges can enhance the thinking skills of pre-service teachers. There have been recent moves to reform teacher education and pre-service teacher training in Ghana but not towards this direction. Educational planners have given little attention to how teacher training institutions should prepare pre-service teachers in enhancing the thinking skills of learners in the teaching learning process (Hill, 2000).
Improving the quality of student thinking in our schools requires skillful teaching. Such a skill does not emerge out of the blue. Pre-service teachers need to be trained in such skills. Raising the quality of students thinking in schools will require a deliberate and systematic effort to prepare teachers to deal with the situation, and this should start from our pre-service teacher education institutions. Surprisingly, this type of training has not been and is not part of the teacher preparation program of Ghana. Teacher preparation in Ghana is devoid of the application of activities or strategies that develop the thinking skills of student-teachers and this has deprived most elementary school teachers the ability to teach their elementary school learners to think for themselves (GES/TED/ODA, 1993).

The challenge to pre-service teacher institutions in Ghana therefore is to pursue training programs that will prepare pre-service teachers to develop their thinking skills so that they can transfer such skills to the learners they will be teaching. In my opinion, it is not a deliberate effort that the development of thinking skills is missing in the teacher training process. Before the problem can be solved, we need to identify what has caused the present state of affairs. Certain factors might have accounted for it. It is therefore, the aim of this research, to identify the factors that have affected the development of thinking skills in initial pre-service teacher institutions in Ghana and what can be done to ameliorate the situation.

1.6 Purpose of the study

The purpose of the study was to identify factors that have affected the inability of pre-service teacher institutions to enhance the thinking skills of pre-service teachers in
Ghana and how the situation can be improved. To achieve this objective, the study aimed at identifying the obstacles that have worked against the enhancement of thinking skills in pre-service teacher education institutions in Ghana. The study also attempted to find out how the thinking skills of pre-service teachers can be enhanced. The study basically answered the following research questions:

3. What factors have affected the enhancement of thinking skills in pre-service teacher education institutions (Teacher Training Colleges) in Ghana?

4. How can the thinking skills of pre-service teachers in initial teacher education institutions (Teacher Training Colleges) be improved?

These two research questions guided the researcher to structure interview questions around these topics:

1. Perception about teaching
2. Teaching methods/strategies
3. Classroom environment
4. Staff development
5. Government/administrative policies
6. Culture of society/school
7. Suggestions for improving student thinking in pre-service teacher training institutions.

This research was not concerned with explicating the totality of training of pre-service teachers that exist in teacher institutions in Ghana. Other researchers can conduct investigation in other areas that fall outside the realms of this study but are concerned
with pre-service teacher preparation. This study examines the enhancement of thinking skills of pre-service teachers in the course of their quest to become teachers.

1.7 Significance of the study

The idea of teaching and enhancing the thinking skills of teacher trainees in pre-service teacher institutions in Ghana has received little or no attention. It is a missing discourse or concept in most educational discussions. People in informal settings acknowledge that their students cannot think, but there has not been any official or formal effort to tackle this problem. This study sought to begin such an effort. A major significance of this study, is to create awareness for the need to promote the teaching of thinking skills in our pre-service teacher education institutions to prepare teacher trainees so that they can transfer this important skill to the children they will be teaching at the basic school level. The study aimed at exposing teacher education planners and policy makers to the need to incorporate the teaching of thinking and thinking skills in teacher education programs. The study is expected to contribute to the transformation of the traditional system of feeding learners (teacher trainees) with information which we inherited from the British education model to teaching them to be “thinkers” and promoters of thinking skills in Ghanaian schools. It is envisaged that the study will go a long way towards helping help teacher trainers with how to teach for thinking. As education programs are gearing towards the enhancement of thinking skills (intellectual development) in schools especially at the elementary level, this study may set the tone for the development of thinking skills programs in pre-service teacher education institutions and open the gate for research work in enhancing thinking skills in Ghana. This study
will create national consciousness on the need to encourage the development of the thinking skills of learners in the Ghanaian educational system.

1.8 Limitations of the study

The issue of thinking and thinking skills in education is very problematic and for that matter, any research conducted in this area is faced with problems. In the first place, there was the problem of finance. The study should have included teachers in the field, more pre-service teacher education institutions, and members of the council for teacher education in Ghana but financial constraints limited the population to the selection of tutors and students-teachers from one institution. In a country where record keeping is very poor, getting certain documents for the study was not an easy task. The researcher could not get all past questions in the three subject areas under study set by the Institute of Education of University of Cape Coast, Cape Coast from 2000 to 2006 at Komenda Teacher Training College. The researcher could not even get the previous examination questions at the Institute of Education, which is the custodian of such documents. The researcher therefore had to move from institution to institution to contact heads of departments and teachers to bring pieces together to make such document complete. Even with this effort the researcher had only 2004 and 2005 external examination questions in the three subject areas under study for the research. Other documents which were difficult getting were past test questions set by teachers and responses by students. In the long run, the researcher had to abandon the inclusion of teachers’ tests because they were not available. All these caused extra finances and time. In addition to this, some recommended textbooks were not available in the school at the time the researcher was
collecting the data since the publishers have not sent them to the school. The researcher had to make do what was available.

No research is without limitations methodologically (Marshall & Rossman. 1999). The focus interview initially became problematic since some of the students did not want to talk for fear of being reported by friends, but as the interview progressed each member of the group opened up and spoke freely. It is essential to recognize the boundaries of this study. The purpose of the study was to identify the factors that have impeded the enhancement of thinking skills in pre-service teacher institutions and how thinking skills can be enhanced in pre-service teacher education institutions. The findings of this study cannot be generalized because the participants were purposefully selected from only one institution among the thirty-eight teacher training institutions in Ghana. However, the findings may be transferable.

1.9 Delimitations of the study

The study was restricted to finding the factors that have affected the enhancement of thinking skills in pre-service teacher education institutions in Ghana and what can be done to improve the situation. It was restricted to tutors and students of pre-service teacher institutions. The scope of the study was limited to Komenda Teacher Training College; a three year coed pre-service teacher education institution in the Central Region of Ghana. The institution offers programs A and B courses. What is reported in this study are the opinions of the participants in addition to analysis of documents in the institution.
1.10 Definition of terms

The following terms are defined as used in the study:

**Thinking** involves any mental activity that helps to formulate or solve a problem, to make a decision or to seek understanding (Fisher, 1990).

**Thinking skills** encompasses any activity employed in developing thinking. It involves problem solving, decision making, critical (thinking) analysis, hypothesizing, and creative imagination (Nisbet, 1993). It also involves evaluative thinking, divergent thinking, and interpretive skills (Beyer, 1988).

**Teacher Training** in this study means a 3-year teacher preparation program for Senior Secondary School (High School) graduates leading to a 3-year Teachers’ Certificate “A” license. It may be referred to as Initial teacher education or pre-service teacher education in this study.

**Teacher Training College** in this study means an institution which gives a 3-year teacher preparation education to Senior Secondary School (High School) graduates leading to a three year Teachers’ Certificate “A” license (now Diploma in Basic Education). It may be referred to as Initial teacher education institution or pre-service teacher education institution in this study.

**Basic Education** in this study refers to the first nine years of education in Ghana, which comprises of the Elementary school (primary one to six) and Junior Secondary School (JSS1-3)
Program “A” Teacher Training College refers to institutions that prepare teachers to teach at the elementary school level made up of lower primary (P1-3) and upper primary (P4-6).

Program “B” Teacher Training College refers to institutions that prepare teachers to teach at the upper primary (P4-6) and Junior Secondary School (JSS).

Higher Level thinking in this study means using new information or stored information and interrelating and/or rearranging and extending the information to achieve a purpose or find a solution to a problem (Lewis & Smith, 1993). This will include application, analysis, synthesis, and evaluation.

Lower Level thinking in this research involves a thinking process which is routine and mechanical application of learned information (Newman, 1990). It is reproductive. This includes knowledge and comprehension.

Tutors in this study refer to teachers who teach at the Teacher Training College. They may also be referred to as Teacher trainers in the study.

Student-teachers refer to Senior Secondary School (High School) graduates who have enrolled at the Teacher Training College to train as Basic school teachers. In the study, they may sometimes be referred to as teacher trainees.

1.11 Organization of the study

This study is made up of five main chapters. The first chapter which is the introductory part of the study concentrates on the background of the study, the design of the study, the problem, purpose, and significance of the study, limitations and delimitations of the study, and definition of terms. The second chapter delves into the
literature associated with the study. This is made up of two broad sections namely thinking and pre-service teacher development. The section on thinking concentrates on the concept of thinking, why thinking in schools, approaches to teaching thinking, the thinking curriculum, measuring thinking outcomes, enhancing thinking skills among learners, and thinking and teacher development. The second part of the literature review revolves around initial teacher development in Ghana, the Ghanaian teacher education curriculum, teacher education and education reform and development, teacher preparation and teacher quality, teacher education and intellectual development, and problems of pre-service teacher education in Ghana. Chapter three takes a critical look at the methodology and research design of the study. It concentrates on the use of qualitative and case study approach for the study, the research design, the research site, data collection strategies, initial institutional contact and gaining entrée, data analysis, and limitations of the study. Chapter four and five deal with the data analysis and discussion, and the conclusion respectively.
CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

The chapter is broadly divided into two sections: thinking and pre-service teacher education. The first part takes a look at the definition, nature, types, and the why of thinking in schools. It also deals with the specificity and generality of thinking and approaches to teaching thinking. In this same section, the literature on thinking curriculum, measuring learning outcomes/taxonomies of thinking, testing and educational materials and higher-order thinking, and how to enhance thinking among learners are clearly dealt with. The second section looks at pre-service teacher development in Ghana, the pre-service teacher education curriculum, teacher education and educational reform and development, and teacher preparation institutions and teacher quality. The latter part of this section delves into teacher education and intellectual development of pre-service teachers and the problems of teacher education in Ghana.

Section 1: Thinking

2.1 What is thinking?

Understanding the nature of thinking and its component is *sine quo non* for the effective teaching and learning of thinking skills (Beyer, 1987). The term *Thinking* is nebulous and has therefore been defined in a number of ways by different authorities sometimes depending on their focus and discipline. *Thinking* has no acceptable definition (Swartz & Perkins, 1989; De Bono, 1991). Notwithstanding, attempts have been made to define the term by some authorities. According to French and Rhoder (1992) from a
creative point of view, thinking is cognition: planned and orchestrated skills, strategies, and content knowledge to help learners come out with new products. This definition is more geared towards thinking skills than the definition of thinking as a concept. Fisher (1990) looks at the concept from a philosophical perspective and states that “thinking involves critical and creative aspects of the mind, both the use of reason and the generation of ideas. [It] is involved in any mental activity that helps to formulate or solve a problem, to make a decision or to seek understanding.” (p. 4). The second part of this definition is all embracing including all forms of thinking. De Bono (1999) also defines thinking as

the deliberate exploration of experience for a purpose: The purpose may be understanding, decision-making, planning, problem-solving, judgment, action, and so on. (p. 33).

This definition has been criticized because when thinking is practiced over time it becomes an unconsciously phenomenon which research evidence indicates can play a meaningful role in thinking (Ruggiero, 1988). In a holistic manner, Ruggiero (1988) sees thinking as “any mental activity that helps formulate or solve problem, make a decision, or fulfill a desire to understand; it is a searching for answers, a reaching for meaning.” (p. 2). This definition caters for both conscious (main mental activity) and unconscious mental activity. Mayer (1983) in contributing to the debate on the definition of thinking looked at the term by using three basic ideas. Mayer says thinking is cognitive because it is an internal occurrence in the cognitive structure, thinking is a process that involves the manipulation of the cognitive structure, and thinking is directed and results in problem
solving. Mayer’s concept of thinking is unique because it recognizes the cognitive, manipulative, and problem solving nature of thinking.

The above definitions give a clue as to how one can define “thinking”. It is conscious, it is a mental activity, it involves reasoning, and it involves problem solving or decision making. In a brief but encapsulating way, thinking can be defined as a spontaneous or conscious mental activity/process which involves reasoning to solve a problem or make a decision. Spontaneous thinking is what every human possess; it is effortless and requires no reflective process while conscious thinking requires a lot of efforts, it is evaluative and reflective, it involves making meaningful decisions and solving problems as well as making inferences. In this research, conscious thinking is the focus.

2.2 Distinction between thinking and thinking skills

Thinking and thinking skills are not synonymous. Beyer (1988) makes a distinction between thinking and thinking skills. He states that thinking is a holistic process through which “we mentally manipulate sensory input and recalled data to formulate thoughts, reason about, or judge” (p. 72) to give meaning to experience, while thinking skills or strategies are very specific operations we deliberately perform on data to accomplish our thinking goals. Wilson (2000) indicates that thinking skills are ambiguous. Notwithstanding, Vail (1990) also defines thinking skills as a set of skills (basic and advanced) that govern a person’s mental processes. These skills, Vail says, include knowledge, dispositions, and cognitive and metacognitive operations. Swartz and Perkins (1989) define thinking skills as competencies that contributes to some kind of
thinking. Enhancing students thinking therefore involves selecting skills or strategies to achieve this goal. According to Beyer (1992), the tools of thinking are thinking skills and that using these tools are essential to good thinking. The implication of this is that developing proficiency in a number of key thinking skills will help learners cope with a variety of thinking challenges. Johnson (1996) adds that a thinking skill is a cognitive process which has been broken into sets of explicit steps which are then used to guide thinking. Thinking skills allow one’s cognitive system to function more effectively (Johnson, 2000). The literature is clear on what thinking skills are. They are the activities teachers engage in the classroom to promote thinking in their learners. The use of meaningful thinking activities will have high probability to promote thinking in learners. Examples of thinking skills according to Ross (1998) include decision-making, predicting, problem solving, inductive reasoning, comparing and contrasting, and classifying. According to McGuinness (1999), the list includes collecting information, sorting and analyzing information, drawing conclusions, brainstorming, problem solving, determining cause and effect, evaluating options, planning and setting goals, monitoring progress, decision making, and reflecting on one’s own progress.

2.3 Nature of thinking

Thinking is a complex phenomenon which involves and serves numerous purposes. Experts on thinking agree that it involves some type of mental activity. The mental activity generally consists of cognitive and metacognitive. French and Rhoder (1992) in their book *Teaching thinking skills: Theory and practice* noted six characteristics of thinking. First, thinking is a natural process. This characteristic has
biological orientation. As Lowery (1985) has indicated all humans engage in thinking without instruction. Thinking looked at from this perspective is ordinary thinking but good thinking to confront challenging issues does not come readily to all people. They need to be enhanced through instruction. Second, thinking is an active process. “Thinking is not a spectator sport” (Halpern, 1987; p. 73). Third, thinking is contextual; both personal and physical. Fourth, thinking is influenced by the society and culture of the thinker. Fifth, thinking is a representation of one’s thought which is expressed in the form of language. Sixth, thinking is a recursive process but not linear. Good thinkers always appraise their thinking as a result of exposure of new information.

McGuinness (1993) in his article *Teaching thinking: new signs for theories of cognition* to review research and practices associated with teaching thinking identified three characteristics of thinking. These include thinking as information processing. Thinking from this perspective is associated with cognitive psychology which views the individual as information processor. Thinking involves making judgment because it has its origin from philosophy and informal logic. Lastly, McGuinness identified that thinking is sense making. This characteristic borders on Piagetian and neo-Piagetian frameworks which hold the view that people make meaning by constructing ideas from existing knowledge. Swartz and Perkins (1989) indicate that the outcomes of better thinking are “more reliable conclusions, deeper insights, sounder decisions, more finely crafted products, more creative inventions, and keener critical assessments” (p. 3), while the process involves considering more possibilities, exploring further and wider,
exercising keener judgment, using more data, challenging assumptions, exercising precision, checking for errors, and maintaining objectivity and balance.

Thinking in this research will be viewed as an active process, contextual, has cultural and societal influence, an expression of thought, and a recursive phenomenon. From the cognitive theorist’s point of view it is an information processing, decision making, and a sense-making phenomenon. Understanding the nature of thinking is essential because it gives an idea of how such a complex concept can be facilitated in an effective and efficient manner.

2.4 Types (taxonomies) of thinking

The varied nature of the definition of thinking and its nature give it different perspectives as what it entails. The distinctions given to thinking are not all identical but they have things in common (Nickerson, Perkins, & Smith, 1985). French and Rhoder (1992) in summarizing components of thinking skills saw that the concept of thinking can be approached from the perspective of the thinker, the information processing demands of the task, and the level of complexity of the task. According to French and Rhoder (1992) the different components do not develop discretely but in an interactive manner. The effectiveness of the interaction will depend on the way teachers blend them. The earliest foundation for the distinction of thinking was laid by Bloom, Engelhard, Furst, Hill, and Krathwohl, (1956) in their taxonomy of educational objectives. In a hierarchical order, Bloom et. al. (1956) categorize the cognitive domain as knowledge, comprehension, application, analysis, synthesis, and evaluation.
Viewing thinking from a pure cognitive perspective, Gardner (1983) in his theory of multiple intelligences also categorizes intelligence into eight types. This includes linguistic intelligence, logical-mathematical intelligence, spatial intelligence, bodily-Kinesthetic intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, and naturalist intelligence. Gardner thinks the brain which is the seat of cognitive development is not a unitary object but has different components. From the information processing point of view which is also linked to cognitive theory, thinking encompasses concept recognition, relationships and patterns, reconstruction, evaluation and exploration of information, problem solving, and knowledge processing (Marzano, 1984).

Thinking has also been partitioned from the point of view of the thinker. Nickerson, Perkins, and Smith (1985) from the thinker’s perspective categorize thinking into two broad areas: rigorous logical reasoning (analytic, deductive, rigorous, constrained, convergent, formal, and critical (hypothesis testing) and exploratory reasoning (synthetic, inductive, expansive, unconstrained, divergent, informal, diffuse, and creative (Hypothesis generation). This is a critical-creative dichotomy.

Thinking has also been classified using developed models and theories. Beyer (1988) in his Model of Functional Thinking sees thinking as cognition and metacognition. Cognition comprises recalling and recording, reasoning, creative thinking, critical thinking, problem solving, decision making, and conceptualizing while metacognition comprises assessing, planning, and monitoring one’s own thinking. From a cognitive model approach perspective, Hunkins (1989) posits that thinking is made up of problem
solving, decision making, conceptualization, critical thinking, creative thinking, and
metaphoric thinking. Based on his Triarchic Theory of thinking, Sternberg (1985, 1994a)
in his book Beyond IQ classifies thinking into analytic (analyzing, judging, evaluating,
comparing and contrasting, and examining), creative (creating, discovering, producing,
imagining, and supposing), and practical (practicing, using, applying, and implementing).
Sternberg approached thinking from a pure cognitive perspective. McGuiness (2001) in
his ACTS (Activating Children’s Thinking Skills) project to develop thinking skills in
upper primary classrooms in Northern Ireland classifies thinking into sequencing,
classifying, analyzing, drawing conclusions, distinguishing, determining bias, creating,
relating causes and effects, problem-solving, planning, and making decisions.

The various views given on thinking by the various authors is very exhaustive and
gives a complete idea of what thinking entails but some of the components comprise both
thinking and thinking skills. For example, sequencing, classifying, analyzing, drawing
conclusions, and distinguishing are thinking skills which learners engage in to enhance
thinking. As explained above, thinking is different from thinking skills. For the purpose
of this research, the term thinking will be viewed as encompassing two broad areas.
Creative thinking (problem solving, decision making, imaginative, review, innovative)
emerged from psychology while critical thinking (interpretation, analysis, evaluation,
inference, explanation, and self-regulation) emerged from philosophy. It involves finding
answers to the “how?, what?, when?, and why?” of issues. There is no strict dichotomy
between the two. They are two sides of the same coin; constantly overlapping and
interacting.
2.5 Why thinking in schools?

What educators need to ask is of what value is emphasizing thinking in schools especially at the elementary level. Beyth-Marom, et. al. (1987) underscore the need to enhance the teaching of thinking in schools when they state that “Thinking skills are necessary tools in a society characterized by rapid change, many alternatives of actions, and numerous individual and collective choices and decisions.” (p. 216). As societies move from receiving information to processing information there is the need for schools to increase the student’s capacity for higher order thinking to improve their capability to acquire, analyze, and apply complex information and be able to solve effectively (Tucker, 1988). Beyer (1995 p. 28) quoting the third president of the United States wrote, “A democracy cannot survive unthinking citizens”. Teaching thinking prepares students to participate fully in a democratic society. In a democratic and ever changing world citizens need to have the ability to make meaningful judgments about issues and information which are personal, social, economic, and political in nature. To do these well require thinking.

Beyer (1988) gives four reasons for the development of school-wide instructional programs to improve student thinking. First, a greater number of students lack the proficiency needed to engage in higher order thinking. Second, the present state of affairs today and in the future (rapid explosion of information) requires citizens who possess the skills to make thoughtful decisions. This can best be achieved through education. Third, the enhancement of thinking in schools is a response to the complaints about deficiencies
in students’ thinking. Fourth, research in teaching, learning skills, and cognitive science has indicated the inappropriate teaching methods are used to teach thinking.

Training learners to be thinkers is beneficial to the individual and the society. It improves student’s academic performance and achievement. Facione (1998; p. 11) says, “There is significant correlation between critical thinking and reading comprehension”. Teachers by engaging in thinking with their learners help improve their own thinking skills. Thinking prepares individuals for future life. Thinking makes learners lifelong learners. The ideal thinker is inquisitive (in the positive sense), well informed, trustful of reason, open minded, flexible, and fair minded and much more. Facione (1998) has noted that thinking is a liberating force in education and a powerful resource in one’s personal and civic life.

Cotton (2001) in a review of fifty-six (56) documents on thinking identified that instruction in thinking skills improves academic achievement. She noted that thinking skills programs and practices investigated had positive influences on achievement level for participating students. It was also identified in the review that learning gains of learners participating in thinking skills instruction programs were accelerated over time.

Fisher (1998) from a philosophical point of view argues that the quality of our lives and learning depends on the quality of our thinking. Fisher therefore, claims that we teach thinking because of the pleasure gained from intellectual stimulus and challenges, it motivates and engages learners, the rapid information change in the society, and it promotes moral qualities and virtues. Fisher adds that teaching children thinking is a
fulfillment of human nature, develop the virtues of seeking truth, honesty and respect for others, and strengthens the basic foundations of democracy.

The value of teaching thinking in schools can be realized when there is effective teacher training in thinking. Cotton (2001) in a review of fifty-six research studies on thinking identified that training teachers to teach thinking skills enhances student achievement gains. Thinking skills program developers claim that teacher training is a key factor in the success of such programs (Cotton, 2001). A study by Crump, Schlichter, and Palk (1988) to assess the potency of Teaching (Higher order thinking Skills) HOTS program in the Middle and High School in a District-Level Initiative to Develop Higher Order Thinking Skills, found that there is positive correlation between teacher training in thinking and student achievement. McGuiness (1991) has noted that a review and evaluation of research into thinking skills commissioned by the Department for Education and Employment in England in 1991 identified that more successful thinking skill interventions have been characterized by explicit models of teacher development. The implications of these are that enhancing thinking in schools will require effective teacher training programs with thinking at its core. It is, therefore, wishful thinking to embark on a program to enhance thinking in schools without training teachers in thinking. A major problem is how to teach thinking in schools.

2.6 Is thinking subject-specific or generic?

Whether to teach thinking and/or thinking skills in specific context or infused into the school curriculum (context/content free) hinges on the question: Is thinking context-bound (subject-specific) or generic. As French & Rhoder (1992, p. 46) put it, “Is
there a body of thinking skills that is applicable to every content area or does each content area generate its own set of thinking skills?” many authors have expressed their opinion about this basic but critical issue. There is sharp disagreement on the issue. There are two main schools of thought. One school of thought holds the view that thinking is specific while the other faction disagrees with this proposition and says thinking is generic.

Nickerson, Perkins, and Smith (1985) hold the view that thinking and/or thinking skills is content specific. They argue that “there are no or few general skills of thinking to be learned, only expertise within particular domains” (p. 58) and any effort to teach general know-how may not be beneficial to learners. Chipman and Segal (1985) see the argument for thinking as generic attractive but argue that it is an unproven fact. They hold the view that general skills must be built on the foundation of skills that have been developed to an advanced state in at least a specific-domain. Perkins (1985) supports the domain-specific argument by postulating that problem finding, and evaluating and revising a product are general thinking strategies but these are so related to the thinker’s knowledge that “often novices do not have the resources in a particular domain to gain much from a very general strategy.” (p. 353). McPeck (1981, 1990a) provides two reasons for the specificity of thinking skills. He says that thinking is always about something and that the content of thought strongly shapes our thinking. According to him, general thinking skills have no practical cognitive value because the usefulness of a skill decreases as generality increases (triviality argument).
On the argument that thinking is generic, Lowery (1985) supporting his scheme of thinking with biological foundation states that there are content-free thinking capabilities which people can learn and transfer. According to Ruggiero (1988), if thinking is subject/domain specific, then courses in thinking (critical and creative) being offered in schools and colleges should be discontinued because they can not achieve their objectives but these courses have been proven to be effective. Ruggiero (1988) has identified that many approaches to thinking skills have been found to be useful not in a particular discipline but also in other disciplines. Referring to a statement by Richard Paul, the director of the Sonoma State University’s Center for Critical thinking and Moral Critique said that looking at thinking as subject-specific means given subjects natural divisions which are not the case. He says that subject divisions are creations by human and are subject to revision because concepts and lines of reasoning that are clearly within one domain are also at the same time within others; “Many problems are multilogical, touching on a number of disciplines.” (p.10). Ruggiero, therefore argues that thinking and/or thinking skills is not subject-specific.

Perkins and Solomon (1989) in taking a middle way say that general cognitive skills and domain-specific knowledge are interdependent. This indicates the flexibility of general skills which operate differently in each domain. A certain amount of knowledge in a new domain is essential to apply generic skills (French and Rhoder, 1992). Presseisen (1985) also is of the opinion that generic and domain-specific thinking skills are related. She however, thinks that due to complexity some thinking processes may be more relevant to certain disciplines than to others. Presseisen’s assertion implies that
skills are generic but simply more appropriate for one area than the other. Smith (2002) states that “A simple resolution of the General Thinking Skills (GTS) controversy is to regard thinking-skills generality as a matter of degree, different skills occupying different positions along a continuum” (p. 660), This argument is satisfying to many educators. Smith (2002) by reviewing the literature on specificity and generality of thinking skills strongly supports the generality of teaching thinking. Smith concludes that

> There is ample knowledge … that is both general and useful, to justify a dedicated course in both high school and college curriculum. General thinking skills instruction should be reinforced by instruction in the disciplines, but the latter is no substitute for the former (p. 676).

What can be made out of the discourse on the subject-specific and generic controversy of thinking and/or thinking skills is that they are interrelated and have a common objective in mind. We should teach thinking skills generally but teach for transfer and reinforce in the specific domains. The key element here is how we train teachers to handle this complex problem of developing thinking among our learners. This is a daunting task which I think will call for viewing thinking as domain-specific and generic and exposing our teachers to develop effective skills to teach our learners to think efficiently.

2.7 Approaches to teaching thinking

The complex nature of thinking demands that conscious efforts must be made in promoting it among learners. The school, teachers, parents, and teacher institutions should consciously (directly) or unconsciously (indirectly) help create an ecosystem that will nurture thinking skills among learners to enhance their thinking in the learning process. Researchers all agree that thinking (skills) should be enhanced in learners but the
approach is where there is disagreement. Kirby and Kuykendall (1991) note that in spite of the general acceptance that thinking skills should be taught in school, there is no consensus on the means. Coles (1993) says that there is no single approach to teaching thinking. The contention has been on whether teaching thinking should be divorced from or infused in the curriculum. According to Swartz and Parks (1994), the argument has centered on three main principles: direct/explicit teaching of thinking skills, infusing thinking skills into classroom teaching, and integrating thinking into content instruction.

2.7.1 Separate thinking courses

Those who argue for the teaching of thinking as any subject on the school curriculum prefer a direct instruction in thinking where skills or strategies that enhance thinking can be taught. This school of thought argues that all thinking is evaluated by some standards of some specific subjects (McPeck, 1981) and that each subject has its different logic (Nickerson, 1988). Hamer and Csapo (1999) refer to this as domain-specific. McPeck argues that the best way to teach thinking is through a given discipline. He is of the view that thinking cannot be properly generalized to all subject areas because one skill cannot be applied generally across other subject areas. McPeck’s view implies that it is not enough for learners to learn the content of a discipline but must also learn to think in that subject. Teachers need therefore to identify the reasoning and inquiry skills appropriate to each discipline and then teach those skills. Teachers who teach thinking using this ideology go in for thinking programs which adopt a “skills approach”; analyze the process of thinking into skills and strategies, and provide training and practice for
learners to transfer (Nisbet, 1993). The theoretical base for this approach is the process-oriented theories of human cognition.

This approach to teaching thinking helps learners identify appropriate reasoning and inquiry skills acceptable to each discipline. It also gives guided practice in applying skills and techniques (Coles, 1993). In my opinion, such an approach will give an in-depth study of thinking. The weakness of this approach is that it prevents learners from seeing that the subjects in the curriculum are integrated. This approach may cause repetition of introductory courses in thinking in all disciplines which is a waste of time and resources. Coles notes again that such an approach will bring tension between teaching thinking and dealing with the direct topics. Joyce (1985) thinks this may make the teaching of thinking disappear gradually from the curriculum. Beyer (1997; P. 239) in summarizing the disadvantages of domain-specific approach to teaching thinking states that it “ignores the important role that subject matter and context play in thinking.”

2.7.2 Infusion Approach

The infusion approach sees the teaching of thinking as part of the subjects in the curriculum. Thinking is not seen as independent of the various disciplines in the school. The proponents of this ideology believe that thinking is virtually in all disciplines. It is referred to as domain-general by Hamer and Csapo (1999). This is an integrative approach. Bransford et. al. (1987) see this approach as portraying thinking as something which develops along human development. Infusion approach argues for a “thinking curriculum” which promotes thinking by means of “problem solving approach” with emphasis on application and integration (Nisbet, 1993). According to Swartz and Parks
(1994), the infusion approach of teaching thinking is based on the natural fusion of information. Beyer (1997) says that infusion approach acknowledges the importance of cognitive operations in the context of subject matter in the instruction process and also students learn subject matter while still focusing on cognitive procedure to develop new insights, connections, hypotheses, conclusions, or generalizations. This approach, according to Ennis (1985), avoids repetition of introductory principles in each subject and encourages the application of cognitive skills to other disciplines. A disadvantage of this problem is that if care is not taken little emphasis will be given to thinking or vis-versa especially in the hands of the inexperience teacher.

2.7.3 Immersion Approach

An alternative of the infusion approach is the immersion approach. Ennis (1985) defines immersion approach as a thought-provoking content instruction in which there is no direct teaching of complex thinking. Beyer (1997) for instance, says that in this approach of blending thinking and subject matter, there is concentration and emphasis on developing subject matter insights, knowledge, and understanding. Thinking in this approach is not explicitly taught but students are expected to think through the subject matter. Brandt (1988) in an interview with Arthur Costa, the editor of Developing Minds, asserted from Costa that teaching content alone and thinking students will learn to think gives disappointing results and the same will happen if thinking skills are taught in isolation. According to Costa, the best approach is to blend the two approaches by selecting contents for its relationship to thought processes. According to Beyer (1997), the proponents of this approach “believe it is the challenge or struggle to carry out
thinking and repeated opportunities to exercise it that lead to more skilled thinking.” The success of this approach is the kind of knowledge learned, its depth, complexity, and degree of thoughtfulness. The major advantage of this approach is that full attention is devoted to subject matter and at the same time given the student skills in thinking.

There is an emerging argument about the arbitrary categorization of the approaches. Paul et. al (1989) favors the Socratic dialogue approach which he calls “dialectical teaching”. This is an eclectic approach to bridge the tension between the two approaches but it is likely to attract criticisms from the believers of the two approaches. I will recommend such an approach for teacher preparation institutions because teacher trainees need to be taught the concept of thinking, the skills involved, and how to integrate them in other content areas in their teaching profession. As Nickerson (1988) puts it, there is the need to teach thinking in the abstract to ensure that students are aware of the specific aspects of thinking and also teach traditional courses in such a way to illustrate the applicability of good thinking in those contexts and provide opportunities for practice. Nickerson believes that for effective teaching of thinking the two main approaches must be combined to some degree. Nickerson notes that

… it is important to treat the skills, strategies, attitudes, and other targeted aspects of thinking in such a way that students come to understand their independence from specific domains and their applicability to many …it seems equally important to demonstrate their application in meaningful contexts so students witness their genuine usefulness. (p. 34).

To support his stand, Nickerson says that if the teaching of thinking is to be useful to learners in a variety of contexts, then students should be made aware of the generality of its applicability which is true independently of the context of the teaching. These
approaches by themselves are neat but their success in the school system will depend on all stakeholders of education most importantly the classroom teacher.

2.8 The Thinking Curriculum

Teaching thinking is anchored on the constructivist theory which originated from the ideas of educators Piaget, Dewey, and Bruner. Piaget’s cognitive development indicates that existing schemata serves as a guide in acquiring knowledge which constantly develop and change throughout life as we interact with the environment. (Piaget, 1972a). Learners construct their own knowledge while Bruner, like John Dewey thinks the school curriculum should foster problem solving skills through the process of inquiry and discovery. The goal of education should be intellectual development (Dewey, 1899; Bruner, 1960). For this to be done effectively, teachers need to aid them. The traditional curriculum has been criticized as not making learners acquire knowledge and use it to make sense of the world. It does not make learners self-determined to acquire and use the tools they need to learn. Additionally, it does not make learners strategic learners, and empathetic. Finally, such a curriculum does not make learners view themselves and the world from multiple perspectives. Nisbet (1990) has noted that the traditional curriculum is built on the assumption that thinking depends on intelligence and that teachers can not teach people to be clever. The traditional curriculum often offers isolated low-level thinking skills. There is therefore the need to develop a conventional system which will address such deficiencies (Fennimore & Tinzmann, 1990).
There is a general agreement that learners need to be taught how to thinking but the approach is a bone of contention between thinking researchers (Nisbet, 1993). The debates between the factions have been sword-crossing than co-operative. One school of thought is of the opinion that thinking should be a separate program for learners to learn thinking skills and transfer while another school of thought thinks thinking should be infused into the regular curriculum. Those who argue for the infusion approach propose for a thinking curriculum. A thinking curriculum according to Nisbet (1993) is the infusion of thinking into the traditional curriculum without necessarily adding a new “subject”. According to Nisbet, in the thinking curriculum problem solving and practical work is at the core and it a means of creating a climate of inquiry in the classroom. Fennimore and Tinzmann (1990) see a thinking curriculum as an integration of content and process. The thinking curriculum is a traditional curriculum injected with capsules of thinking skills.

The thinking curriculum is underpinned by some assumptions. It is based on the assumption that thinking is domain specific; there are characteristics of mode of thinking which are associated with specific disciplines of knowledge (Nisbet, 1993). Tiedt, Carlson, Howard, and Watanabe (1989) list the following as some assumptions for the thinking curriculum: learners are eager and possess the ability to think, thinking includes creativity, criticism, intuition, reflection (both cognitive and affective), teachers should teach learners to think about their thinking (metacognition), and thinking is not a discrete set of skills to be learnt. These assumptions imply that each discipline has a way of thinking about and must be developed on such lines to advance knowledge in the
discipline. It also acknowledges that learners possess the innate ability to thinking which needs to be teased out so that they can think about their own thinking.

The thinking curriculum is characterized by in-depth learning; learners develop deep understanding of the concepts and processes involved in communicating knowledge in the field, it is contextual, there is sequential arrangement of topics to situate holistic preferences on increasingly challenging environment, and content and process are connected to the learner’s background (Fennimore & Tinzmam, 1990). The thinking curriculum promotes higher level process involved in planning, evaluating, problem-solving, decision making, construction or critiquing arguments, composing essays, and teaches learners to use knowledge even after school (Nisbet, 1990).

The arguments favor integrating thinking into the curriculum as oppose to teaching thinking as a separate discipline in the school curriculum. Merely enshrining thinking into the curriculum does not guarantee students’ thinking. Serious efforts must be made at the initial teacher institution to train pre-service teachers in integrating thinking into content areas, design instruction, use teaching techniques/strategies, and design teaching materials that will advance thinking in the classroom. Merman and Tishman (1988) think that to make the integration of thinking into the traditional curriculum a success strategies designed should be simple so that student can easily learn them and teachers can easily integrate the strategies into and across the curriculum. This will ensure easy transfer of strategies from one domain to another and out of school. Anything short of this will defeat the aim for which the thinking curriculum stands for.
The ultimate aim of education is to teach learners to think in a critical and independent manner (Sternberg & Baron, 1985) but educators, policymakers, and the public agree that higher-order thinking is neglected in the curriculum and tests, and therefore underdeveloped in students (Quellmalz, 1985). According to Quellmalz, “Assessment of student thinking should be based on a core of essential skills that apply to academic, everyday, and novel situations, and should include a variety of test items that require sustained reasoning (p. 29).” Though this statement was made about twenty years ago it still reflects a phenomenon in present-day tests and curricula.

The ability of students to understand and use information is what tests, curriculum objects, and other educational materials should seek to accomplish. If we want to teach to enhance thinking skills in our learners, our instruction must be conducted and planned in the same manner (Stiggins, Rubel, & Quellmalz, 1988). This should be the same for testing. Planning and conducting instructions and tests to determine what thinking skills our learners have mastered and what they need to master is very essential in enhancing thinking among learners. This involves a daily monitoring and assessment but it is not an easy process, especially when it involves critical thinking and problem solving. The difficulty involved has come about as a result of the vague nature of measuring thinking.

2.9.1 Categorizing learning outcomes

There is disagreement as to how thinking should be measured. The earliest attempt at measuring was made by Bloom, Engelhard, Furst, Hill, and Krathwohl (1956) in their taxonomy of educational objectives. These six-fold objectives are knowledge,
comprehension, application, analysis, synthesis, and evaluation in a hierarchical order. The categorization of the taxonomy is Lower level which comprises of knowledge, comprehension, and application while higher level encompasses analysis, synthesis, and evaluation. The model though has its weaknesses offers a flexible categorization of thinking skills and also can be applied at any grade level and in all subject areas. It is a level of abstraction, which occurs in educational setting and provides a useful means of categorizing test question and learning objectives to help students develop all levels of intellectual development.

Criticisms about the vagueness of Bloom’s model have generated some models. Another category of measuring learning outcomes was made by Gagne (1965). Gagne in his book *Conditions of learning* articulated his Information Processing Theory. The theory in a hierarchical order listed the following as his taxonomy of learning outcomes: verbal information, intellectual skills (discrimination, concrete concept, defined concept, rule, and higher order rule), cognitive rules, attitudes, and motor skills. Ennis (1985) from a philosophical perspective thinks thinking should be measured in terms of clarification, identification, evaluation (using inductive and deductive reasoning), and judgment. His model is geared towards critical thinking leaving the creative part.

From a problem-solving perspective, Sternberg (1983; 1994a) in his Triarchic theory of thinking suggested that thinking can be measured in analytic (analyzing, judging, evaluating, comparing and contrasting, and examining), creative (creating, discovering, producing, imagining, and supposing), and practical (practicing, using, applying, and implementing) manner. This model puts emphasis on both creative and
critical thinking and the practicality of thinking. Stiggins, Rubel and Quellmalz (1988) think the best way to measure thinking skills effectively and efficiently is to have a clear and usable definition. In an eclectic non-rigid, non-hierarchical approach, Stiggins, Rubel and Quellmalz combined the ideas from philosophy, psychology, and education and produced a model which encompasses recall, analyze, compare, infer, and evaluate.

Anderson and Krathwohl (2001) classify learning outcomes/knowledge into four types namely factual, conceptual, procedural, and metacognitive. Marzano and Kendall (2007) partition learning outcomes into retrieval, comprehension, analysis, knowledge utilization, metacognitive system, and self esteem starting with the lowest in that order.

The models discussed above although different, often run into each other. The use of a model has implications for constructing a test or writing lesson or course objectives which emphasize on higher order thinking skills. Stiggins, Rubel & Quellmalz (1988) suggests that the key to measuring and teaching thinking skills is to stick to a model and use it consistently. They reiterated that the key to ensuring effective measuring of thinking skills lies in the action verbs used in eliciting response from learners in each category of the thinking taxonomy employed and most of the above taxonomies discussed use action verbs to illustrate each category.

2.10 *What is lower level and higher level thinking?*

The categorization of the various levels of learning outcomes into higher and lower level thinking has generated some arguments. Some researchers categorize it as knowledge and understanding (Level I – Lower level thinking) and application, analysis, synthesis, and evaluation as level II (higher order thinking). Another school of thought
holds the view that application belongs to both sides and is the link between lower level and higher-level thinking. It is the overlapping point. They therefore categorize Bloom’s taxonomy into knowledge, comprehension and application as lower level and application, analysis, synthesis, and evaluation as higher level thinking. Stronge, Tucker, and Hindman (2004) in their book *Handbook for Qualities of effective Teachers* with Bloom’s taxonomy as their framework labeled knowledge as lower level, comprehension and application as intermediate cognitive level, and analysis, synthesis and evaluation as higher-order thinking. Bloom et. al. (1956) in their original categorization of their taxonomy of cognitive domain indicated that lower level comprises knowledge, comprehension, and application and higher level as analysis, synthesis, and evaluation.

Perhaps understanding lower and higher order thinking will help with a categorization for this research. Maier (1933) defined lower order thinking as learned behavior and reproductive thinking while higher order thinking is reasoning or productive thinking. There is repetition and reproduction of learned pattern to illustrate a behavior in lower order thinking while higher order thinking involves integration of two or more learned behaviors to produce a novel idea or behavior. Lower level thinking involves basic processes like observing, measuring, inferring, classifying, and predicting while higher order thinking includes integrated processes like interpreting data, controlling variables etc. Newman (1990) in a study based on classroom observations and interviews with teachers and department chairs in five high schools in their bid to develop higher order thinking skills among learners indicated that lower level thinking is routine and mechanical application of learned information. This involves memorizing to list a series
of names of previously learned material. Higher level thinking according to Newman, “challenges the student to interpret, analyze, or manipulate information.” (p. 44). Lewis and Smith (1993) for instance, in defining higher order thinking pointed out “higher order thinking occurs when a person takes new information and information stored in memory and interrelates and/or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations.” (p. 136). This definition includes both creative and critical thinking. The key in higher order thinking is using learned or known information and manipulating it to extend knowledge or solve a problem.

In this research, learning outcomes will be categorized into two broad areas namely lower level thinking and higher level thinking as the working model but guided by the cognitive educational objectives of Bloom et. al. and others. Lower order thinking will comprise knowledge and comprehension while, application, analysis, synthesis, and evaluation will be classified as higher order thinking. The clue to classifying the various learning outcomes into lower and higher order thinking will be the action verbs used. After searching diligently through the literature, it was found that the following verbs have been used for the various categories of the cognitive aspects of the various learning outcomes.
Table 1: Verbs associated with the various cognitive educational objectives

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<tr>
<th>LOWER LEVEL THINKING</th>
<th>KNOWLEDGE</th>
<th>COMPREHENSION</th>
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<tr>
<td>acquire</td>
<td>point</td>
<td>memorize</td>
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<td>choose</td>
<td>quote</td>
<td>name</td>
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<td>cluster</td>
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<td>describe</td>
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<td>enumerates</td>
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<td>examine</td>
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<td>fill-in</td>
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<td>find</td>
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<td>follow directions</td>
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Table 1: (Continued)

<table>
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<tr>
<th>APPLICATION</th>
<th>ANALYSIS</th>
<th>SYNTHESIS</th>
<th>EVALUATION</th>
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<td>apply generalize</td>
<td>analyze</td>
<td>adapt</td>
<td>appraise</td>
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<tr>
<td>put into action</td>
<td>focus</td>
<td>generalize</td>
<td>assess</td>
</tr>
<tr>
<td>act graph</td>
<td>arrange</td>
<td>synthesize</td>
<td>argue</td>
</tr>
<tr>
<td>put to use administer</td>
<td>formulate</td>
<td>anticipate</td>
<td>compare/contrast</td>
</tr>
<tr>
<td>illustrate put</td>
<td>appraise form</td>
<td>generate</td>
<td>convince</td>
</tr>
<tr>
<td>together practice</td>
<td>break down</td>
<td>substitute</td>
<td>conclude</td>
</tr>
<tr>
<td>articulate imitate</td>
<td>classify</td>
<td>hypothesize</td>
<td>criticize/critique</td>
</tr>
<tr>
<td>project calculate</td>
<td>generalize</td>
<td>specify</td>
<td>choose</td>
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<tr>
<td>interpret</td>
<td>compare</td>
<td>assemble</td>
<td>invent</td>
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<tr>
<td>change interview</td>
<td>illustrate</td>
<td>summarize</td>
<td>decide</td>
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<tr>
<td>preserve chart</td>
<td>contrast infer</td>
<td>blend</td>
<td>defend</td>
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<tr>
<td>investigate chart</td>
<td>connect outline</td>
<td>incorporate</td>
<td>explain</td>
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<tr>
<td>choose provide</td>
<td>calculate</td>
<td>speculate</td>
<td>grade</td>
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<td>relate classify</td>
<td>prioritize</td>
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<td>inform information</td>
<td>criticize put</td>
<td>individualize</td>
<td>justify</td>
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<td>record collect</td>
<td>into</td>
<td>validate</td>
<td>judge</td>
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<td>restructure</td>
<td>correlate point out</td>
<td>combine initiate</td>
<td>reframe</td>
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<td>complete instruct</td>
<td>out</td>
<td>communicates</td>
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<td>report compute</td>
<td>categorize relate</td>
<td>integrate</td>
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<tr>
<td>infer schedule</td>
<td>diagram</td>
<td>compare</td>
<td>revise</td>
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<tr>
<td>construct keep</td>
<td>recognize</td>
<td>intervene</td>
<td>score</td>
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<tr>
<td>records select</td>
<td>discriminate solve</td>
<td>compile model</td>
<td>select</td>
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<tr>
<td>convert locate (info) sketch</td>
<td>detect</td>
<td>modify/make up</td>
<td>standardize</td>
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<td>demonstrate make solve determine</td>
<td>decide</td>
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<td>model show develop modify</td>
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<td>operate translate differentiate</td>
<td>sub divide</td>
<td>construct</td>
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<td>between transmit dramatize</td>
<td>distinguish tell</td>
<td>originate reorganize</td>
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<td>organize teach</td>
<td>why divide</td>
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<td>employ estimate operationalize</td>
<td>transform</td>
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<td>transfer establish perform use</td>
<td>draw conclusion</td>
<td>constitute predict</td>
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<td>participates prove write examine</td>
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<td>plan experiment</td>
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<td>find (implies predict investigation) produce</td>
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<td>produce formulate</td>
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<td>reinforce</td>
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* Sub-categories adapted from Bloom, Engelhard, Furst, Hill, and Krathwohl (1956).
A look at the above table shows that some verbs belong to two levels. The proper categorization of these verbs into the appropriate learning outcome will depend on the context in which they are used.

2.10.1 Testing/questions and higher-order thinking

Higher-order thinking has been defined by Resnick (1987) as nonalgorithmic, complex and, often yields multiple solutions; it involves nuanced judgment and interpretations, and it is effortful. What we need to ask ourselves is whether our current system of testing fits this definition. Research has shown that the answer is negative. One reason of testing is to provide information necessary for improving curriculum and instruction. If we want to develop a thinking curriculum and instruction rich in higher-order thinking, our tests should emphasize higher-order thinking skills. Contrary, our tests do not reflect this objective. Much research work has not been done on how teacher-made or standardized tests reflect higher-order thinking but the few available indicates that most test measure only lower level thinking skills. As far back as 1956 Bloom and others found that about 95% of the test items students respond to are at the lowest level-recall of information (Bloom et. al., 1956). Hummel and Huitt (1994) acknowledge that most test items used at all levels of education tremendously emphasize on lower levels of Bloom’s taxonomy (knowledge and comprehension) and not higher-order thinking.

Black (1980) analyzed the levels of thinking in Nigerian Science Teachers’ Examinations and found out that most of the question asked in Biology, Physics, and Chemistry were in the areas of knowledge and comprehension (low-level questions) with few in application across all forms (class levels). The study noted that questions asked by
teachers were influenced by those set by the West African School Certificate Examination (WASCE) which also emphasized mostly on knowledge and comprehension. The assessment behavior of these science teachers is nothing different from the other subject area teachers because they operate in the same context. This does not exclude the Ghanaian teacher and his approach to writing test items because they are operating within the auspices of the same examination body. The study involved an achievement test as oppose to standardized test like GRE.

Marzano and Costa (1988) in a research to see whether standardized tests measure general cognitive skills identified that they do not test higher-order thinking skills. The study used twenty-two general cognitive processes or thinking skills to analyze 6,942 test items from the Stanford Achievement batteries (the Stanford Early School Achievement Battery, the Stanford Achievement Test, and the Stanford test of Academic Skills). Only nine out of the 22 general cognitive skills were identified. They therefore suggested that there is the need to have a test which emphasizes thinking. They said “The need is clear for … alternatives that examine … thinking skills important for the information age.” (p. 71). The study only used Stanford tests but its pedigree makes it a credible representative of other tests.

Holden’s (1992) report on a study conducted by The Center for the Study of Testing, Evaluation, and Educational Policy on school science and mathematics test at Boston College indicates that tests in these areas fail to measure higher-order thinking which are involved in problem-solving. The study involved an interview with more than 2200 teachers and school personnel from 300 schools in six cities. The study also did
item-by-item analyses of a number of widely used tests in the United States. It was identified in the study that 95% and 73% of the standardized test items in mathematics and science respectively tested lower level thinking skills. The study also revealed that 95% and 90% of textbook contents in mathematics and science respectively dealt with lower level thinking skills. Only about 10% of the teachers surveyed indicated that the test have positive impact on students and teacher motivation. The study although involved only two content areas the findings may not be different from other subject areas.

Wasserman (2001) in a study to look at the quantum theory, the uncertainty principle, and their relation to standardized testing cited Edward Fiske, the then editor of the New York Times as a great critic of standardized testing. He noted that Fiske thinks standardized tests do not allow for divergent thinking, did not ask students to synthesize information, solve problems, and think independently. The tests focus on basic skills as oppose to higher-order thinking. These criticisms are indications that our testing systems do not support higher-level thinking to encourage teacher preparation institutions to prepare their prospective teachers to face such challenges in the classroom. Sternberg and Baron (1985) caution that to develop test items with emphasis on higher-level thinking, consideration must be given to several thinking skills theories because no single theory is wholly accepted among psychologists and educators. This also ensures catering for individual differences.

The problem of lower level testing is not peculiar lower grade levels, in standardized tests, and in particular subject areas but also in universities. A study
conducted by Ole Takona (1999) at Kenyan State University in Africa revealed that most test items used on students in the university are lower level mental skills in relation to Bloom’s taxonomy. The study involved analysis of examination questions from seven faculties and twelve academic departments of undergraduate students between 1989-1990 and 1994-1995 to determine how they specify cognitive levels. MANOVA was used as a statistical tool in analyzing the result. This study should send panic among lovers of promoting thinking in schools. If the highest level of education is testing mostly in lower level thinking than what is happening at the lower levels in African schools.

If teachers can write test items which deal with higher-order thinking, objective for their teaching lessons should reflect it. Unfortunately, most objectives reflect lower level thinking. A study conducted in Kentucky to examine the first lesson plans of 67 first year teacher interns for three years (1995-1998) to see how their objectives reflect higher-order thinking skills revealed that most of the objectives (77.0%) were in the lower level thinking of Bloom’s taxonomy. About Forty-three percent of the objectives were at the knowledge level while about 3% were in the evaluation category. The study used two raters. The study did not indicate the subject areas where the objectives were selected, and the grade levels of the teachers. A follow up study of the test items of these teachers will be very interesting to see how they reflect the various thinking categories. The implication of this study is that such teachers were not taught to write higher level thinking objectives in their training.
2.10.2 Textbook/curriculum and higher-order thinking

The portrayal of higher-order thinking skills in the educational set up is not found only in testing but in the curriculum and textbooks. Whatever is enshrined in the school curriculum and the textbook is reflected in tests because these are what the teachers teach. Like testing, most textbooks and curricula do not reflect higher-order thinking skills.

Risner, Nicholson, and Myhan (1991) in a study to ascertain the level of questioning in current fifth-grade science textbooks in elementary schools in the United States found out that questions at the end of each chapter lack emphasis on application, analysis, synthesis, and evaluation (higher-order thinking skills). The study used simple frequency and chi-square to analyze 600 items (300 each from the old and new editions and 200 from each publisher) from the following science books: Merrill Science (1983, 1989), Holt Science (1984, 1989), Scott, Foresman Science (1984), and Scott. Foresman Science (1989). The items were categorized for analysis using Bloom’s taxonomy. The study also found out that there was gap between the stated objectives of the elementary science curriculum and actual published materials. The implication of this study is that teachers should devise ways of supplementing the questions in the textbooks with both written and oral ones to develop the higher cognitive process of their learners. This calls for a teacher who has been trained in such skills to do such supplementary cognitive activities.

In a summary, research on higher-order thinking skills in mathematics textbooks using nine levels of cognition (1- recall, recognize, repeat, copy; 2- iterate; 3- compare,
substitute, 4- categorize, illustrate; 5- apply, relate, convert, symbolize, summarize, describe; 6- justify, explain, analyze; 7- hypothesize, synthesize, generalize, deduce; 8- prove, test, design, solve; 9- evaluate) and using simple percentages to analyze levels of complex numbers, decimals, and exponential and logarithmic problems, Niecly Jr. (1991) found that lower order thinking was highly represented in all areas and in all textbooks. The textbooks analyzed were commercially published in the 1960s, 1970s, and 1980s across all grade levels. This study reveals that textbooks are woefully inadequate resources for developing higher order thinking skills. This requires that teacher institutions should train their prospective teachers in thinking skills development so that they will use these skills to compensate for what is missing in the textbooks.

In a MUSTER Country report on a study about teacher training in Ghana, Acheampong (2001) analyzed the first and second years’ In-in-out mathematics and science curriculum for pre-service teacher education. Acheampong looked at the frequency of verbs used to describe specific objectives according to Bloom’s taxonomy and found that there was no higher level objective thinking skills in the practical area of both mathematics and science, no higher-level thinking skills verbs in science in the cognitive area, there was no synthesis in mathematics but there were fairly good use of verbs denoting higher-level thinking in mathematics. Looking at it from the point of view that mathematics involves problem solving, this curriculum does not involve much higher-level thinking skills. The study should have looked at how thinking skills are reflected in the textbooks accompanying these curricula. Further studies need to be conducted to see how teachers teach to supplement the higher-level thinking skills which
are absent in the curricula. There is also the need to look at other subject area curricula and see how they reflect higher-level thinking skills.

Lower level questioning in textbooks is not only a problem with science and mathematics textbooks as found in the above but also in language. A study conducted by Hoeppel (1980) in reading skills development books in Maryland Community College to categorize questions found in the books using Bloom’s taxonomy, indicated that only lower level questions are present. The study randomly selected 555 questions from 62,483 questions from 185 books. The inter-rater reliability was 96%. The study found that 145 of the questions were in the knowledge category, 408 in the comprehension category, two in application, and non in the other categories. The implication of this study is that we give prominence to lower level question rather than using higher level ones to stimulate the thinking abilities of our students. Teachers therefore need to supplement these lapses with their own skill to stimulate thinking. The important question is have we trained our teachers to do so.

The situation is not all that gloomy as seen in the above researches. A study conducted by Risner, Nicholson, and Webb (2000) on how third grade new Social Studies textbooks used in Alabama reflect higher order thinking using Bloom’ taxonomy found that the books emphasize higher order thinking. The researchers used two textbook series – Harcourt Brace Social Studies (2000) and Communities: Macmillan-McGraw Social Studies (1997). The study used three raters with inter-rater reliability of 98% rated 200 textbook questions (100 from each). The study found 38% of the questions as lower level whereas 62% were rated as “above-knowledge or higher level” (p. 9) (Harcourt
Brace Publishing - 19% knowledge and 81% above knowledge; Macmillan Publishing – 57% knowledge level and 43% above knowledge). The study considered knowledge as the cut off point for lower level thinking. Saying “above knowledge” is nebulous and confusing. The finding of the study is limited in relation to Bloom’s taxonomy because in Blooms’ original classification, comprehension and application were lower level thinking skills. Another query about this study is that if a school uses only Macmillan Publishing, the students will not experience higher level thinking. More textbooks in Social Studies by other publishers need to be analyzed to see how they reflect higher-order thinking before a generalized conclusion can be made.

2.11 Enhancing thinking skills of learners

Most attention on thinking is devoted to importance and definition than how to enhance it. Most articles on how to teach it are vague, even the domain specific articles. Notwithstanding, there are a few which have made meaningful suggestions on how to teach and enhance thinking skills of learners. Our learners are good thinkers who need someone to stir them up. Fisher (1990, p. 245) quoting Barry, eight “I’m quite a good thinker. I just need someone to start me up”. The teacher, parents, the learner, teacher institutions, and the school together play an essential role in developing the thinking skills of learners.

2.11.1 Role of teachers

The success of any program mostly depends on teachers. The Center for Critical Thinking (1996) suggests that teachers should let their students be aware of what they are in for the first day they attend classes, teachers should speak less in class, develop
specific strategies for cultivating thinking, use concrete examples in class, regularly
question students, and break class down frequently into small groups to work on specific
tasks. The Center added that teachers should think aloud in front of the students and
present concepts in context of their use. In addition to the above, Cotton (2001) suggests
that teachers should use various instructional approaches to enhance thinking skills.
Cotton (2001) for example, says that the use of probing questions, redirection and
reinforcement increases students’ content knowledge and enhance the development of
thinking skills. Cotton suggests to teachers that they should use higher order questions in
the classroom and also have enough waiting time for students to respond to a question.
These practices increase students’ participation in class activities. According to Beamon
(1997), teachers need to use the cognitive instruction approach to teaching advocated by
Jones in 1986. Teachers should acknowledge that learners have the capacity to learn and
this can be improved considerably by building on their preexisting knowledge and
strengthening and expanding their current repertoire of thinking and learning strategies.

Collins (1993) suggests that in enhancing critical and creative thinking (higher-
order thinking skills), the teacher must be a model. The teacher must practice critical and
creative thinking skills in the teaching process. The teacher must provide opportunities
for students to select activities from a range of appropriate choices, seek imaginative,
appropriate, and ethical solutions to problems, exhibit genuine interest, curiosity, and
commitment to learning. Besides, the teacher should engage students in meaningful
activities which incorporate students’ interest, abilities, backgrounds, and needs. Collins
also suggests that teachers can enhance critical and creative thinking by involving
students in role plays/simulations, using “structured controversy”, encouraging students to recognize contradictions, asking divergent questions, asking students to analyze the content of materials/texts, and asking students to defend their assertions with reason.

One area where teachers can work on to promote thinking among learners is to eradicate from the students any negative attitude that inhibit thinking and replace it with positive ones. Harris (1998) lists the following as positive attitudes that teachers should inculcate in their students: curiosity, constructive discontent, the belief that problems can be solved, the ability to suspend judgment and criticisms, see good in the bad, problems lead to improvement, and a problem can be solved. Fisher (1990) also suggests that the teacher should build self esteem among the learners, reach all children in the class, listen to learners with care, be a learner too, and be positive.

Another thing the teacher can do to enhance thinking skills and thinking is to create conducive classroom environment. Potts (1994 citing Keefe and Walberg, 1992) thinks “… thinking in the classroom is facilitated by a physical and intellectual environment that encourages a spirit of discovery” (p. 3). Potts gave two suggestions to enhance the physical environment which include seating arrangement and visual aids in the classroom. The seating arrangement must be done in a way that each child can be seen to avoid passiveness and the visual aids should encourage ongoing attention to critical and creative thoughts processes. The classroom environment should be a motivating place for learners to express their views without fear of intimidation. There should be fairness, tolerance, and respect for each others opinion. Dialogue, negotiation, care, and active participation should be key elements in the classroom. Beamon (1997)
for instance, asserts that teachers should create an environment that will raise expectations and extend opportunities for students to use their ability to think. Beamon adds that the classroom environment must be created to motivate and challenge learners to think.

Beyer (1988) suggests that teachers should do direct teaching of thinking skills in the classroom and that such teaching should focus on the specific operations that constitute thinking. According to Beyer teaching and learning of thinking skills at the initial stages should concentrate on the specific skills to be developed rather than on content. Teaching skillful thinking must extend beyond practice and exercise. Bayer claims that researchers say that direct instruction in thinking skills primarily consists of carefully structured academic tasks, explicit instruction in their accomplishment, systematic practices to attain mastery, numerous opportunities for direct practice, and appropriate assessment. To make direct instruction a success, Beyer suggests that the teacher must have understanding of the skills to be taught and apply the appropriate rules and procedures. The benefits of direct instruction are that it speaks directly to the student and helps them to develop self-confidence and self-esteem.

In the teaching process, teachers should structure learning tasks around problem solving, decision making, or conceptualizing which show students opportunities on how to use thinking skill (Beyer, 1987). In this process students articulate their claims, provide evidence, and reason in support of their claims and do same form other points of views. This makes students identify and respond to challenges to different points of views put forward; identify and examine the underlying assumptions and examine their consistency.
Though this is student-centered process it offers the teacher the opportunity to interrupt the process to see how student are using the important thinking skills they have learnt in the execution of a problem or task (Beyer, 1987).

In sum, teachers need to encourage discussions in class, ask questions that cause students to think, encourage learners to ask and answer questions, and feel comfortable to express opinions, and encourage learners to respect the views of others. In addition, teachers need to probe for clarity of expression, give learners choices and involve them in meaningful projects, and believe that all learners have the ability to develop and improve their thinking ability (Beamon, 1997).

2.11.2 Role of Parents

Another factor that enhances thinking skills among learners is parental involvement. A study by Kashani, et. al. (1987) indicates that parental support has positive effect on the development of personality of the adolescents. Alpay-Altug, Ozkan, and Alpay (1998) in a study on parental attitude and critical thinking ability in adolescents identified that parental attitude plays an important role in the determination of learners critical thinking ability. This implies that parents should have positive attitudes and enhance thinking skills among learners. In the home, parents should engage their kids in divergent question, ask kids to give reason for their choices and actions. They should also engage their kids in games and activities that are likely to develop their cognition and their ability to think. Parents should themselves engage in critical and creative thinking (thinking skills). Parents should give encouragement to their kids when they get involve in thinking activities. Lopes (1995) in talking about how to help kids
grow creatively, suggested that parents should relax controls which diminish self-confidence, it is not always critical to have the correct answer to a problem, inspire perseverance, provide creative atmosphere, and offer but not to pressure kids. The implications of these are that parents need to encourage and give their kids time to develop the creative talents which is innate. Encouragement from parents reinforces the kid’s interest in thinking.

2.11.3 Role of the school

Besides parental involvement, the school has a major role to play in enhancing thinking skills among learners but according to Perkins (1990), schools do not serve this interest very well. The school environment should encourage the teaching of thinking skills. The school should value thinking and support it. Schools should promote the intrinsic motivation of learners (Perkins, 1990). One factor that hinders the teaching of thinking skills is large class size. Schools should therefore have reasonable class sizes to facilitate the teaching of thinking skills. In addition, schools need to appreciate teaching and learning of thinking skills by awarding prizes to teachers and students engaged in thinking skills activities. By so doing, the school provides an ecosystem that nurtures, supports, and honor skillful thinking (Beyer 1988). The school should also provide appropriate staff development. Teaching thinking skills do not come readily to all teachers. Beyer (1988) is of the opinion that considerable staff development has to be undertaken to carry a thinking skills program from curriculum guide into effective student learning. Schools must provide continuous staff development for teachers to be aware of the modern trends in teaching thinking skills and have the opportunity to use
them. Schools can institute thinking skills day (i.e. once in any other week) to discuss issues concerning teaching thinking skills, circulating and discussing of journal articles, and providing demonstrations and presentations.

2.11.4 Teacher training institution

Teacher institutions have a major role to play in enhancing thinking in learners by incorporating the teaching of thinking skills in the teacher education curriculum. Cotton (2001) for instance affirms that training teachers to teach thinking skills (critical and creative thinking) leads to students achievement gains. Teacher training is the key factor to most successful thinking programs (Cotton 2001). Crump, Schlichter, and Palk (1988) have identified that there is positive relationship between teacher training and student achievement. According to Beyer (1988), to develop proficiency in the strategies and skills used in the teaching of thinking skills, a teacher training program must include the following elements: provide education through lectures, reading, and discussion in the theories and research upon which they are based, demonstrate constantly how these strategies work, offer repeated practice and observation in the use of these strategies and skills, and provide coaching. The kind of training given to teacher trainees should take into consideration teacher needs. The teaching of thinking skills in schools will be enhanced when there are quality teachers to handle them effectively in the classroom. Unfortunately, pre-service teacher institutions have failed in this endeavor. Stuart (1999) in a comparative analysis study in primary teacher education identified that tutors do not use appropriate methods that enhance thinking skills. She states “It is quite rare for tutors to get professional development designed to help them. Most stumble into and train in the
way they were trained—sometimes using their university notes of fifteen years ago.” (p. 24).

To improve the performance of learners on thinking skills tests, pre-service teacher institutions must improve teacher training. Teacher training institutions must teach cognitive skills to pre-service teachers before training them to teach thinking skills in the classroom (Ashton, 1980). Teacher institutions need to incorporate thinking skills into all aspects of teacher preparation and train future teachers to be models of effective thinking strategies (Walsh & Paul, 1988).

2.11.5 The role of learners

Learners after receiving instructions in thinking skills from teachers need to use them. They have a major role to play in making their innate thinking skills ability work. Learners need to cultivate positive attitudes towards creative and critical thinking skills and do all it takes to enhance their use. Learners need to take active part in class activities e.g. discussions. Wilks (1995) suggests the following as some of the things learners should do in a discussion group to enhance thinking skills: not to yell or call out, concentrate on what others are saying, be tolerant, and say what they think and feel freely. Learners must ask questions for clarification, listen attentively, make sound judgment, think before they respond to a question or comment, weigh the implications of what they say, give reasons for what they say or do, learn to practice thinking skills learnt, and learn to take risks. Harris (1998) suggests that learners should do away with negative attitudes that block how they will use the creative and critical thinking they have learnt. These negative attitudes according to Harris include using expressions like “Oh
no, a problem!, it can’t be done, I can’t do it, but I am not creative or critical thinker, I might fail”. Learners need to develop positive attitudes like curiosity, challenge assumptions behind ideas, constructive discontent, belief that most problems can be solved, ability to suspend judgment and criticism, see the good in the bad, and problems lead to development. Harris adds the following as good attitudes: perseverance, flexibility, imagination, and knowing that mistakes are unavoidable.

2.12 Factors that inhibit thinking

Teaching thinking skills in schools has have setbacks due to certain factors. Bayer (1988) for instance, identifies five factors that inhibit the teaching of thinking skills in schools. These factors include inappropriate teaching methods employed by teachers, ineffective testing procedures used by both teachers and testing companies which fail to support and reinforce the development of thinking skills among learners, and severe overload of skills in the curriculum. The others are lack of consensus among educators on which thinking operations are essential and worth teaching, and the inability of teachers, test makers, material developers, and curriculum designers to identify the essential thinking operations to select for teaching.

In addition to the above, educational policies negatively influences the teaching of thinking skills in schools. Most educational policies emphasize on standards and teachers accountability. There is increase prevalence of standards, high-stake testing, and outcome assessment (Ward & McCotter, 2004). This places pressure on teachers to prepare their learners for test rather than helping them to be creative thinkers in the learning process. In some cases, the culture of the school and that of the society do not support the teaching of
thinking in schools. According to Leat (1999), thinking skills programs and the development of thinking skills in learners depend on cooperative group work. Leat (1999; p. 392) indicates “The school culture may offer some encouragement [to teaching of thinking skills], but it is often not wholly supportive, given other pressures. The teaching of thinking skills and developing thinking skills programs in schools sometimes show lack of commitment on the part of teachers. Sometimes, it rest on a few enthusiastic ones. In addition, schools kill the intrinsic motivation by engaging in practices like emphasis on heavy grading, minimal informative feedback, lack of choice of activities, and constant scrutiny of work (Perkins, 1990). In most developing countries including Ghana where information delivery is one sided (from the elderly to the young) the school runs into conflict when it tries to be open and democratic in information delivery in the classroom.

2.13 Thinking and teacher development

The complex and daunting task of enhancing thinking behooves on all partners involved in the education of the child to put their shoulders to the wheel and make it a success. There should be collaboration between teacher training institutions, classroom teachers, parents, educational planners, researchers, and learners but the teacher holds the key. The success of a thinking program or a thinking curriculum will depend on careful planning and implementation. There must be some components about a program or curriculum that will make it effective. Costa (2001) for example, says a well develop thinking skills program or thinking curriculum must have the following components: “judiciously selected content, instruction in thinking skills, providing tasks requiring the application of and reflection on skillful thinking, and habituating certain dispositions
toward thinking or habits of mind.” (p. 1). It must be noted that these components are essential but they do not necessarily guarantee program effectiveness and success.

Teacher training and development is very essential. This component has been identified by McGuiness (1999) in a review and evaluation of research into thinking skills commissioned by the Department for Education and Employment in England in 1998 as a major contributing factor in program success. He identified that more successful thinking skill interventions have been characterized by explicit models of teacher development and teacher support. This implies that teacher preparation is key to promoting thinking in schools especially at the elementary level.

Brandt (1988) in an interview with Arthur Costa, the editor of Developing Minds, noted from the interview that teachers/administrators who model intelligent behavior are effective in creating an ecosystem for thinking in their classroom/school. Our teachers/administrators cannot model intelligent behaviors when they have not been thought to do so. The major challenge of the classroom teacher is how to manage the complexity of working in subject areas to transform them into instructions that will stimulate thinking among learners (Branford, Sherwood, Hasselbring, Kinzer, and Williams, 1987). This challenge continues to exist in present-day teachers. Teacher training institutions need to model such behaviors in their training for prospective teachers to emulate.
2.14 Teacher Education: Introduction

Presently, teacher education program in Ghana is structured to provide a three-year pre-service Diploma in Basic Education (DBE) to train teachers for program A (teachers teach at the primary level at the basic level) and program B (teachers teach at the Junior Secondary School level). In addition to this, there are degree programs in education where teachers are trained teach at the Senior Secondary School or Teacher training College levels and rarely at the basic level. The main teacher training institutions in Ghana are the University of Cape Coast (Faculty and Institute of Education, University of Education, Winneba, and Teacher Training Colleges (38 public and 3 private). Cape Coast University and University of Education, Winneba also provide in-service training for teachers who have graduated from the Teacher Training Colleges and want to further their profession after teaching for at least three year. In this research the focus is on Teacher Training Colleges (TTC).

2.15 Pre-service Teacher Education Development in Ghana: Historical Overview

Teacher education in Ghana was started by the missionaries. The first teacher education institution and a systematic teacher training program in the Gold Coast (now Ghana) was started by the Basel mission in 1848 at Akropong Akwapim (MacWilliam, 1969; Graham, 1971). From 1845 to 1851, unsuccessful attempts were made at establishing a teacher training in Akrah (Graham, 1971). Initial teacher education in Ghana is concerned mostly with the training of teachers for Basic schools (primary and junior secondary) education. Currently, it is a three-year program for high school graduates leading to a certificate in Diploma in Basic Education (DBE) The development
of teacher education has had a checkered history sometimes calling for ad-hoc programs to meet emergencies (Acheampong, 2001). According to Anamuah-Mensah (1999), the institution has had not less than eight different models. The changes have been in response to changes and reforms in education.

Teacher education in Ghana started in 1930 with a four-year teacher training course which led to Certificate “A”. This was meant for middle school graduates who were trained to teach at primary and middle schools. In 1937, a two-year Certificate “B” teacher training program was instituted to train more teachers to cope with the ever increasing number of schools (MacWilliam, 1969; Graham, 1971). The introduction of the Accelerated Development Plan in 1951 to expand and improve education in the country necessitated the introduction of a two-year post-B program to upgrade such teachers to Certificate “A” (Post-B Certificate “A”) after teaching for some time.

After independence in 1957, there was increase in school enrolment which called for increase in demand for teachers. The nation reintroduced the four-year post middle Certificate “A” in 1961. This was because the Certificate “B” program was found to be ineffective. Alongside the year program a three year post secondary training program was introduced to train teachers for the middle school and junior Secondary (JSS) levels. The three-year program was later abandoned and replaced with a two-year post secondary Certificate “A” which was later eliminated. In 1979, the three-year post secondary Certificate “A” was reintroduced. In 1982, the Modular Teacher Training Program (MTTP) was introduced. This program blended distance education and conventional teacher training approach for pupil teachers (unqualified) to become trained teachers.
These classroom teachers had two years sandwich courses and then enroll for two year in a teacher training institution for a four-year Certificate “A” to teach at the primary level after completion. Presently, all these models have been abandoned except the three-year post secondary Certificate “A” which has been upgraded into diploma programs called Diploma in Basic Education (DBE) in 2004. The table below summarizes how initial teacher education has metamorphosized over the years:

Table 2: Pre-service teacher preparation models in Ghana since post-colonial era.

<table>
<thead>
<tr>
<th>Program model</th>
<th>Certificate</th>
<th>Teaching level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-year post middle</td>
<td>Certificate “B”</td>
<td>Primary school</td>
</tr>
<tr>
<td>Two-year post “B”</td>
<td>Certificate “A”</td>
<td>Primary/middle school</td>
</tr>
<tr>
<td>Four-year post middle</td>
<td>Certificate “A”</td>
<td>Primary/middle school</td>
</tr>
<tr>
<td>Two-year post Secondary</td>
<td>Certificate “A”</td>
<td>Primary/middle school</td>
</tr>
<tr>
<td>Three-year post Secondary</td>
<td>Certificate “A”</td>
<td>Primary/JSS school</td>
</tr>
<tr>
<td>Three-year Diploma in Basic Education</td>
<td>Certificate “A” Diploma</td>
<td>Primary/JSS school</td>
</tr>
</tbody>
</table>

By 1967 Ghana had eighty-three initial teacher education institutions but now there are thirty-eight public and three private ones. Only seven of these are single-sex female institutions.

2.16 The Curriculum

The aims of pre-service teacher education as enshrined in the New Structure and Content of education (Dzobo, 1974) and have remained until this time are to

1. Provide teachers with a sound content base of the courses at the levels at which they will function.

2. Provide teachers with sound professional skills to make them effective and efficient to guide their learners.
3. Inculcate the qualities of leadership into would-be teachers to make them able to integrate the school with the community, to create an ecosystem which will make children learn with pleasure, and to prove themselves acceptable in the society.

4. Train teachers in manual skills so that they motivate the children they teach in the acquisition of basic vocational skills.

These objectives have outlived their usefulness in an information and technological driven world but they continue to stand firm in the teacher education program in the country. The curriculum is tailored towards the achievement of these objectives.

2.16.1 The old curriculum

The initial pre-service teacher education curriculum had undergone constant changes as changes occurred in the structure. These were minor changes but the major change occurred in 1998. Before then the pre-service initial teacher education curriculum for basic education was as follows: general education (30%), academic education (30%), and professional studies (40%) (Acheampong, 2001). The general education encompasses core subjects: basic mathematics, English language, basic science, Ghanaian language, physical education, cultural studies, education, and agricultural science. The academic education is made up of two elective subject chosen by each student from group one or group two. The group one includes science-based subjects while the group two comprises vocational subjects. Some teacher institutions specialized in group one, others in group two while others engaged in both. Time allocation per week for the various subjects depends on emphasis given to it in the teacher education program. Each period consists of a forty-minute lesson. Each teacher institution has flexibility to organize its time
schedule and time allocation per subject but has to inform the Teacher Education Division of the Ghana Education Service. The professional component part of the curriculum includes two weeks school observation and two weeks for on-campus practical teaching (micro-teaching) in year one, and a six week each in year two and three practical teaching in schools.

2.16.2 The new teacher education curriculum (In-In-Out model)

One problem leveled against the old curriculum in the Initial Teacher Training system was that it did not give much emphasis to practical training. This necessitated the proposal of the new curriculum the In-In-Out model in 1999/2000 to be adopted. In the In-In-Out model, students spend the first two years in school for academic work and spend the whole of the third year teaching in a school for practical training. The new curriculum is as follows (Acheampong, 2001).
Table 3: New teacher education curriculum: In-In-Out Model

<table>
<thead>
<tr>
<th>“IN” (Year 1)</th>
<th>“IN” (Year 2)</th>
<th>“OUT” (Year 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Curriculum</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Foundation Academic courses (Subject content knowledge)</td>
<td>i. Curriculum studies and methodology (CSM) in all subject area.</td>
<td>* curriculum (under development)</td>
</tr>
<tr>
<td>(ii) Education Studies (Introductory Education courses)</td>
<td>ii. Education studies</td>
<td>i. Distance learning materials reflecting classroom teaching</td>
</tr>
<tr>
<td>(iii) School attachment at end of year one</td>
<td>iii. On campus practice teaching</td>
<td>ii. Mentorship training</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Year 1 promotional Examination based on education studies and foundation academic courses</td>
<td>i. External Exam in CSM</td>
<td>i. Final external examination of classroom based teaching experience</td>
</tr>
<tr>
<td></td>
<td>ii. Continuous Assessment CSM</td>
<td>ii. Mentors and selected college tutor assessment of teaching.</td>
</tr>
<tr>
<td></td>
<td>iii. Project work assessment</td>
<td></td>
</tr>
</tbody>
</table>

The essence of this model is to provide enough opportunities for relating theory into practice thus the need for a year’s practice teaching.

A feature of this program which is different from the old model is the role of District Assemblies in recruiting of candidates and sponsoring them in their teacher training. These sponsored teachers are then bonded to teach in the district after their training. This proposal has been put on hold because of funding problems to some districts.

Teacher institutions under this model offer either program “A” or “B” courses. There are no elective courses for Program “A” students because they study all the
subjects. On the other hand, students in Program “B” specialize in two subjects as elective and two other subjects from program “A”. This implies that students pursuing Program “B” specialize in four subjects.

Assessment which used to be at the end of the second and third years is now done at the end of the first, second, and third years. The first year assessment is composed of internal and external promotional examinations. Failure in this examination results in withdrawal from college. The subjects examined in the external examination include environmental and social studies or technical skills, integrated science or French, English, Ghanaian language, and Mathematics. The pass mark in this examination is at least 40% in all subjects. In addition, learners will have to pass the following internal subjects: Religious and Moral education, Music and Dance, Physical Education, and Vocational Skills. A student’s progress to the second year depends on passing in the internal and external subjects. The second year assessment encompasses an in class continuous assessment and an external examination. The students are also assessed on on-campus practice teaching. A student who fails in such examination has two other chances to write the examination and pass before moving on to the third year. (Read for 3rd year assessment).

The model has a practice teaching (practicum) component. At the end of the first year there is school attachment for observation of teaching and work practice where student teachers observe regular teachers in the classroom teach. In the second year, students do on-campus practice teaching for practice in lesson designing and the development of specific skills in teaching. The third year is out of campus practice
teaching where students spend a years teaching in a school. They are mentored by seasoned teachers in the schools they are practicing.

2.16.3 The Diploma in Basic Education Program (DBE)

In September 2004, the three-year postsecondary teacher program which had the in-in-out component added to it was upgraded to a three-year Diploma in Basic Education. This move is to ensure quality education delivery in the country’s basic education system. The curriculum is based on the semester and course system. This idea was conceived as far back in 1992 as part of the regional colleges of Applied Arts, Science and Technology institutes program. This program has two basic components; DBE “A” and DBE “B”. DBE program “A” is structured to produce teachers to teach all subjects in a primary school while program “B” teachers are trained to teach two or three subjects in the Junior Secondary School. The underlying principles of this program include demand, integration of theory and practice, school/classroom focus, competency and process assessment (ED/HED/TED, 2003).

There are five curriculum components to this program. These are foundation academic courses, specialized personal development, educational studies, curriculum studies and methodology, and practical training. The foundation studies course include all subjects studied at the basic education level while the specialized personal development studies encompasses communication and study skills in addition to socio-economic issues that underlie national development. The educational studies include studies focusing on the learner, the teaching-learning process, and assessment. Curriculum studies and methodology focuses on the teaching of content of either the primary school subjects or
Junior Secondary school subjects whereas the practical training consists of school visits, school attachments, on-campus practical teaching, design and preparation of teaching learning materials, and external school-based teaching. The table below shows the courses pursued in this program (ED/HED/TED, 2003).

Table 4: List of courses in the Diploma in Basic Education Program

<table>
<thead>
<tr>
<th>COURSES</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOUNDATION COURSES</strong></td>
<td></td>
</tr>
<tr>
<td>1. English</td>
<td>8 Credits</td>
</tr>
<tr>
<td>2. Mathematics</td>
<td>8 Credits</td>
</tr>
<tr>
<td>3. Ghanaian Languages and Culture</td>
<td>5 Credits</td>
</tr>
<tr>
<td>4. Integrated Science</td>
<td>6 Credits</td>
</tr>
<tr>
<td>5. Environmental and Social Studies</td>
<td>6 Credits</td>
</tr>
<tr>
<td>6. Religious and Moral Education</td>
<td>2 Credits</td>
</tr>
<tr>
<td>7. Music and Dance</td>
<td>2 Credits</td>
</tr>
<tr>
<td>8. Physical Education</td>
<td>2 Credits</td>
</tr>
<tr>
<td>9. Technical Skills</td>
<td>9 Credits</td>
</tr>
<tr>
<td>10. French</td>
<td>9 Credits</td>
</tr>
<tr>
<td>11. Vocational Skills</td>
<td>4 Credits</td>
</tr>
<tr>
<td><strong>EDUCATION STUDIES</strong></td>
<td>14 Credits</td>
</tr>
<tr>
<td>1. Teaching as profession</td>
<td>2 Credits</td>
</tr>
<tr>
<td>2. Principles of Education</td>
<td>2 Credits</td>
</tr>
<tr>
<td>3. Child and Adolescent development and Learning</td>
<td>2 Credits</td>
</tr>
<tr>
<td>4. Measurement and Evaluation at the Basic Level</td>
<td>2 Credits</td>
</tr>
<tr>
<td>5. Introduction to special Education</td>
<td>2 Credits</td>
</tr>
<tr>
<td>6. School management and Administration</td>
<td>2 Credits</td>
</tr>
<tr>
<td>7. Development of Education in Ghana</td>
<td>2 Credits</td>
</tr>
<tr>
<td><strong>PROFESSIONAL STUDIES</strong></td>
<td>29 CREDITS</td>
</tr>
<tr>
<td>1. Principles of Curriculum Development</td>
<td>2 Credits</td>
</tr>
<tr>
<td>2. The Primary School Curriculum</td>
<td>2 Credits</td>
</tr>
<tr>
<td>3. the Junior Secondary School Curriculum</td>
<td>2 credits</td>
</tr>
<tr>
<td>4. Principles and Methods of Teaching at the Basic Level</td>
<td>7 credits</td>
</tr>
<tr>
<td>5. Educational Research methods and project Work</td>
<td>3 Credits</td>
</tr>
<tr>
<td>6. On-Campus Teaching practice</td>
<td>3 credits</td>
</tr>
<tr>
<td>7. Off-Campus Teaching Practice</td>
<td>6 Credits</td>
</tr>
<tr>
<td>8. Project</td>
<td>4 Credits</td>
</tr>
<tr>
<td><strong>GENERAL STUDIES</strong></td>
<td>6 CREDITS</td>
</tr>
<tr>
<td>1. Communication Skills</td>
<td>2 Credits</td>
</tr>
<tr>
<td>2. HIV/AIDS Education</td>
<td>2 Credits</td>
</tr>
<tr>
<td>3. Introduction to Information Technology</td>
<td>2 Credits</td>
</tr>
</tbody>
</table>

This program sought to produce lifelong learning teachers. This objective is hoped to be achieved through problem-solving techniques and strategies which will make the learners
learn by themselves. Individual as well as group activities will be employed to help learners apply the content and skills acquired. Teachers of this program should possess a minimum of a bachelor’s degree in their area of specialization.

2.17 Teacher education and education reform and development

Most educational systems are plagued with lack of parental/community support, large class sizes, lack of funds, flawed curriculum, and poor quality teachers. These problems undoubtedly have negative repercussions on development of education in most countries and on students’ emotional, physical, social, and intellectual development. With well prepared teachers, these problems can be handled to have minimal effects on learners. Unfortunately, teacher institutions have failed to prepare teacher for this task. Teacher institutions themselves are crowded with numerous problems. Notable among them lack of resources, lack of teachers (Leskiw & Girhiny, 1992), use of poor teaching methods, and recruitment of academically weak students (Avoseh, 1992). The ripple effect of this is poor training given to teacher trainees which makes them ineffective in the classroom after their training.

If nations are interested in improving education, attention should be given to teacher education. According to Razik and Zaher (1992), strengthening education in general must come from the professional activities of well prepared teachers. Improving teacher education should be at the heart of any educational reform and development. Any reform in education must commence from teacher education. In a Harris poll in 1998, a majority of the participants believed that quality teachers hold the key to a successful educational reform (Rothstein, 1999).
The importance of teachers and teacher education in educational reform and development has been echoed in the report of The National Commission on Teaching and America’s Future (1996). The commission in its report stated that if America hopes to achieve her educational goals, premium should be placed on recruiting, preparing, and supporting excellent teachers. The executive summary report added that “A caring, competent, and qualified teacher for every child is the most important ingredient in education reform” (p. 1). This calls for a reform in teacher education. The call for such reforms in the United States is echoed in many other countries including Ghana. A nation cannot develop its educational system and be successful without paying attention to the preparation of its teachers. It was appropriate therefore that The National Commission on Teaching and America’s Future (1996) started its work with three premises all in lieu of teachers: The knowledge teachers possess and their actions in the classroom have immense impact on what students learn. Improving schools depends on the recruiting, preparing, and retaining of good teachers, and school reforms can not succeed unless conditions are created for teachers to teach and teach well. These premises point to the fact that teachers are indispensable in any educational reform.

Palmer (1998) in his book, *The courage to teach* identifies that the teacher is sometimes forgotten in the quest to reform education. He cautions that any reform in education which relegates the teacher to the background is destined to fail. He says

In our rush to reform education, we have forgotten a simple truth: reform will never be achieved by renewing appropriations, restructuring schools, rewriting curricula, and revising texts if we continue to demean and dishearten the human resource called the teacher”. (p. 3).
The implication of this statement is that in any educational reform and development, serious attention should be given to teacher education and development. Teacher preparation and development must be accorded the needed attention because teachers are the pivots around which success in education revolves. Unfortunately, most nations including Ghana have neglected this important aspect in educational reforms.

In 1987, Ghana embarked on a major educational reform termed the Educational Reform Program (ERP) to increase access to education, improve educational inputs, and restructure the educational system. Seven years later, a committee; Education Reform Review Committee (ERRC) mandated to review the reform, identified that despite improvement in access to education and improvements in school facilities, teaching and learning outcomes remain poor (Ministry of Education, 1994). The committee attributed this to neglect in human resource; the teacher. The Ministry of Education (1995b) in its appraisal of the 1987 Educational Reform identified ineffective pre-service teacher training and inadequate in-service teacher training as a major cause of low achievements in schools. In response to this, the government of Ghana launched the Free Compulsory Universal Basic Education (FCUBE) in 1996 which targeted reform in pre-service and in-service teacher training programs. This situation is not different at present. Initial teacher institutions have failed to train teachers in an effective manner to handle the situation because academic standard in basic schools is worse than it was in 1996. There is high probability that effective and quality teacher preparation giving to pre-service teachers will result in effective teacher delivery in the classroom. Acheampong (2001) concludes his report on *Teacher training in Ghana: Does it count* by saying that
Student learning outcomes is greatly influenced by the level of commitment and competence. Teachers are at the forefront of basic education quality delivery. Therefore their training … needs to be given more serious consideration in education development in Ghana. (p. 102).

The aspirations we want our children to attain in school are linked to teacher competence. Surprisingly, little attention is paid to teacher education and teacher preparation. We need to boost teacher competence through teacher preparation for our children to achieve the best.

2.18 Teacher preparation institution and teacher quality

Teacher quality matters. It is the most important school-related factor influencing student achievement (Rice, 2003). Sanders and Horn (1994) in a value-added study using student achievement data found that student achievement gains are influenced by the teacher assigned to them than other factors like class size. Attaining teacher quality is not easy. Hamachek (1999) for instance, says that finding definite answers to the essential qualities of a good teacher and knowing how to help people become good teachers is a problem which has eluded educators. In Hamachek’s view, this is due to the fact that there are differences in context and it is impossible to formulate a definite description of a good teacher. Teacher quality is not attained in vacuum and overnight. It is attained through effective training and experience. The type of learning and teaching assignment teacher institutions offer their pre-service teachers have immense influence on their quality after completion.

Being qualified as a teacher does not necessarily mean being quality/effective. Rice (2003) asks whether all qualified teachers are really quality teachers. A qualified teacher is one who has gone through teacher education program that has been approved
by the State Department of Education (Ministry of Education in case of Ghana) to confer license to its trainees to teach (Feistritzer, 1989). Merely being a qualified teacher does not make one a quality/effective teacher. Revkin, Hanushek, and Kain (2005) in a study on teachers, schools and academic achievement using test scores of 3rd, 4th, 5th, and 6th graders from over 3000 schools in Texas in the United States identified that teachers are a major determining factor of students’ achievement but did not describe teacher quality in terms of specific qualification as indicated by Darling-Hammond (2000) who equates teacher quality to specific qualifications.

The main essence of teacher institution is to prepare efficient quality teachers to enhance teaching and learning in schools but most teachers turn out feeling unprepared for the job ahead of them. They are either not prepared pedagogically or academically. The preparedness of a teacher may be a sign of how his training prepares him to meet the complex classroom challenges. In a survey conducted in 1988 by the National Center for Educational Statistics in the United States identified that most teachers were “moderately” or “somewhat” well prepared for classroom activities (National Center for Educational Statistics, 1998). The study concerned itself with how well prepared teachers felt for some compelling classroom demands. It failed to address the issue of how well prepared teachers felt in content area and professional knowledge which are very essential in teacher effectiveness and quality.

Ayers (1982) conducted a study on teacher preparation programs of Tennessee Technological University by observing teachers in the classroom to evaluate the efficacy of their pre-service teacher education program. The study identified that most of the
teachers indicated that based on their perceived needs their pre-service training did not prepared them adequately on how to handle school/community relations, exceptional children, handicapped, reading, and mathematics.

Another study by Wilson, Floden, and Ferrini-Mundy (2000) on teacher preparation research buttresses the point that pre-service teacher preparation is inadequate. This meta-analysis study sought to find out among other things what research says on subject matter and pedagogical preparation of prospective teachers. The review of the research showed that prospective teacher preparation in subject matter is inadequate for teaching towards high standard subject matter. The reviews identified that the prospective teachers have mastered basic skills but lack deeper conceptual understanding. It was also found that mathematics teachers who are fully certified have their students scoring higher mathematics standardized tests than their counterparts who are not certified. They also identified that those secondary school teachers who have no pedagogical preparation have limited ability in engaging their students in the subject matter. The tone of the review tries to equate teacher certification to teacher effectiveness which is not always the case in my opinion. Teacher education and certification are not related to teacher effectiveness as reported by the US Secretary of Education in his Annual Report on Teacher Quality (Darling-Hammond & Young, 2002). Though there has been some evidence to support that teacher certification is related to teacher effectiveness it is not always the case. In addition, it is somewhat misleading to think that once learners have high scores in a subject it means their teacher is effective. There are other factors that affect students’ performance besides test scores.
Inadequate pre-service teacher preparation in subject matter and pedagogy is not predominantly a United State of America problem. It is a world-wide concern. Lefoka and Sebatane (2002) in a study on initial primary teacher education in Lesotho identified that most newly qualified (trained) teachers have problems managing classrooms, difficulty dealing with individual needs, problem introducing lessons, problem managing time, problem using methods learned while in training, problem planning, scheming, and keeping records of work done while others have problems working with the curricula in all subjects. These are signs that they were not adequately prepared for the job ahead.

The scenario above is not different from teacher preparation in a developing country like Ghana. A report by the national Commission on Teacher Education set up by the Ministry of Education in 1993 indicated that teacher training institutions are producing ineffective teachers. The report state that

[Initial teacher institutions] are inefficient in producing effective teachers since the trainees and the tutors have so little exposure to actual schools and classrooms, and academic content is taught and tested above practical teaching methodology. [The] college curriculum does not differentiate sufficiently between primary and junior secondary methodology. (Ministry of Education, 1993, p. 23)

The implication of this is that teacher education fails to prepare its products by relating teacher preparation to real classroom situation. There is disconnect between theory and practice in their preparation. Acheampong and Furlong (2000) have identified the following as the causes of poor performance of trained teachers: academic content is emphasized more than practical teaching, lack of exposure to real school and classroom situations, inadequate training in classroom methodology, and lack of creative training for handling new directions in teaching.
Acheampong (2001) in looking at teacher preparation in Ghana identified that college teachers used lecture methods in content delivery without involving their students actively in the lesson. He also found out that teaching pedagogical knowledge was done mostly by lecture with occasional demonstrations with interjection of questions which does not encourage reflective thinking. Acheampong’s observation of classroom practices in three colleges revealed that students’ professional learning concentrated mostly on pedagogical content knowledge with little or no discussions on contextual application of teaching strategies. In concluding, Acheampong stated that “What is missing in our classroom observations was the importance of effective qualities, attitudes and dispositions towards effective teaching.” (p. 54). This is a pointer to the fact that teachers in Ghana like their counterparts elsewhere are in adequately prepared.

There is a debate as to where teacher education should lay emphasis to ensure the production of quality teachers. There is disagreement on whether emphasis should be on content or pedagogy. For example, The National Commission on Excellence in Education (1983; p. 5) in its report on A Nation at Risk included in its findings that “The teacher preparation curriculum is weighted heavily with courses in educational methods at the expense of courses in subjects to be taught.” The report added that 41% of 1,350 teacher training institutions surveyed indicated that more time is spent on educational courses which reduce the amount of time spent on subject matter courses. Public Agenda (2000) in a survey to find out whether teachers are well prepared and whether they need more background in content areas they teach found that teachers perceived pedagogic knowledge as important as subject knowledge. The teachers identified that their training
lacks class management and making class lively to make students learn. The survey also identified that most beginning teachers indicated that they were sometimes at a loss when they tried helping children with problems. The survey did not have a particular level of teachers in mind. It was generic.

For effective preparation of teachers there should be proper integration of content and pedagogy. Schulman (1987) argued that teacher educators can not produce effective teachers without incorporating the basic pedagogical understanding of subject matter content. This means that in teaching prospective teachers the content of a subject matter teachers need to use the appropriate methods of delivery so that prospective teachers can learn from them. Ball (2000) thinks fragmenting subject matter and pedagogy will leave the prospective teacher in a state of confusion as to how to integrate the two in the context of their work in the classroom. Bell posits three problems that are likely to occur when there is fragmentation. These are how to identify the content knowledge essential to be taught, how such knowledge should be taught, and how to create avenues for learning the subject matter and using them in varied contexts practice.

The relationship between theory and practice and how they might be practicalized in the training of teachers is at the core of the debate on preparing effective teachers. Dewey (1964) holds the view that pedagogy is tied to subject matter and that effective teachers are those who use this approach to create “genuine intellectual activity” to enhance the thinking skills of their learners. The implication of this is that teaching a subject matter without the appropriate method may not encourage intellectual development in learners.
2.19 Teacher education and intellectual development of Pre-service Teachers

Any useful educational system seeks to enhance the thinking skills of students. Dewey (1966) says that all that the school (education) can or need do for pupils, so far as their minds are concerned is to develop their ability to think. Enhancing the thinking skills of learners is very essential in making them self-sustaining in an ever changing world. Swartz and Parks (1994) think that in this age of technological challenges and multicultural world, good thinking is the key to success. They further reiterate that for our learners to achieve personal advancement, the school must prepare them to “exercise critical judgment and creative thinking to gather, evaluate, and use information for effective problem solving and decision making in their jobs, in their professions, and in their lives” (p.1). This puts a lot of burden on the classroom teacher and ultimately on teacher preparation institutions. The question is, have pre-service teacher institutions prepared the prospective teacher adequately enough for this daunting task.

Pre-service teacher institutions should prepare prospective teachers to be agents of change by emphasizing on thinking skills in their training so that the prospective teachers can in turn transfer such skills to the children they teach. Darling-Hammond (2000) has noted that teachers who have greater knowledge about teaching and learning are more effective with students when it comes to requiring higher-order thinking and problem-solving. (Chiasson (2005) in using Peirce’s Design for Thinking as a framework for developing thinking in schools says that “once teachers develop their own intellectual potential by expanding [their thinking] capabilities with themselves, they will be able to begin to think about development of these capabilities in their students” (p. 207)
According to Chiasson, educators should be required to learn and demonstrate mastery in the fundamental skills in reasoning and learn the pedagogical skills involved in helping students to develop such skills. In Chiasson’s opinion, to improve education, we need to first improve the minds of educators (teachers). This implies that teacher education institutions must train their prospective teachers to develop intellectually to enable them practice such skills in the classroom.

A critical review of ninety-three empirical studies on learning to teach by Wideen, Mayer-Smith, and Moon (1998) revealed that traditional teacher education programs do not engage their pre-service teachers to do reflective thinking of what is being taught. As Hill (2000) puts it “Many teacher education programs barely scratch the surface of pre-service teachers’ entrenched believes.” (p. 51).

Teacher education institutions need to make conscious efforts in developing the intellectual development of prospective teachers. An experimental study by Hill (2000) involving 119 undergraduates and post graduates students educational psychology students in Australia revealed that when teacher education programs embark on effect training programs they will develop the intellectual growth of prospective teachers in the form of increase awareness, understanding, and ability to deal with complexity, uncertainty, and ambiguity if they occur. Though the study did not indicate how the students were sampled for the experimental and control groups it gives teachers trainers a unique opportunity that when efforts are made the intellectual development of prospective teachers can be improved.
Certain factors might have limited the inculcating of thinking skills in prospective teachers in their training process. One of such factors is the increase prevalence of standards, high-stakes testing, and outcome assessment (Ward, & McCotter, 2004). Acheampong (2001) in looking at teacher training in Ghana in relation to curriculum delivery found that external examinations have influenced college teachers’ instructional practices and willingness to engage learners in activities that will enrich teaching and learning. Most teachers insist on students conforming to certain methods of solving problems so that they can answer accurately questions asked in examinations. Teachers are under pressure from students to teach in ways that will maximize their scores in external examinations. Insistence on standards and performances in teacher institutions has shifted the attention from output to input model of assessing the training of effective teachers (Cochran-Smith, 2000). Undoubtedly, such a phenomenon will not produce teachers who are intellectually developed to challenge their students in the learning process in the elementary schools.

It is a fact that most teacher institutions are not training their prospective teachers in a way to enhance their thinking skill so that they can adequately challenge their students. Hill (2000) says “We do not educate our teachers to engage in with children intellectually” (p. 50). Stuart (1999) for instance, in a comparative analysis study of primary teacher education curriculum in Ghana, Lesotho, Malawi, South Africa, Trinidad and Tobago identified that tutors do not use appropriate methods that enhance thinking skills. She states “It is quite rare for tutors to get professional development designed to help them. Most stumble into and train in the way they were trained- sometimes using
their university notes of fifteen years ago.” (p. 24). If we want products from our schools to be able to face the challenges of the present information and technology age, we need to train teachers to accomplish such a mission. Developing intellectually does not come by itself. There must be an effort. Hill (2000) echoes that intellectual development is a journey requiring effort … Teachers must embark on that journey with reclaimed intrepidity and gusto if they are to meet their learners in genuine intellectual endeavor. If we want teachers to be educators, then we must educate them. We must provide them with opportunities, support, and challenge to become reflective, critical, and creative thinkers, to grow intellectually, to engage in a process of constant transformation (p. 50)

This quote indicates that pre-service teacher institutions like the one in existence in Ghana must make it as their focal point to develop the intellectual development of their learners.

2.20 Who becomes a teacher in Ghana?

Understanding who becomes a teacher is *sin quo non* to the type of preparation given to them. Wideen, Mayer-Smith, and Moon (1998) have noted that several studies indicate that the typical person who becomes a teacher in the United States and Canada is a lower or middle class female who has comes from a suburban or rural area and have not traveled beyond a-hundred mile radius from his home. Classroom practices of these people even when they have gone through the teacher preparation program are influenced by their socio-historical past, beliefs, and values. This is not different from the characteristics of teacher candidates in Ghana. According to Acheampong and Stephens (2000; 2002), in a qualitative study to explore the backgrounds and shaping of beginning student teachers in Ghana noted that the past experiences of teachers shape their everyday
classroom practices. This according to Bullough, Knowles, and Crow (1997) implies that beginning teachers come to the teacher education program with a preexisting knowledge probably from their interaction with their teachers while in school or/and their own prior experience as pupil teachers (untrained teachers). This preexisting knowledge gives them an idea of what teaching is supposed to be. The idea of who typically becomes a teacher is discussed under general characteristics of student teachers, idea about teaching and teaching profession, and idea about purpose of teacher training.

According to Acheampong and Stephens (2002), a majority of student teacher enrolled in Teacher Training Colleges in Ghana have their ages ranging between 17 and 21. The have spent six years in primary school, three years in Junior Secondary School (JSS) and three years in the Senior Secondary School (SSS). The Ghanaian child usually starts primary education at the age of six. From the age range it means most of the student teachers spend between two and five years after graduating from the Senior Secondary School before enrolling as teacher trainees. This time is spent either bettering their SSS grade to qualify them into Teacher training college or a tertiary institution. The academic performance of these students are said not to be satisfactory. A majority of them possess the minimum requirement for entry into the teacher training college which is “E” (the weakest pass) in at least six subjects (aggregate 24 or less) including core mathematics, core science, and core English in the Senior Secondary School Certificate Examination (SSCE). Acheampong and Stephens (2002), in a qualitative study to explore the background of beginning student teachers identified that about 62% of the students have “E” in English and 40% had “E” in mathematics. Considering that English and
mathematics are very essential in identifying a good candidate in the teacher training college, this is not good news. In terms of socio-economic background, Acheampong and Stephens note that majority of the students come from middle class homes. The study also found out that student-teachers have little or no teaching experience before enrolling as student-teachers and believe that the most important duty of a teacher is to teach pupils facts. They also hold the belief that the purpose of teacher education is to prepare teachers for professional practice, interpersonal relationship and general living. Knowing such characteristics of student-teachers in Ghana is essential in designing an effective teacher education program that will develop their intellectual potentials.

2.21 Problems of pre-service teacher education in Ghana

Teacher education, especially pre-service teacher education has not been effective in its delivery and production of competent teachers because of many problems confronting the institution. As Cochran-Smith (2004) identifies in an editorial, teacher education in the United States is saddled with three main problems. These are training problem, learning problem, and a policy problem. These are general problems to teacher education in most countries including Ghana. This will serve as a framework for discussing the problems of pre-service teacher education in Ghana.

Teacher education in Ghana is faced with problems related to training. Pre-service teacher education in Ghana is aimed at training teachers to ensure that they possess the behavior of “effective” teachers. Training is tailored towards the conformation of acceptable patterns. Teacher trainers therefore transmit procedures and techniques that are likely to produce such behaviors. What is an acceptable behavior in my view is
ambiguous and relative. Teacher training in Ghana is product-oriented as oppose to
process-oriented. The approach to pre-service teacher training in Ghana as Cochran-
Smith (2004) in identifying problems of teacher education in the United States puts it is
atheoretical and anti-intellectual. Prospective teachers are trained in empty techniques
rather than training them in knowledge and decision making. Teacher educators should
demonstrate strategies and techniques in their teaching and how they can be applied in a
classroom situation but this is absent. Acheampong and Stephens (2002) identified in a
study on training primary school teachers in Ghana that pre-service teacher training
institutions do not relate what they teach to the school context. He also noted that there is
no strong link between Teaching Practice Preparation (TPP), Teaching Practice (TP), and
the curriculum. This does not make prospective teachers competent to use what they have
been taught in their training when they assume full responsibility as teachers.

Another problem associated with pre-service teacher education in Ghana is in the
area of learning. Cochran-Smith (2004) indicates that teacher education is to build and
explore the professional knowledge base, codify what teachers should know about subject
matter and pedagogy, and the numerous conditions and contexts that shape their learning.
Teacher education should also pay attention to pupil’s learning. Unfortunately, pre-
service teacher education in Ghana focuses on knowledge, skills, and beliefs and pays
little attention to pupils’ learning. Teacher practitioners and researchers hardly pay
attention to linking what pre-service teachers know and believe and how to develop
professional practices in the context of different schools and classrooms. Acheampong
(2001) attributes this to limited time and heavy workload. In addition, most teacher
trainers are out of touch in modern trends in teaching and what is actually happening in the elementary classroom. Prospective teachers need current experiences that deepen and broaden their understanding to learn about the social problems that impact on the classroom. Learning in pre-service teacher education has become examination centered. This is due to the numerous assignments and examinations. This leaves the learning and acquisitions of skills and attitudes essential in teaching neglected. A teacher needs to pass three external examinations plus numerous internal ones before passing out as a professional teacher. This makes the teaching and learning process geared towards examinations. Teachers are not taught to be agents of change; to challenge current arrangements of schools and critique teaching methods that are portrayed as good practices. The caliber of teachers recruited for pre-service training contributes to the learning problem. Prospective teachers recruited into initial teacher education come have relatively low academic achievements. In a study of 300 final year students to find out what kind of trained teachers emerge from the initial teacher training system in Ghana, Acheampong, Ampiah, Fletcher, Kutor, and Sokpe (2000) found out that 76% of the student teachers have weak Senior Secondary exit grades of D and E or 5 and 6 (O level students) in English and 56% in mathematics. Though the study has a small sample it findings is an indication that teacher trainees possess weak academic background to do any serious academic work. This problem was identified also by the report on A Nation at Risk (1983) in the United States. The report identified that too many teachers are drawn from the bottom quarter of graduating high school and college students. This does not give a good reputation of teachers in terms of academic proficiency.
Finally, policy formulation and implementation is a major problem of teacher education in Ghana. Policy formulation to reform teacher education should be based on sound empirical research (Cochran-Smith, 2004). Policy formulation for teacher education in Ghana is done with no consideration to empirical researches on aspect of teacher preparation which has positive effect on pupils’ learning, pupils’ social and emotional growth, teacher retention, and preparing democratic learners. Teachers are most often left out in policy decision affecting education in general and teacher education in particular. For example, in 1987 Ghana embarked on a major educational reform without paying much attention to teacher input and teacher education (Ministry of Education, 1994). Teacher education policies emphasize on training teachers to help pupils pass tests. Policy formulation for initial teacher education centers on training and testing to ensure that teachers have the basic subject matter knowledge and technical skills to bring pupils’ test scores up (Cochran-Smith, 2004). Though the curriculum documents make references to development processes of teaching and learning and enhancing pupils’ learning experiences, the curriculum is silent on the actual processes involved. Policies in teacher education should be directed towards preparing teachers to enhance democratic principles and values in teachers to be transferred into the elementary classroom so that the nation can maintain a healthy democratic system. Interestingly, teacher education policies have neglected this important aspect. Financial constraint has also played a major role in hindering effective policy formulation and implementation in teacher institutions. Inadequate human and material resources in teacher institutions are attributed to financial constraints. This has had immense negative impact on pre-service
teacher preparation. In conclusion, policies concerning teacher education in Ghana are characterized by a top-down approach which fails to address basic problems affecting the institution.

These three major problems are interrelated and each affects the other. For example, the policy to have three external examinations in initial teacher training affects teacher training and learning. Prospective teachers are trained in how to pass examination which affects the way they learn. They are not trained to be reflective thinkers to transfer this skill to their learners.

2.22 Conclusion of literature

Today’s globalization process impinges on every nation to provide excellent education to its citizens. A key to achieving this is through the education and reinforcing of global perspective for teachers at all levels of preparation and continuing professional development. Teacher institutions should train prospective teachers to be reflective, critical, and creative thinkers to reinforce these skills in their learners. The aim of education is to have love for learning among learners and make quality contributions to knowledge advancement in all spheres of life. This requires producing learners well grounded in higher-order thinking. Teachers will play a major role in this endeavor. Although the curriculum is changing to reflect thinking, the teacher through his day-to-day activities in the classroom must help learners to become better thinkers (Swartz and Parks 1994). The Ghanaian teacher therefore needs to be trained to take up the task and educated the elementary school child to cultivate higher-order thinking skills, which are essential in their personal survival and the development of the Ghanaian society. In this
endeavor, the teacher training institution has a focal role to play in educating prospective teachers
3.0 Introduction

The previous chapter looked at the literature review of the study. This chapter broadly describes the methodology and the research design used in the study. It deals with the research design (research problem, sample strategy, participant selection), the case for a single case study, the setting and research site, fieldwork strategies which include interviews, observation, and documents, and the self as a researcher. The data collection protocol, limitations of the study, and data presentation strategy will also be discussed in this chapter.

3.1 Qualitative methodology

As said in chapter one, the study employed qualitative single-case study approach. According to Denzin and Lincoln (1994; p. 107), qualitative research is

… multimethod in focus, involving an interpretive, naturalistic approach to its subject matter. This means qualitative researchers study things in their natural setting … [It] involves the studied use and collection of a variety of empirical materials- case study, personal experience, introspective, life story, interview, observational, historical, interactional, and visual texts- that describe routine and problematic moments and meaning in individuals’ lives.

This definition provides for multiple sources of information and the approaches of interpretation. Creswell (1998) also defines qualitative research as an inquiry process of understanding, based on a clear methodological process that uses a social or human problem by building on a complex, holistic picture, analyzes words, reports detailed views of informants, and conducted in the natural setting. One striking feature of this
definition is conducting the research in a natural setting as oppose to contrived setting. Strauss and Corbin (1990) also define the concept as a research where findings are reached through non-numerical/non statistical means and concern people’s lives, stories, behaviors, organizations, social movements, or interactional relationships. This definition provides the context under which qualitative study can be conducted. In my view, qualitative research is the use of interviews, documents, observations in a systematic and rigorous way to study an element in its natural setting to arrive at a meaningful conclusion through the interpretation of the data collected in a subjective manner. Qualitative research is subjective, holistic, and phenomenological. In addition, it is anti positivistic, descriptive, naturalistic, and inductive.

Qualitative methodology has some strengths as well as weaknesses. In the first place, studying a subject in the natural setting provides authentic information. Behavior is influenced by the setting in which it occurs. The contextual variables provide enough information to support the heard and the observed. Qualitative methodology helps the researcher explore the process and meanings of events. Babbie (2004) has noted that qualitative research gives an in-depth understanding of a situation. It provides the subtle nuances in attitudes and behavior. Besides, this methodology is very flexible as compared to quantitative research methodology. The design can be modified at any time depending on what is happening in terms of data collection.

Notwithstanding, qualitative research methodology has some weaknesses. Silverman (2000) for instance, has noted that some writers have criticized qualitative research methodology as being a minor methodology. There is also problem with
reliability (Silverman, 2000; Babbie, 2004) because different people will interpret the same thing differently. But this is a social reality which seems to go against this criticism. In addition, they note that there is the problem of anecdotalism in qualitative research methodology because there is no attempt to analyze less clear data. This is a problem of validity because the researcher sometimes does not deal with opposing cases. Babbie (2004) has also identified that qualitative methodology uses a small population. Despite, low sample size in qualitative research, it provides an insight to general behavior patterns.

3.1.1 Characteristics/nature of qualitative research

Qualitative research possesses certain features which makes it distinct. Bogdan and Biklen (1992), note that the natural setting is the data source and the researcher the key data-collection instrument. The researcher concerns himself/herself with process rather than outcome, and the concentration is on what things mean. In addition, the researcher first describes and secondarily analyzes, and data analysis is done in an inductive manner. Patton (2002) partitions the features of qualitative research into three main areas; design strategies, data-collection and field work strategies, and analysis strategies. The design strategies include naturalistic inquiry, emergent design flexibility, and purposeful sampling. The data-collection and fieldwork strategies are qualitative data, personal experience and engagement, empathic neutrality and mindfulness, and dynamic systems, while the analysis strategies include unique case orientation, inductive analysis and creative synthesis, holistic perspective, context sensitivity, and voice, perspective, and reflective.
There are five main types of qualitative research according to Patton (2002), which includes phenomenology, ethnography, case study, grounded theory, and historical research. The main data collection instruments include interviews, observation, and documents. Qualitative research gathers information which is varied, in-depth, and rich. In this research, the case-study approach of qualitative methodology will be employed.

3.1.2 Case study

There are different types of qualitative research paradigms. One such paradigm is case study. Case study is the systematic process of selecting information about a particular person, social setting, event, or group to understand how it operates or functions (Berg, 2001). Babbie (2004, p. 293) defines case study as “the in-depth examination of a single instance of some social phenomenon.” According to Berg, case study is a methodological approach which involves a number of data gathering techniques. However, Stake (1995) indicates that case study is not a methodological choice but a choice of what is to be studied. Most often the label “case study” is used because it draws attention to what specifically can be learned about a single case. It ranges from general field studies to the interview of single individual or group. In the view of Kemmis (1980), a case study is both a process of inquiry about the case and the product of that inquiry. Patton (2002) states that case study may either refer to the process of analysis or the product of analysis or both.

The data gathering techniques involved in case study research include life histories, documents, oral history, in-depth interviews, observation, diaries, and biographies. Case studies are used in areas like medicine, psychology, business, and law
while in education it includes the study of unique people and programs (Berg, 2001). In other words, “case study is the study of particularity and complexity of a simple case, coming to understand its activity with important circumstances” (Stake, 1995; p. xi). What needs to be understood is that case studies are not sampling research; we do not study a case primarily to understand other cases. Though the term qualitative and case study are used interchangeably, case study research can involve qualitative data only, quantitative data only or both (Yin, 1984). Stake (1995) indicates that we study a case when it is of special interest to us. Case study involves a holistic treatment of phenomenon, it is existential and contextual, it is noninterventional, and searches for patterns for circumstances. It is subjective and recognizes fault. Lastly, the case study is personalistic. Yin (1984) and Tellis (1997) have identified three types of case study which include exploratory, explanatory, and descriptive case studies. In this study, the descriptive case study is used. In this type of case study, the researcher presents a descriptive theory as the overall framework for the study research. It involves identification of a reliable theoretical framework before embarking on the research question. The researcher determines from the beginning what the unit or analysis will be before beginning the research.

3.1.3 Nature/characteristics of Case Study:

Case study has certain characteristics which make it unique from other qualitative approaches. According to Hitchcock and Hughes (1995), a case study is concerned with a rich and vivid description of events, provides a chronology of a narrative of events, combines a description of events with the analysis, and focuses on understanding the
perception of events from the point of view of individuals or group. It also highlights specific events which are relevant to the case. The researcher is involved in the case, and portrays the richness of the case. Hitchcock and Hughes also suggest that case study is set in temporal, geographical, organizational, institutional, and other context that ensures easy demarcation and can be defined by the role and function of participants. According to Cohen, Manion, and Morrison (2000), case studies can be used in making theoretical statements. In this way, they must be supported by evidence presented in the study. A case may be used to provide description of a phenomenon, test a theory, or generate a theory (Esienhardt, 2002). The focus of most case studies is to generate a theory. When the aim of a case study research is to generate a theory, in an ordered manner it begins with the definition of the research question, selection of cases, decision on data collection methods, entry to the field, analyzes of data, shaping of hypothesis, enfolding of literature, and reaching closure (Esienhardt, 2002).

The use of case study research has profound advantages. According to Adelman, Kemmis, and Jenkins (1980), case study is ‘strong in reality’, pays attention to subtlety and complexity of a case in its own right, and has truth embedded in it. It begins action and contributes to it, and is easily accessible to readers. From the viewpoint of Nisbet and Watt (1984), case studies speak for themselves, capture features which otherwise would have got lost in a large scale data, can be undertaken by a single researcher, and embraces unanticipated events and uncontrolled variable. Hodkinson and Hodkinson (2001) indicate that case study research shows the process involved in causal relationship and also facilitates explanation. Notwithstanding, case study research is plagued with
lack of generalizability, not easily open to cross-checking, and prone to observer bias. Hodkinson and Hodkinson (2001) add that case study is expensive to embark on when done on a large scale, and there is often too much data for easy analysis.

3.2 Research design

The qualitative research design used for this research is the case study. A case study is defined by Berg (2001) as a systematic way of collecting information about a particular person, social setting, or group to understand how it operates. It involves data collection techniques like the interview, observation, and documents. Case studies can be exploratory, explanatory, or descriptive. The type used in this study is descriptive. The purposeful sampling strategy was used; the qualitative data was gathered through field strategies like interviews, observation, and documents, while the inductive analysis strategy was used. The study involved investigating the factors that have militated against the enhancement of thinking skills of pre-service teachers and what can be done to improve the situation.

3.2.1 The research problem

In recent times, there has been agitation for a shift from the traditional system of “dishing” out information to learners in the classroom to promoting intellectual development. The aim of this shift is to develop thinking skills among learners. This movement can succeed to an appreciable level when teachers have been trained to be reflective thinkers so that they can transfer such skills to their learners. There have been recent moves in Ghana to reform teacher education and pre-service teacher training but not towards this direction. Teacher educational planners have given little attention to how
teacher training institutions should prepare pre-service teachers in enhancing the thinking skills of learners in the teaching learning process (Hill, 2000). There is the need to train pre-service teachers in the art of teaching to enhance thinking in schools but this has received little or no attention in most developing countries including Ghana. This study seeks to find out factors that have impeded the enhancement of thinking skills of pre-service teachers in their training and what can be done to enhance the thinking skills of pre-service teachers in their teacher preparation program.

3.2.2 Sampling strategy

The sampling strategy used in this study is purposeful sampling. The researcher used this strategy because he wanted to get an in-depth knowledge of the case using a small population. This approach is sometimes called purposive or judgment sampling (Patton, 2002). Patton indicates that purposeful sampling is used to select information-rich cases for study in depth; that is participants who possess rich information on the case. The purposeful sampling type that was used in this study is the maximum variation (heterogeneity) sampling (Patton, 2002). The problem with the maximum variation sampling is attaining heterogeneity when small sampling is involved. This problem was attended to by applying the following logic by Patton (2002): that is, I treated any common pattern that emerged from each variation as of particular interest and value in capturing the core experiences and central, shared aspects or impacts of a program. I also identified diverse characteristics for constructing the sample. I complemented the data collected from the small sample through interviews with data from observation and document analysis.
3.2.3 The case for the single case study

Yin (1984) indicates that case studies can be made up of either a single or multiple cases. Yin adds that within a single case study there can be multiple levels of analysis while Patton (2002) indicates that a single case study may possibly be made up of many smaller cases. A qualitative researcher who embarks on a research using a case study method is torn between using either a single case or a multiple case approach. In this study the researcher is using a single case approach. Many are of the opinions that a single case study makes the study incapable of providing generalization because it lacks a sufficient number of cases but according to Yin (1984), a single case is acceptable provided it meets the established criteria. Yin (1989a) criticizes the idea that a single case study is local by arguing that the methodological qualities of the case and the rigor with which it is constructed makes it acceptable for applicability. Yin is of the opinion that if the desired protocol is followed in the construction of a single case study, it ensures transformation from the local to the global. This becomes possible when the three conditions of qualitative method; describing, understanding, and explaining are satisfied (Yin, 1989a). The use of a single case study is appropriate when there is no case available for replication as it is in the case of this study, the researcher is limited to the use of a single case study (Tellis, 1997). A single case study can also be used when the researcher wants to confirm or challenge a theory or to represent a unique or extreme case (Yin, 1984). According to Tellis (1997), it is essential and ideal to use a single case study in a phenomenon which was previously not accessible to researchers but now accessible. In Tellis’ opinion, single case study allows for careful investigation to avoid
misrepresentation. In a single case study, the researcher has adequate control over the situation. The researcher in this instance has opted to use a single case study for this qualitative study because there has not been a study on this topic in Ghanaian teacher institution for replication. Also the researcher wants to carefully investigate the problem and present a unique case.

3.2.4 The setting: The teacher training college

Ghana has two systems of preservice teacher preparation. The first applies to those who enter the university (University of Cape Coast University or University of Education, Winneba) and graduate with a Bachelor in Education (B.Ed). The second applies to those who enter the three-year teacher training colleges and graduate as three year post-secondary certificate teachers (Three-yr. Postsec.), currently as Diploma in Basic Education. The products of the former mostly teach in the senior secondary schools or teacher training colleges with a few of them teaching at the junior secondary schools, while the products of the latter teach at the primary and junior secondary levels. In this study, attention is on the latter, which is usually referred to as teacher training college. There are 38 government owned teacher training colleges in Ghana and recently three privately owned ones. The study concerns itself with the government owned teacher training colleges. The students of the teacher training colleges are products of the Senior Secondary School (High School) and have an average age of between 18 and 21.

The teacher training colleges have a national curriculum which is common to all. They are either science bias, liberal arts bias or both. In addition, a college can pursue a Program “A”, Program “B” or both. Program “A” teacher training colleges specialize in
training teachers to function at the primary level (Primary 1-6) while Program “B”
institutions train teachers for the upper primary (Primary 4-6) and the Junior Secondary
School (JSS 1-3). The training consists of content and pedagogy. Currently, the three year
teacher training program is captioned *In-In-Out* which means students spend two years in
college and spend the final year in the field doing practical teaching after which students
come back to college and write their final certificate examination and present their
research project. To support students financially, the government pays students a monthly
allowance. The site selected for the study is both science and liberal arts and train
teachers in both Programs A and B. The school is ranked among the best four initial
teacher training institutions in the country by the Teacher Education Division of the
Ghana Education Service.

### 3.2.4.1 The research site

Komenda Teacher Training College is situated on a cliff along the coast of the
Gulf of Guinea of a semi-urban community called Komenda in the Central Region of
Ghana. The school’s motto is “Bepɔw so kuro hyerɛn” literally meaning “a town on a hill
shines”. Komenda is divided into two with a historical connotation. The part known as
Dutch Komenda traditionally called Kanka, was where the Dutch built their castle during
the Gold Coast era. British Komenda, referred to by the inhabitants as Akatakyi, which
literally means *brave men*, was where the British resided and built their fort for trading
purposes. The two Komendas are separated by a lagoon. Komenda Teacher Training
College is situated at Akatakyi (British Komenda) which has farming as its predominant
occupation though it a coastal town and has a population of about 5000. It has a rural
bank, a Senior Secondary Technical School, two public basic schools, and two private basic schools.

Where Komenda Teacher Training College is situated today was a British military camp for the training of British West African troops during the Second World War (WW II). After the war in 1945, the place was used as an asylum camp for the mentally handicapped. This gave the place the name *Asae Hills* (literally meaning “spoiled hills or hills for the insane”). In 1948, the Methodist Mission in Ghana acquired the buildings when it was abandoned and converted it into a Methodist teacher training center for its missionary expansion and the training of teachers for its schools. Later, the government of Ghana took over and converted it into Komenda Teacher Training College, which is now a public institution under the jurisdiction of the Teacher Education Department (TED) of the Ghana Education Service (GES). Though the institution is public and under government jurisdiction, the Methodist mission still plays a significant role in its administration and selection of principals to run it.

Though new structures have been built, it still has most of the old buildings housing its administration, the library, classrooms, and staff. It is situated on a cliff facing the Gulf of Guinea. Below the cliff on the north are the newly built three science classroom block, four dormitories (one for females and three for the male students), the dinning-assembly hall complex, a technical block (which is in ruins now), and some houses for staff accommodation. There is a road joining the two sites in addition to a 39 stair-case path which most students use. The school has an allocated land area of about one square miles but less than half of the allocated area has been developed. On the right
side (west) of the classrooms is the administrative block and the college’s practice primary school (Komenda College Practice School). Stretched along the cliff beyond the primary school are a number of staff accommodations, which are threatened by sea erosion. Between the new administrative block and the old one (abandoned due to erosion) are the school library and the home economics block which is now used as a classroom. The buildings on the cliff are very crowded. The classrooms form a quadrangle, which was a meeting place for the West African British troop stationed at the base during the Second World War. When one enters the school from the soccer field, one first sees the dormitories and then “scales” up the cliff to where the administration block and most classrooms are situated. With the exception of the third male dormitory, the new science block, and the dinning-assembly hall complex, all other buildings are in great need of renovation.

For the purpose of this research and to provide a context for the observations, I will concentrate on the description of the classrooms and other resources essential to students learning and thinking. There are 12 classrooms. With the exception of the newly built science block, which was built to normal classroom standard, all others are not. The new science block which has three rooms (two meant to be used as classrooms and one as a science lab—also used as a classroom because there are no equipment in it with the exception of 6 long tables and chairs) is down the cliff and shares boundary with the school soccer field. These rooms are spacious and well ventilated. They are used as second year classrooms. This block was built to replace the old dilapidated one, which was too small and also threatened by erosion. The old science block is now used as an art
classroom. The classrooms (2A, 2B, and IC) on the cliff used to be a dinning hall. It is interesting to know that all classrooms on the cliff were created by breaking walls and making adjustment to the old military buildings. This makes the classrooms very small in relation to the number of students (about 52) in each class. The average size of a classroom at Assai hills is about 560 sq. ft. (28ft by 20ft.). With the exception of a few classrooms, which have two doors located in front and at opposite sides all others have one door located either at the back or at the front side of the room. One cannot imagine how students will go out in case of an emergency. The roofing of the rooms is high at the apex but extended very low at the base to cover the corridors. This gives the rooms poor ventilation. The classrooms become very warm as early as 9 am in the hot tropical sun, which make the late morning and afternoon classes very uncomfortable. The absence of fans and air conditions coupled with lack of proper ventilation makes the situation worst during the dry season when the north-east trade winds are in full force. This research was conducted during this period. Another building of interest to this study is the old assembly hall which has been converted into a computer lab. There are about 15 old computers for the whole school. The computers are not connected to the internet and there is no professionally trained computer instructor. It is one of the physical education instructors who has taking up the task of training the students in the basic use of the computer.

As indicated earlier, the classrooms are small in relation to the number of students. None of the classrooms I visited has a single teaching aid displayed. The furniture (tables and chairs) used are the wooden dual desk type. It seats two people. The
chair is attached to the table. They are the same type used in the junior and senior secondary schools. The sizes of the students make getting in and out of the desk very difficult and make seating very uncomfortable. It makes rearranging the seat for any method of teaching (e.g. group work, discussion) beside the lecture method impractical if even there were enough space in the classrooms. Most classrooms the researcher visited had four by six desk arrangements with two or three desks out of order at the back. The spaces between rows are too small that if teachers want to get to a student at the back of the class, they walk sideways; virtually squeezing themselves through. As a result, teachers observed spent most of their teaching times in front of the class lecturing and writing or dictating notes. The space between the first set of desks and the chalkboard is very narrow so the teacher is virtually pushed under the chalkboard. There is no provision for the physically disabled student in this institution.

Another area worth talking about is the school library. The school library is among the first buildings put up in an effort to convert the military base into an educational institution. Built in 1948 to accommodate only a few students at the time, the library has not seen any renovation in terms of expansion. There is one librarian who mans it from 8 am to 5 pm daily and a student librarian who takes over during evening prep (evening individual studies). The library is closed on weekends when students are expected to have time and do research there. Students and tutors hardly patronize the library. When I asked students why they do not use the library, they indicated that the books in the library are very old and also there are few seats in the library to accommodate them. They also indicated that the only time they have to go to the library
is in the evening during prep time but they have to register with their class captains to show that they are actually in the library to avoid being punished for not attending prep. They see this process frustrating because they are sometimes punished even though they had registered with their class captains. To avoid this, most of them have decided not to go to the library. The few students I saw in the library during my stay either came there to write their assignments or read their notes. The library has four large tables with 12 chairs each. This means it can accommodate 48 students at a time. There are about five moderate size shelves with books. The few books in the library are old and have outlived their usefulness in terms of teacher training and academic work. The place is more of a museum than a library. There is not a single computer in the library. The library therefore, according to students does not play any significant role in their training.

The school has about five laborers who manually maintain the school compound. This leaves most of the compound maintenance in the hands of the students mostly the first years. As a students said in the interview, “If you are in the first year, you are a laborer to the school.” The students clean their own dormitories and its surroundings and clear the school fields when they are weedy. They clean the classrooms and the compounds every morning to make sure they are ready for classes. These services are extended to tutors of the school and it is official in the institution. On weekends when students are expected to get organized academically for the coming week is when they are engaged in manual work on the compound. There is no time left for students, especially first years to go to the library. This may explain why the library is closed during weekends. One perennial problem of the school is water supply. There is no
regular water supply to the school and the situation is worse during the dry season. Students have to get up by 5 am to draw water from the school well to the kitchen and tutors’ homes in addition to other chores and attend morning assembly before classes start at 8 am. Sometimes classes are cut short for students to draw water to the school kitchen for the cooking of their meals. This situation makes students already tired before they begin the day’s class. Sometimes, they are late to classes. The irony of this is that some tutors punish students for attending classes late and the cycle continues. This situation leaves students with limited time for their studies and research. They therefore rely on their tutors for information most of the time, which affects their ability to think for themselves.

From a humble beginning, the institution now has an average intake of about 250 students each year from the late 1990s and now has a total population of about 755 students. The institution is one of the two coed teacher institutions in the central region of Ghana which offers both science and liberal arts courses. It prepares three-year postsecondary certificate “A” (now Diploma in Basic Education) teachers for both the primary level and the Junior Secondary School, which means it offers both programs A and B in teacher training. The present students recruited for training possess a Senior Secondary School Certificate (High School Diploma). They have had 9 years basic education and 3 years Senior Secondary education. The institution occupies a unique position among the 38 teacher training colleges in Ghana because it offers all the programs individual teacher training institutions offer and admits students from all over the country. Any observer looking at the institution sees a representative example of
initial teacher education in Ghana. In addition, the researcher is a product of the institution and is aware of the fact that his training was not rooted in developing his thinking skills to be a reflective teacher to engage his pupils after training to think for themselves. This will help the researcher to see whether things have changed in terms of teaching to enhance the thinking skills of preservice teachers over the years. Knowing the terrain will help the researcher get the information he needs though there might be some challenges. This makes the institution a good choice for study to understand some characteristics of Teacher Training College education in Ghana.

3.3 Data-collection and fieldwork strategies

The researcher employed the qualitative data collection approach (Patton, 2002). The use of qualitative data yields detailed and thick description in the case of observation and captures direct quotations in the case of interviews. The data-collection strategies used included observation, interviews, and documents. The researcher triangulated these three data-collection sources. Patton (2002) has noted that triangulation strengthens a study. The use of triangulation portrays a truer portrait of the case to be studied. I used this approach because it revealed issues that could not be raised in a single data collection strategy. Studies that use only one data collection procedure may suffer from errors linked to the particular method used. The use of triangulation in data collection enhances credibility.

3.3.1 Initial Institutional contact

At the later part of 2005, precisely 20th of December, 2005 I had a discussion on the phone with the vice-principal of academic affairs of Komenda teacher training college.
on the possibility of conducting a research on the topic *Enhancing the thinking skills of preservice teachers: A case study of Komenda training college* at the school. He expressed interest and assured me that he will contact the principal, the staff, and the students of the institution for their approval and interest to participate in the study. In about two weeks he contacted me on the phone and indicated that the various groups have expressed interest in the project. I followed this up with an official letter on the 20th of January, 2006 requesting permission to use the institution for the study. On May 6th, 2006 I had a response indicating that the institution has accepted my request. The purpose of the institutional contact was to establish initial relationship with the institution and to gain access to the school.

3.3.2 Participant selection

The participants for the study were teachers and students selected from mathematics, science, and social studies at Komenda teacher training college. One teacher from each of the three subject areas was selected for the study. The researcher relied on subjects’ interest to participate in the study. The first teacher who volunteered from each subject area was selected. Though the researcher relied on interest he still made sure that the selected tutors had taught for at least three years. These teachers were used for both the interview and the observation. They also had their documents analyzed to see how they reflect the two main thinking skills; lower and higher level thinking.

In addition, 30 students, ten from each of the three year group, were selected for the three focus group interviews. Each focus group represented a year group and was comprised of ten students from the three subject areas. So I had a first year focus group of
ten students from mathematics, science, and social studies. The study intended to give a fair representation to gender. In each year group, the gender with more students was supposed to have more students selected, while that with less number will have fewer students represented. The study intended to work the proportion of girls and boys in each class to be used and to rely on students’ interest to participate in the study and later hand pick where necessary to form the focus group but this changed when each class agreed to send their class captain and assistant (male and female) to represent the group. This was an easy way of getting the students because each year group has five classes and all students were doing the three subjects. This gave each focus group five male and five female students. This strategy was used for the first and second year students since the third year students were out on teaching practice (practical teaching). With the help of the senior house master of Komenda College, I got ten third year students doing their practical teaching at the nearby primary and junior secondary school for the third year focus group. This was made up of six and four males and females respectively.

3.3.3 Gaining Entrée

While in the school, I first met the staff of the institution in the staff common room and had a talk with them about my study and sought their assistance and cooperation. After this meeting, I met the teachers of science, mathematics, and social studies who will be involved in the study. After I selected my participants, I had another meeting with the selected teachers and had a brief discussion with them about what we will be doing for the study. The next day, I provided them with the consent form and went through it with them. I gave each participant a day to return the forms to a
designated box in the staff common room for pick up. This initial meeting was to establish personal contact and a relationship with the teachers. This was also to show respect for the members of the institution. This gave me an idea of how to design the consent letters for the interview and the observation.

After I met with the teachers, I met the students and explained to them the purpose of the study and how they would be involved. At this meeting, I gave each student a consent form to sign indicating their willingness to participate in the study. They were given a day to make such decision and return the form to the school library. I then selected participants who would be involved in the interview and whose documents would be used for the study. After the selection was done, I met the selected students and explained a bit in detail to them about their role in the study. This consent form pertains to willingness to participate in the interview and also allows for the use of their documents. I then presented them with another consent form and went through it with them. I asked the students to return the consent form to a designated box in the school library after a day where I picked them up. The day’s interval gave the selected students time to ponder over what they were about to do and make a meaningful decision. I asked the students to do independent decision making. When this was done, the study then began.

3.3.4 Self-as-Researcher

The main investigator of this research project is the researcher himself and therefore takes responsibility for any shortcoming associated with the study. The researcher assumes the responsibility as sole investigator because he knows the focus of
the study and is aware that being at the site, interacting with participants, and taking a
critical look at documents is essential in making informed decisions on the study. Also,
the researcher’s familiarity with the site and the participants will help him get the
necessary information for successful completion of the study.

The motivation to embark on this research is rooted in my genuine interest to
contribute to the enhancement of thinking skills in preservice teacher institutions. This
stems from my experience as a teacher, my own experience as a preservice teacher, my
experience as a teacher trainer, and my perception of what effective and quality teacher
training should be. According to Clandinin and Connelly (2000), a person’s research
interest is shaped by his/her own experiences. It is essentially autobiographical. Given
this background, my goal as a researcher is to add to knowledge and not to pass judgment
(Bogdan & Biklen, 1998). This study admittedly will be impacted by the researcher’s
experience as a teacher but efforts will be made to avoid being blinded by such
experience. Schuck (1996) indicates that our interpretation of a phenomenon under
examination will be barren and incomplete if it is not done from the perspectives of the
beliefs and experiences of the researcher.

I am aware that my role as a researcher is very vital to the success of this project.
As Delamont (1992) puts it, the researcher is his best data collection instrument. This has
implications to me in terms of subjectivity, emotional dynamics, making judgments, and
personal values. As the researcher, I will use the data collection strategies described in
this chapter to make meaning for readers. To use these data collection strategies
effectively, I need to establish and maintain rapport with the participants. This rapport
will be established through making the purpose of the study known to participants at the initial stages and during the interviewing process, giving them consent letters to indicate their willingness to participate in the study, using language which participants will understand, and asking for clarifications about the language they use.

3.3.5 Data-collection strategies

The data collection strategies used in the study included interviews, observations, and review of documents. The researcher triangulated these three sources of data collection.

3.3.5.1 Interviews

Interviews are integral to qualitative research, especially in case studies. They help the researcher capture direct quotations about people’s perspectives and experiences. There are three forms of interviews namely, structured, semi-structured, and unstructured (Fontana & Frey, 2005). Interviews are purposeful conversations with subjects to obtain information to answer a research question. With a structured interview there are prepared questions and all interviewees are asked the same questions in the same sequence, while a semi-structured interview is a situation where the researcher specifies issues and topics to be covered in an outline form and the interviewer decides the sequence and wording in the course of the interview (Patton, 2002). The unstructured interview format has no predetermined questions before the interview but questions emerge from the immediate context and are asked in the natural course of things (Patton, 2002).

In this study, the researcher mainly used semi-structured interviews for both the tutors and the student-teachers but initially used the structured interview to get
demographic information from the participant. The semi-structured format was used because it helped the researcher get in-depth information from the participants and get direct quotes to represent the voices of the participants while staying on course. This gave richness to the whole study. The use of interviews helped me understand the world from the subjects’ point of view. Notwithstanding, interviews are more intrusive, and expensive and time consuming when it comes to analysis and interpretation.

The structured interview consisted mainly of closed ended questions used to obtain demographic information from the participants. The questions in this case were mostly closed type. The closed questions enabled me to develop some open ended questions for the semi-structured interview. There were two separate sets of interview guides for the two sets of participants; the tutors and the student-teachers. I used the semi-structured form of interview because it enabled me to get the information I want and at the same time gave the interviewees some flexibility to go outside the box and express their opinions. It also ensured comprehensiveness, “systematicness.” and effective use of time. The use of this type of interview gave me the freedom to digress and probe further for clarifications while still staying on course. Using the semi-structured form of interview ensured effective maximization of time in the case of the focus group. The interview bordered on issues like teaching methods and strategies, teaching learning materials, students’ engagement, classroom environment, staff development, governmental and administrative policies, the educational system of the country, the culture of the society, the caliber of students recruited, the implications of these factors on student-teacher preparation, and how the problem can be fixed. In keeping with the
flexible nature of qualitative research designs, the interview guides were modified over
time to focus attention on areas of particular importance, or to exclude questions the
researcher found to be unproductive for the goals of the research (Lofland & Lofland,
1995). The interviews were conducted solely by the researcher. The interview schedules
were tried out on students and tutors at Fosu Teacher Training College, Fosu in the
Central Region of Ghana before being used. The essence of the pilot was to make sure
the questions were reliable and were capable of helping the researcher get the information
he needs.

The approach for conducting the interviews differed. The tutors of the institution
were interviewed individually, while the focus group approach was used for the student-
teachers. The individual approach was used to see how the tutors responded to the
interview in their own way drawing on their experiences as teacher training college
teachers. The focus group approach of interviewing is appropriate at the early stages of
the research because it is used as problem-reduction (filter) when the questions and issues
are so numerous. The focus group tactic was employed because it is an ideal exploratory
technique which ensures freedom, stimulation, and spontaneity inherent in such
interactions. This approach will let the students spark off one another (Rubin & Rubin,
1995). The personal interactions in this form of interviewing bring out issues which the
researcher has not thought of but are very vital to the research. The interviews were
conducted after participants were observed in a lesson in the case of both student-teachers
and tutors. This gave them the opportunity to explain certain actions and decisions they
took in their teaching-learning process. If the interviews had been conducted before the
observation, the participants would be aware of the issue at stake which would likely affect their classroom practices.

3.3.5.2 Observation

Observation in qualitative research can be participant observation and also complete participant (Gall, Borg & Gall, 1996) where the researcher is fully engaged in the process (participation) while at the same time observing and talking with other participants about what is happening. At other times, the researcher has little or no interaction with those being observed (Patton, 2002) also referred to as complete-observer (Gall, Borg & Gall, 1996). The type I used in this research is the complete-observer technique. This type of observation was used for tutors of the institution to see how they teach to enhance the thinking skills of learners. The use of observation helps the researcher get information about things that people are not willing to talk about, and makes the researcher understand the context within which people interact (Patton, 2002). Observation helps the researcher get firsthand information about the setting and the people and gives the researcher the chance to capture things which otherwise might have eluded him in the setting and then moves beyond the selective perceptions of others. Gall, Borg and Gall (1996) say observational methods avoid the inaccuracy and bias of some self-data.

With permission from the tutors and student-teachers, most of the lessons were audio-taped to capture important phrases or statements which would have eluded the researcher during the observation process. The problem with audio-taping is that it distracts attention and causes uneasiness in the classroom but using it for the trial
observation made both learners and teachers familiar with the situation when the actual observation started. Each selected teacher was observed for at least six times or more. Lessons were described as observed.

3.3.5.3 Documents

In addition to interviews and observation, the researcher used documents as a source of data. Documents are information about an event or phenomenon which observers or participants have prepared (Tuckman, 1999). They are written accounts to describe and occasionally to explain events or phenomena that have taken place. Patton (2002) says that ethically, we need to respect the confidentiality of the document we use for research. Documents are valuable because researchers learn directly from them. Additionally, they provide both historical and contextual dimension to observation and interviews (Patton, 2002). Documents sometimes hold the key to unlocking some hidden information which interview and observation could not reveal. The documents in the institution that were used for the research included the college curriculum, textbooks, handouts, and test items (external) in the three subject areas under study. The various documents were analyzed using the concept of lower level thinking (knowledge, comprehension) and higher level thinking (application, analysis, synthesis, and evaluation) of learning outcomes as the framework. Broadly, I used the content analysis approach to take a critical look at the documents.

3.4 Data Collection Protocol

The research began with fulfillment of the Institutional Review Board (IRB) conditions at Ohio University, Athens. This was preceded by writing a letter to the
institution where the study would be conducted for permission to use the site. This is a requirement from Ohio University, Athens, before undertaking any research which involves human subjects to ensure that ethical procedures are followed. After approval has been given by the Institutional Review Board (IRB), while in Ghana, I wrote permission letters to the Ghana Education Service and Teacher Education Department to allow me conduct the research in Komenda Teacher Training College, Komenda. After their approval, I asked for a letter of introduction to enable me to conduct the research in an institution under their jurisdiction. Though I had the initial letter from the institution giving me access to use the institution for the study, I gave a consent letter to the authorities of Komenda Teacher Training College, Komenda to sign for approval to conduct the research in the institution and use its tutors, student-teachers, and documents like the curriculum, textbooks, and other related documents for the study.

After these, I wrote a letter to the mathematics, science, and social studies teachers of the institution asking them to give permission to participate in the study. I indicated that this was voluntary. After I got a list of those who were willing to participate in the study, I selected from them and gave them a consent letter to sign on agreement that they would participate in the interview, observation, and their documents could be used in the study. They were also given another consent letter about audio-taping of their observed lessons and interviews. In those letters, they were assured of the highest level of confidentiality and anonymity involved in the study. Participants were assured that their names will not be used and the information provided will be used only for this research. They were also assured that the information provided will only be
shared with the director of this project and always be under lock and key in the researcher’s office. To ensure that the researcher had the required number, he had backup or standby teachers ready to participate if there were a dropout at the initial stages of the study.

Lastly, student-teachers in science, mathematics, and social studies were given consent letters to sign as acceptance to participate in the research and the observation and their willingness for their observation to be audio-taped. After this, some students were selected for the interview and documents analysis. They were also given consent letters. These letters specified their involvement in the interview, and assignments/project work, and audio-taping of their interviews. The selection was voluntary. In all these letters, the selected participants were assured of the highest level of confidentiality and protection.

To ensure confidentiality in the review of the documents, names were removed and replace with numbers. This was the case of third year students whose lesson plans were used. No student was allowed to participate unless he/she had signed the consent form and returned it. The observation process preceded the interview. After the data collection process, I debriefed the participants and assured the institution that I will provide them with the result of the study after it has been completed. I also wrote appreciation letters to all those who contributed towards the successful collection of data for the study.

3.5 Data Analysis

Patton (2002) mentions different forms of data analysis which include unique case orientation, holistic perspectives, context sensitivity, and voice, perspectives, and reflexivity. Another data analysis strategy is inductive analysis and creative synthesis.
The analysis strategy used in the study for the data collected to make sense was the inductive analysis and creative synthesis. In inductive qualitative analysis the researcher groups responses based on his judgment that the responses are similar. The researcher then describes this similarity conceptually and creates domains into which responses can then be grouped as analysis continues. The researcher looks at the themes emerging from the data as he codes them and then puts them into conceptual categories in a way which describes what is happening. The researcher then re-examines the categories identified to see how they are linked. Lastly, the researcher translates the conceptual model into a story line that will be meaningful to readers. This is a bottom-up approach.

In this study, I began by looking for recurring regularities particularly in the interview and observation data, which represented a pattern and sorted out into categories bearing in mind internal homogeneity and external heterogeneity. I then worked back and forth between the data and the categories created to check on the meaningfulness and accuracy of the categories and placement of data in the categories. I grouped and analyzed the data and created a profile for the factors that have impeded the enhancement of the thinking skills of pre-service teachers and how it can be improved. In drawing conclusions, I matched the literature to the themes from the findings. The documents were analyzed using content analysis approach and guided by the concept of higher and lower level thinking as defined in this research. The documents were qualitatively described in relation to the type of thinking skill they reflect. Data analysis occurred simultaneously with data collection but became intense when the researcher returned from the research site.
3.5.1 Case study and inductive analysis and creative synthesis

According to Patton (2002) qualitative inquiry, of which case study is one type is geared towards exploration, discovery, and inductive logic. In inductive analysis, the researcher starts with specific observations and develops towards general patterns. The researcher comes to understand the patterns that exist in the setting as a result of the categories of analysis emerging from the field work. This is the objective of a case study which seeks to understand the phenomenon through the analysis of the data collected. The use of inductive analysis prevents the researcher from presupposing in advance what the important dimensions will be. Variables that are likely to impact the study are not decided in advance as in the case of deductive approach. The use of this approach in a case study allows the researcher to listen to the data and act accordingly. Patton (2002, p. 56) indicates “theories about what is happening in a setting are grounded in and emerge from direct field experience rather than being imposed a priori as is the case in formal hypothesis and theory testing:” The precise nature of inductive analysis to be employed in a study depends on the purpose of the analysis and the number and types of cases in the study (Patton, 2002). In a case study research which involves several cases, the researcher analyzes each case separately, which is then followed by cross-case analysis. In the case of a single case, the researcher constructs the case working through the single case by categorizing and then aggregating thematically. The emerging categories and discovered patterns are then put in a theoretical form. In an inductive and creative analysis, the researcher works his/her way from bottom up.
In this study, I first collected the data and worked my way upward. After collecting the data, I categorized and aggregated it thematically looking at the patterns emerging. Lastly, I put the patterns that emerged from the data into theoretical form to make sense and meaning to the reader. The data directed me on what to do.

3.6 Limitations of Study

This section deals with the methodological limitations of the study. It begins with the criteria for a good qualitative research, and how to judge the quality of a case study. It also looks at the question of reliability and validity in qualitative research and how it was employed in this study. Finally, the section takes a look at the various field strategies used, their strengths and weaknesses and how they were employed to ensure maximum output.

3.6.1 Criteria for good qualitative research

In the positivist era, qualitative research was judged using traditional quantitative criteria like internal validity, external validity, reliability, and objectivity (Devers, 1999). When qualitative research became an independent discipline it was judged using its own criteria. A good qualitative research is characterized by words like openness, trust, integrity, surprise, honesty, acceptance, tolerance, patience, subjectivity and many more. Hammersley (1992) indicates that good qualitative research should have the ability to generate substantive and formal theory, be empirically grounded and credible, be able to produce results that can be transferred, and be internally reflexive. Another criterion for judging qualitative research in the post-positivist era is that of Lincoln and Guba (1985). Lincoln and Guba indicate that a good qualitative study, in other to establish
trustworthiness, must be credible, transferable, dependable, and confirmable. These criteria are parallel to the criteria for assessing quantitative research which is internal and external validity, reliability, and objectivity.

Devers (1999) gives the criteria for assessing a qualitative research by looking at the various stages involved and what needs to be done appropriately to make the research acceptable to readers. Devers begins with the research question and indicates that the question should be clearly stated and of significance. Besides, the researcher’s perceptions and assumptions must be clearly stated. Second, the researcher needs to give a clear and apt description of the context, clear and detailed description of the researcher’s role in the context, and how the context will play a role in answering the research question. Third, the researcher must use the most appropriate research strategy for answering the research question. The researcher must give a detailed account of the purposive sampling strategy to be used and why, and a more detailed description of the data collection and analysis strategies to be used. Fourth, a qualitative study should provide detailed strategies and techniques for enhancing rigor. Fifth, a good qualitative study is clear, original and coherent, uncovers new perspectives, and points to future work. Sixth, theory is not explicitly stated. These criteria deal with the process and the product of a qualitative research.

Patton (2002), from the social construction and constructivist point of view gave the following set of criteria as a yardstick for judging qualitative inquiry. Patton suggests that qualitative research have subjectivity acknowledged, must be trustworthy, authentic,
reflexive, enhance and deepen understanding, contribute to dialogue, use triangulated
data sources, and do well to enhance the integrity of the case in question.

To sum it up, a good qualitative research begins with the researcher who has
informed conceptual frameworks but refuses to impose the frameworks on his/her
participants. The researcher gives enough opportunity for data to inform his/her
observations. A researcher who embarks on qualitative research maintains self-respect for
his own abilities and cultural values as research instrument. In qualitative research, there
is a contextual approach where the researcher allows the situation, the subjects, and his
own interactions to indicate the method of inquiry (Maiterud, 2001).

3.6.2 Judging the quality of a case study

To be able to undertake a good case study research and come out with a good
report, one needs to know the criteria for judging case study research. The judging of the
quality of a case study includes the process and the product of the research. The process
concerns the trustworthiness and authenticity of the study while product is about the
narrative presented (Lincoln & Guba, 1990). Most of the time researchers pay more
attention to the process rather than the product. It is assumed that once the process is
good there is the possibility that the product will be the same. Lincoln and Guba discuss
four criteria for judging the product of a case study. These include resonance, rhetoric,
empowerment, and applicability.

Resonance implies assessing the “degree of fit, overlap, or reinforcement between
the case study report as written and the basic belief system undergirding that alternative
paradigm which the inquirer has chosen to follow” (Lincoln & Guba, 1990, pp. 53-59). In
Lincoln and Guba’s opinion, there should be a portion of the methodology which gives room for reflexivity on the part of the researcher’s own personal experience of the fieldwork. The construction of the product of the case study is rooted in the philosophy of the researcher. The rhetoric criteria deal with the structure, form, and presentation. Zeller (1987) indicates that a case study report must ensure unity (well organized and advances central ideas) through narration, while Lincoln and Guba (1990) think unity encompasses coherence and collaboration. A case must also be simple or clear (Zeller, 1987) to fully engage readers’ interest and involvement and be rich with quotes from the human subjects (Stake, 1978). In addition, Zeller suggests that the rhetoric criterion should include effective organization, and craftsmanship. Lincoln and Guba (1990) add that a good case study should possess among others some of these characteristics: power and elegance, creativity, openness and problematic, display courage, and independence, display of writer’s emotional and intellectual commitment to craftsmanship. The empowering characteristic of a good case study is the capacity to induce and facilitate readers to take action on the problem been investigated. Finally, a case study should make readers able to apply the findings of the case study to their own context or situation. This is not generalizability but transferability. These criteria for judging a good case study report will be a guiding principle in writing this study.

In line with the above criteria indicated by Lincoln and Guba, Stake (1995) asks series of questions which serve as a checklist in assessing a case study research report. The questions border on easiness to read, fitness of sentences, availability of conceptual structure, and development of issues in a scholarly manner. Others are provision of
vicarious experiences, effective use of quotes, sufficient presentation of raw data, use of sufficient data sources, triangulation of sources, empathiness to all sides, and examination of personal intentions among others. This case study research therefore will be conducted and reported using the criteria expressed above as a guiding principle.

3.6.3 Question of reliability and validity

Validity and reliability are two factors which any qualitative researcher should strive to achieve in the course of designing a study, analyzing results and judging the results of the study (Patton, 2002). In qualitative research, the essential criteria for quality are credibility, conformability/consistency/dependability, and applicability or transferability (Lincoln & Guba, 1985). Lincoln and Guba (1985) use the term dependability to correspond to reliability. To ensure reliability in qualitative research trustworthiness is very crucial (Seale, 1999). Validity (quality, rigor, and trustworthiness) in qualitative research emanates from reliability. Validity can be internal or external. Internal validity in qualitative research is the extent to which the researcher is justified in studying and understanding a process while external validity is the phenomenon where a researcher generalizes from a set of research findings to other people, setting, and times (Johnson, 1997). Generalizability is not the major purpose of qualitative research rather transferability. Reliability and validity which has positivist connotation (quantitative orientation) is credibility and trustworthiness in qualitative research. Enhancing trustworthiness results in credibility and defensibility which leads to transferability.

The concepts of reliability and validity are perceived in different ways by authors. According to Lincoln and Guba (1985), qualitative validity and reliability is truth value,
applicability, consistency, and neutrality while Glaser and Strauss (1967) see the concepts as credibility, usefulness, and trustworthiness yet LeCompte and Goetz (1982) see the concepts as comparability and translatability. The strategies for achieving credibility and trustworthiness in qualitative research include prolonged interaction with participant in the real setting and triangulation of methods of data collection methods, multiple investigators, and multiple contexts (Patton, 2002). Other strategies include reflexivity, structural coherence, dense description, dependability and confirmability audit, and dense description of research methods (Krefting, 1991).

To ensure validity and reliability, I truthfully analyzed and interpreted the data and used real quotes from participants to support any assertion I made. I maintained neutrality by not taking sides and not making judgments. I presented the data from both sides in an objective manner. To ensure credibility and trustworthiness, I interacted with the participants and used multiple field strategies (interviews, observation, and documents. In addition, I used a presentation strategy; narrative logic, which made coherence and dense description of the phenomenon possible. I also described in detail the methods I used to collect the data

3.6.4 Advantages and limitations of data collection strategies

The data collection strategies used in the research; interviews, observation, and document have their strengths and weaknesses which are likely to affect the credibility or otherwise of the study. In this section the strength and limitations of these data collection strategies will be addressed. A triangulation of the three strategies is likely to atone for the weaknesses of each strategy.
3.6.4.1 Interviews

Interviews are very essential in qualitative studies, especially case studies. They have immense advantages. Bailey (1987) indicates that interviews ensure flexibility because the interviewer can probe for more specific answers and questions can be repeated for clarifications. They can also help the interviewer to use non-verbal behaviors to identify the credibility of the interviewee’s responses and allows the researcher control the environment to ensure privacy. In addition, the use of semi-structured interviews, for instance makes the interviewer control the questions to ensure that the respondents are not out of order. The spontaneity associated with interviews makes the participant more informative and less normative. Patton (2002) also indicates that interviews, especially semi-structured interviews increase the comprehensiveness of the data and ensures systematicness in data collection for each respondent. In this way “logical gaps can be anticipated and closed” (p. 349).

Despite these strengths, the use of interviews in qualitative research has some limitations. It is costly, time consuming, there is likelihood of interview bias, participants have no opportunity to consult records for accuracy, may cause inconveniencies to participants and there is less anonymity (Bailey, 1987). Patton (2002) adds that the use of interviews, especially semi-structured interviews may omit important and salient questions and also the wording may result in different responses thus reducing comparability of responses.

To overcome the limitations of the strategy, Patton (2002) suggests that the researcher asks neutral questions, use illustrative examples in questioning, provide
helpful contexts cues, and alert the interviewee to the question to be asked before asking it. Others include the provision of reinforcement and feedback, working with the interviewee to facilitate the desired response, and allowing the interviewee to have the final say. It is also essential to pay attention to non-verbal cues. Kvale (1996) indicates that there is the need to have shorter interview questions while our subjects provide longer answers, follow up and clarify meanings of relevant aspects of the interview, and do interpretation throughout the interview and verify interpretations. Most importantly, Kvale mentions that the researcher should make interviews “self-communicating,” and ensure that he gets a “spontaneous, rich, specific, and relevant answers from the interviewee” (p. 145).

3.6.4.2 Observation

Observation is very important in a qualitative study because it helps collect data on non-verbal behaviors. It is also essential when one wants to study in detail the behavior that occurs in a particular setting. Notwithstanding, its use in research has strengths and limitations. Patton (2002) lists the following as some of the strengths of observation: allows the researcher to understand and capture the setting, makes the researcher open and adopts a discovery oriented approach in the study, and allows the researcher the opportunity to see things likely to elude people in the setting. Patton adds that observation helps the researcher learn about things participants will not want to talk about, helps the researcher discover things which people have not paid attention to, and helps the researcher draw on personal knowledge during the interpretation stage of the analysis. Bailey (1987) also indicates that observation helps collect data on non-verbal
behaviors which are missing in the use of interviews and documents. On the other hand, the use of observation limits the control of the researcher on the natural environment, gaining entry to the setting is sometimes difficult, and there is lack of anonymity (Bailey, 1987). Gall, Borg and Gall (1996) identify that observation cannot be used in studying complex behavior patterns, the researcher is faced with the problem of the degree to which his/her presence changes the situation being observed, observers often change the situation being observed, and also it is a time consuming process. The process involves preparing for the observation will the interpretation and analysis of the data collected. In other to overcome the limitations of the use of observation, the researcher should bear in mind the purpose of the observation, guide against predetermined ideas, be prepared to learn from the site and the people, observe the situation, and describe it in a vivid manner and lastly, take notes of the participants.

3.6.4.3 Documents

Documents like any other qualitative research data collection strategy have some strengths and limitations. They are valuable because researchers learn directly from them. Additionally, they provide both historical and contextual dimension to observation and interviews (Patton, 2002). Documents sometimes hold the key to unlocking some hidden information which interview and observation could not reveal. Some limitations of using documents in research are that sometimes they are incomplete and inaccurate. Tuckman (1999, p. 411) says that “In no instance, can the researcher confidently assume that such an account accurately portrays events or conditions.” Bailey (1987) thinks sometimes certain documents are not available and where available it is difficult to get access to, and
limited to verbal behavior. To use documents effectively, Stake (1995) indicates that the use of documents demands attention and care. The researchers should be open for unexpected clues when dealing with documents. In addition, researchers must prepare in advance, have a system to keep things on track, and estimate the usefulness of potential documents in advance before spending time, energy, and money on it.

3.7 Data Presentation

Data presentation is essential in qualitative research. The manner in which data is presented helps readers to understand the research and make meaning out of it. Chenail (1995) recommends that in presenting qualitative data, the researcher should be open to readers about the method-creation process (Constas, 1992), the researcher should consider the data collected as the centerpiece of the research and should make all efforts to feature it prominently in the data presentation, and the researcher should do juxtaposing. Data excerpts should be juxtaposed with researcher’s talk about the data (descriptions, explanations, analysis, or commentaries). The researcher should triangulate data with the literature to validate what has been observed in the research.

In addition to the above, Chenail (1995) suggests that there are different channels a qualitative researcher can employ to arrange and present data. These include presenting data in a natural way, presenting data from the most simple to the most complex, and presenting data from first discovered to last discovered (chronological manner). Other presentation strategies include quantitative-informed presentation (data presentation using a quantitative or statistical studies approach), theory-guided presentation (data presentation done with a particular theory in mind), narrative-logic presentation, dramatic
presentation (data presentation done to save surprises and unforeseen discoveries for the last), from minor to major presentation, and presentation in no particular order (data presentation done with no pattern in mind). In this study, the researcher employed the narrative-logic approach. The researcher presented the data in a way which enabled him to transition from one exemplar to another just as narrators employ in storytelling.

3.8 Summary

The chapter has looked at the method employed for the study. It dealt with the research design which encompasses the design strategy, the data-collection and fieldwork strategy, and analysis strategy. This was followed by the population and sampling. The population includes teachers and teacher trainees at Komenda Teacher Training College in Komenda. The sampling strategy used was the purposive sampling that included maximum variation sampling. The chapter also dealt with the instruments used in collecting data which included observation, interview, and documents. The validity and reliability of qualitative research and the criteria for judging qualitative research were also discussed in this chapter. This section concluded with the data collection protocol, and how the collected data was analyzed and presented.
CHAPTER FOUR
DATA ANALYSIS AND INTERPRETATION

4.0 Introduction

The previous chapter dealt with the method employed in gathering information for the study. This chapter deals with the analysis and interpretation of the data collected from the interviews, observations, and documents analysis. Initial data analysis started during the data collection process. Analysis of documents and review of transcripts became intense with the completion of the data collection.

The data analysis in this chapter was organized around the two main research questions: what factors have affected the enhancement of the thinking skills of pre-service teachers in teacher education institutions (Teacher Training Colleges) in Ghana? and how can the thinking skills of pre-service teachers be improved? Documentation of the perception about teaching, teaching strategies/methods, classroom environment, government/administrative policies, staff development, students engagement, caliber of pre-service teacher recruited, culture of society and school, and documents used in pre-service teacher institutions provided the guideline for the organization of this chapter.

The research questions were addressed individually. First by looking at the factors that have negatively affected the enhancement of the thinking skills of pre-service teachers in teacher training institutions and secondly, how the thinking skills of pre-service teachers can be improved. This chapter begins with an overview of the student participants interviewed and the three teachers included in the study.
4.1 Study Participants

As indicated in chapter three, three teachers (one each from mathematics, science, and social studies) and 30 students (ten from each year group) were involved in the interviewing process. The three teachers were observed as they taught for a period of one month. Each teacher was observed for at least six times with each lesson between fifty minutes and two hours.

4.1.1 Teachers

For confidential reasons the teachers were given pseudonyms. They were Mr. Mensa, the science teacher, Mr. Boaten, the mathematics teacher, and Mr. Abedu, the social studies teacher. The education background and teaching experience are summarized in the table below:

*Principal Superintendent: A teaching rank in the Ghana Education Service*

Mr. Mensa:

Mr. Mensa is the head of the science department of Komenda Teacher Training college. He is an old student of the institution. He had his bachelor degree in science education from University of Education, Winneba. He teaches biology methodology and
content in all three classes. As head of the science department of the institution, he has represented the institution in many decision making processes concerning science curriculum development and staff development. His area of specialization is biology. He is currently a Principal Superintendent (P/S) Mensa is 46 years old with 21 years teaching experience of which ten are in the teacher training college. He is a science examination team leader for the Institute of Education, University of Cape Coast, Cape Coast, which is responsible for the examination of pre-service teacher institutions in Ghana. He was proud to indicate that he has been actively involved in science teacher training programs and running in-service training programs for teachers in the basic schools. This made Mr. Mensa a good candidate for the study. At the time of the research he has just returned from a staff development training program for science teachers concerning a sandwich program for untrained teachers. After the researcher has briefed the staff of the institution about his research, Mr. Mensa volunteered to represent the science department. He was observed seven times (four methodology classes and three content) in the classroom and interviewed on two occasions.

Mr. Boaten:

Mr. Boaten had his three-year post-secondary teacher training education from Komenda Teacher Training College to become a professional teacher and had his bachelor degree in Educational Foundation at University of Cape Coast, Cape Coast. Mathematics was his minor area of study during his bachelor degree education. At Komenda Training College, he teaches mathematics content and methodology with three other mathematics tutors. He has 12 years teaching experience of which the last three
years were in teacher training institution. Mr. Boaten is a Principal Superintendent in the Ghana Education Service. When the objectives of the study was made known to the staff at the first meeting with the researcher, the mathematics department nominated Mr. Boaten to represent them and he willingly accepted the offer. He volunteered to arrange for and set up the venue for the interviews which he did very well. His contribution enhanced the speedy completion of the data collection process. Mr. Boaten was observed six times (three methodology and three content teaching) in the classroom and was interviewed on two occasions.

Mr. Abedu

Mr. Abedu is a 36 year old social studies teacher with 12 years teaching experience. His teaching experience comprises of five years at the Junior Secondary School (JSS), four years at the Senior Secondary School (SSS), and three years in the teacher training college where he is currently teaching. He is a Principal Superintendent in the Ghana Education Service and the assistant head of the social studies department. Mr. Abedu had his initial teacher training from Komenda Training College and his bachelor degree from University of Education, Winneba. His area of specialization is in geography. At Komenda College, he teaches both methods and content. He was observed seven times (four in content area and three in methodology) and interviewed twice. Mr. Abedu volunteered to participate in the study. The students interviewed saw him as a hardworking, intelligent, and a strong disciplinarian. He is regarded as one of the best teachers on campus. He was interviewed twice. During the data collection process, Mr. Abedu assisted the researcher in securing some of the needed documents like
syllabi/curricula, textbooks and past test questions from teachers and the school authorities. He also helped in mobilizing the students for the interview. His contribution aided the speedy collection of the research data.

4.1.2 Students

As indicated earlier in chapter three, 30 students were interviewed for the study. They were made up of 17 males and 13 females. With the exception of the third year group which was pulled from a nearby primary and junior secondary school where they were doing their out program (practical teaching), the rest were the class captain and the class assistants who represented the various classes (Year 1&2 A, B,C,D,E). This was a general agreement made by the members of the two classes. Since all students were doing the three subjects which is the focus of this study, it was not a problem making such arrangement. These students are pursuing a three-year Diploma in Basic Education (DEB) and will teach at the basic education level (primary and junior secondary school) after their program completion.

The average age of the students interviewed is 23 years with the youngest being 20 and the oldest being 29. From the responses of the structured questionnaire, only eight of the participants had teaching experience prior to enrolling in the teacher training program. Their teaching experiences range from three months to two years. The students interviewed represent the various subject areas studied in the Senior Secondary School (SSS). Four majored in business, twelve in general arts, three in visual arts, and eleven in science. From the students’ responses, 17 will want to teach at the Junior Secondary School, eight at primary 4-5, and five at primary 1-3 after their program completion. The
report of the students indicated that only five (5) students opted to be teachers as their first priority while the rest did it as a last resort. They reported that they were forced by circumstances, mostly inability to qualify for the tertiary institution, to enroll as pre-service teachers. To them teaching will not be something they will do for life. Twenty out of the thirty students have stayed home for a year or two to improve their Senior Secondary School grades before enrolling as pre-service teachers.

4.2 Factors impeding the enhancement of thinking skills of pre-service teachers

Improving the thinking skills of learners does not come from the blue. Instructors will have to go extra mile to enhance the thinking skills of learners. It is a difficult task even in the hands of the experience teacher. Several factors, including the teacher, impact the enhancement of the thinking skills of students in the learning process. These include effective use of questions (Cotton, 2001), conducive classroom environment (Potts, 1994), use of effective teaching methods (Bayer, 1988), effective staff development (Beyer, 1988), educational policies (Hill, 2000; Ward & McCotter, 2004), and the culture of the school (Leat, 1999). These factors enshrined in the literature on thinking skills helped the researcher thematized and coded the factors that have affected the enhancement of thinking skills in pre-service teachers in Komenda Teacher training College, Ghana as he analyzed the data. This section answers the first research question.
Research Question 1: What factors have affected the enhancement of the thinking skills of pre-service teachers?

The enhancement of thinking skills in schools especially in pre-service teacher institutions has received little or no attention. Majority of teacher education programs pay little attention to the development of the thinking skills of the student-teachers they prepare (Acheampong, 2001; Hill, 2000). For most teachers the development of thinking skills has not been part of their education (Mangieri & Collins, 1992). This present state of affairs is due to certain factors which this research sought to find out. The analysis below is from the data collected through interviews, observations, and documents at Komenda teacher training college to answer the question. The analysis combined the interviews and observations while the documents were dealt with separately due to the numerical values involved.

4.2.1 Perception of teaching

Our perception of teaching influences the way we teach in the classroom. For example, if we perceive teaching as problem-solving, the structure of our course and strategies employed in delivery will be underpinned by problem-solving assumptions. As Villegas-Reimers and Reimers (2000) put it, the different ways in which societies, policy-makers and teacher educators think of teachers are factors that affect how teachers are prepared. In this research the researcher wanted to know the perception of teacher trainers and pre-service teachers of teaching. When asked why the students opted for teaching the majority of the respondents did not indicate a real love or genuineness for joining the
teaching profession. Circumstances might have driven them into it. Some of the responses are captured in the following statements:

- There was lack of funds to pursue university education.
- I did not qualify for university.
- I do not want to be a teacher but I have no option.
- Being a teacher is better than staying at home.
- There is more time to do other thing.
- There is demand for teachers in the country.
- It is a stepping stone to earn better job and because it’s a place for constant learning.

However, two responses from the students indicated intrinsic motivation to become a teacher. They indicated,

- I became a teacher because I wanted to become a teacher
- I decided to become a teacher because I love children.

The responses from the students indicate more altruistic motives for becoming a teacher than extrinsic or intrinsic ones. Motives as those described earlier need a stronger teacher education program to change for the better.

The researcher wanted to know what participants perceive teaching to be. The interviewees (both teachers and students) first perceived teaching as imparting of knowledge and later as guiding or helping students. When asked what teaching is, the students responded

- It is imparting knowledge to younger ones to become useful in life, it is helping people acquire knowledge, teaching is identifying people’s problems as far as
education is concerned and find[ing] solutions, and guiding someone to know what he does not know already.

The teachers also saw teaching as imparting knowledge. The social studies teacher indicated

*It is imparting knowledge, ideas, and skills to learners using suitable methods*

while the mathematics teacher added

*Teaching is guiding someone to know what he does not know already.*

The science teacher also saw teaching as imparting knowledge in a skillful manner. He said

*Teaching is the art of imparting knowledge but one need to be skillful.*

The teachers’ perception of teaching expressed above was evident in the observation process. Their teaching strategies were mostly the lecture method; passing on knowledge rather than engaging learners in the learning process. They either lacked the skill or suitable methods they talked about to impart the knowledge. This finding has earlier been documented by Acheampong (2001). He identified that training college teachers in Ghana use lecture methods in content and methodology delivery without involving their students actively in the lesson.

The perception of a good teacher influences how one teaches or will teach so the researcher asked “who is a good teacher?” The interviewees’ ideas of a good teacher were varied ranging from teaching to the understanding of learners to having love for learners. From the pre-service teachers’ viewpoint the idea of a good teacher borders on good teacher-pupil relationship, knowledge in content and methodology for effective
delivery of lessons, a good model in and outside the school, and dedication to work.

Some responses from the interview confirm this:

*A good teacher is a knowledgeable person who tries to impact knowledge to others who are illiterate and also having patience.*

...someone who involves the children in the learning activities in the learning process.

... one who is punctual and make sure that the work is done.

*A good teacher is one who knows how to deliver his information and knows how to interact with children and summarize everything he has taught in class.*

*A good teacher has positive impact on people’s lives in and outside the classroom*

*A good teacher teaches to the understanding of learners and has love for children...*

Responses like these call for a teacher education program that is capable of developing all these skills in teachers. The teachers’ perception about a good teacher is not far removed from that of the students. The following statements from teachers capture their perceptions of who a good teacher is:

*Good teachers are fair and firm, able to know what learning is and use meaningful activities to advance their aims, and have good interaction with students.*

...one who makes advance preparation towards teaching.

*A good teacher is one who knows his stuff and delivers it using appropriate methods.*

The responses from the teachers involve knowing the psychology of learning, use of meaningful learning activities, advance preparation, lesson delivery, teacher-learner relationship, and teacher qualities which are very essential in teaching, but unfortunately these responses were at variance with what the researcher observed in the classroom
during the teaching process. Teachers did not have good interaction with learners, had little patience, and did not use meaningful activities in the learning process. The responses like “… know what learning is and use meaningful activities to advance their aims…” show that teachers are concerned with what they want to achieve and not the needs of learners. The observations revealed lack of advance preparation towards lesson delivery. There were, for example, no use of teaching learning materials and effective use of questions which may indicate advance preparation on the part of teachers. This response from a student shows how teachers do not do advance preparation before coming to class

*Teachers are very lazy. Some of the materials are there but they do not want to use it; also they don’t prepare where the materials are not there...*

4.2.2 Teaching strategies/methods

To develop the thinking skills of learners, teachers should use appropriate instructional approaches. These include the use of probing questions, redirection and reinforcement, and use of higher order questions in the classroom (Cotton, 2001). Teachers need to use cognitive instruction approaches to teaching (Beamon, 1997). Some of these approaches include problem solving, questioning, inductive and deductive teaching, and scaffolding (Beyer, 1997). Teachers should employ learner centered strategies which provide learners with opportunities to think (Beyer, 1997). Strategies used in the teaching-learning process should be structured to engage students in knowledge-producing activities. What became evident in the interviews and observations was that teaching was giving information. The lecture method was predominantly used though occasionally the discussion, the demonstration, and role play methods are
employed. When asked what teaching strategy/strategies do your teachers use the students responded

_The lecture method is the main strategy used by teachers though a few go to the extent of using discussion method._

_Mostly, they use the lecture method because there are inadequate materials._

_Occasionally, they use the discussion, demonstration, and activity method but as I have said the lecture method is what they use most._

Sometimes teachers dictate notes to students as captured in the statement below

_Since at the beginning we had no idea about the subjects/topics, for the first two weeks they dictated notes to us but they allow us to do our own research for assignments._

When asked in the interview why teachers dictate notes to students instead of leading discussion in class and letting students writing their own notes, the science teacher said

_I don’t know whether it is in methodology or content but in whatever area I think there are no textbooks so the teacher researches and give the information to students._

In the observation, I found that if teachers do not dictate notes to learners they ask for it.

In a mathematics methodology lesson the teacher defined gender sensitivity and expected learners to write their own definition, but they asked the teacher to dictate it for them to write. An excerpt from the lesson below demonstrates this.

Student: Responses. Responses
Teacher: Yeah, being responsive to something we are relating it to gender. You have acknowledged that there is gender imbalance in class because whenever we come to class because of the nature of the mathematics we do being difficult you ask only boys questions to solve the problems and you have acknowledge that this is happening in the classroom so what you are going to do is to be responsive so that everybody in the class can participate. So you have acknowledged that there is gender imbalance so you are trying to solve the problem by putting in some measures for all to benefit. So the
acknowledgement that there is gender imbalance and there is the need to solve the problem is termed gender sensitivity.

Student: **Please sir, repeat for us to write**
Teacher: (Repeats) Being acknowledged that there is gender imbalance and making efforts at correcting it.

This phenomenon permeated through all lessons observed because it has been entrenched in the whole teaching process.

Besides textbooks as indicated in the statements above, what has driven teachers to using the lecture method very often is time and examinations. The teachers said they use the lecture method due to time constraints. The mathematics teacher indicated

*We use the lecture because of time constraints ... sometimes we have to lecture and give notes to help students.*

The science teacher indicated that he uses the lecture method especially in the first year classes because he thinks they have little knowledge in the subject areas so they need extra information to pass their examinations in time. He said

*... yes, I think I use the lecture method especially the first years. When they come in they have the basic knowledge and comparing the length of time for the 16 weeks for the final paper....*

The mathematics teacher said

*In mathematics, we have investigational skills where we pose problems to learners and come out with their views to solving it. It is an activity oriented method which increases the students’ ability to think and make learning practical.*

The social studies teacher also indicated

*In social studies we have learner centered... because learners are giving much time to express their views. We involve them in the learning...*

The mathematics and social studies teachers’ responses indicate that they have these approaches in teaching their subjects but their lesson observations revealed that they do
not apply them in the classroom. The lecture method is used for both content and methodology teaching. Most of them could be equated to sermons in the church room. The observations of the various lessons showed that averagely 90% of the talking that went on in the classroom was by teachers. Lessons were boring because learners were passive listeners. As a first year students put it:

*They lecture us; which sometimes makes the class boring ... and their approach to the students is bad so with the lecture method it is not good.*

This phenomenon became evident in the observation of lessons conducted in the afternoon. In most lessons almost half of the class was found dozing off midway in the lesson.

What makes the use of this method fall short of enhancing the thinking skills of learners is that teachers fail to utilize thought provoking questions and involve students while using it. In a one hour social studies lesson, the teacher asked 34 questions of which 21 were subject/topic related (all of which were lower level thinking - knowledge and comprehension questions). The unrelated questions were: *Are you confused? Are you with me? Are you listening? Do you follow? Anybody confused?* and many more.

Students lamented that the use of lecture method in teaching methodology makes it difficult for them to apply the methods in the classroom. A third year student on practical teaching said

*We learn theoretically the methods ... although we learn the methods they do not practicalize[sic] it so when we go out we find it difficult to apply.*

Another added

*Instead of taking us to the nearest primary school to practicalize [sic] the methods of teaching they rather lecture us.*
This phenomenon is confirmed by Acheampong’s (2001) finding that teachers used lecture methods in content and pedagogy delivery without involving students actively in the lesson which does not encourage reflective thinking. A student thinks that if teachers do not use the appropriate method for them to emulate, then it is not a good practice. He said:

*If it happens that teachers are not using the role play, demonstration or bla, bla, bla and they intend to expect us to go and use them in our intended class, then I do not think they are doing the right thing because they are to do and practice it so that we can also practice it when we go so that we don’t mess up. If they go by the lecture method alone and neglect the other methods, they are not doing it right.*

This statement suggests that teachers need to use a variety of teaching approaches in the classroom for learners to learn their use and application. Students were of the view that the use of the lecture method in teaching methodology makes them handicapped in their application as captured in this statement

*Using the lecture method will help us to know the method but at the end of the day how to use it becomes a problem. If they do not demonstrate the methods in the class you will not know how to use it or how to go about it.*

The science teacher also thinks that feeding learners with information or using the lecture method for both methodology and content lessons will not help with the professional development of pre-service teachers. He states:

*At this level we are not only teaching them to develop their academic ability but we also helping them to develop professionally. When we feed them with information they will academically do well but the profession. How will they impart the knowledge they have acquired to the children? That is very important so if we don’t teach them the methodology well, they will go out there and mess up because they will spoon-feed the children, which is not good because they should teach to engage the children.*
In addition to the above, the observations revealed that teachers teach without using teaching learning materials. Their excuse is that they are not available in the school. This makes the teaching very abstract and sometimes difficult to understand. This is captured in the statements below:

*Teachers do not use teaching learning materials in class to engage students.*
*Using teaching learning materials have never happened in my class. We do most of our learning in abstract and we don’t think it is healthy.*

*The teachers think we are adults and therefore need not prepare materials that will help us to teach in the primary school.*

In sum, the teaching strategies employed by teachers at Komenda teacher training college is equal to what Cochran-Smith (2004) referred to as atheoretical and anti-intellectual; perspective teachers are trained in empty techniques rather than training them in knowledge and decision-making.

Questioning and motivation in the teaching learning process enhances students’ thinking (Beamon, 1997). Thinking is enhanced if teachers encourage discussions in class, ask questions that cause students to think, and encourage learners to ask and answer questions. The study revealed that this essential issue was violated in the pre-service teacher classrooms observed in this study. It was observed that teachers lack the questioning skills to bring the best out of their learners. The questions they asked in the observed lessons were not leading and probing enough. Examples of questions asked when students have responded to an earlier question (major question) included *what do you also say? Any other? Anything to add? Anybody to say something?* In the observation, it was realized that teachers failed to reward good responses but rather picked on wrong ones and disparagingly dealt with it. Sometimes students’ questions are
disregarded and not treated in class. At times teachers do not give students the chance to ask questions. Added to this is that often teachers fail to respond to students’ questions or refer them to their class for discussion. These were confirmed in the interview by the following responses in a student interview:

*If you ask a question when they are teaching they shout you down or punish you; some students were punished for asking questions when the teacher was talking.*

*Sometimes when you answer a question and it is not right, the way the teacher uses derogatory words on you may put you in a bad mood and sometimes demeaning, with that next time when he asks a question in class nobody will want to try.*

*At times, when you even ask a question, I don’t know, if they don’t have enough knowledge about the question; they don’t talk about it. They just brush it aside and go on with what they are doing instead of referring the questions to the whole class for discussion.*

*Sometimes teachers do not have time for questions and answers. Sometimes you raise up your hand to ask a question and he asks you to put your hand down; he will just shout you down so you wouldn’t want to ask questions. At times, they do not even give you time to think about the question they ask. They are always rushing.*

*Sometimes you ask a teacher a question in class and he asks you to go and find out. Everyday he comes to class and you ask a question he says you should go and find out so when he comes to class we will not talk, we allow him to talk till he finishes and then we go and do our research.*

Rowe (1972) states that teachers should give their learners at least three seconds or more after asking questions for students to think about it because the more time we give to learners the more the increase in correctness of their responses and increase in number of volunteers to respond to the question. Tobin (1987) posits that allowing a wait time of three seconds which is the threshold facilitates higher cognitive learning and achievement. The third statement above shows that teachers observed violates this
important proposition. The other statements indicate that learners are deterred from asking questions and participating in lessons. This may explain why in the lessons observed about 98% of the questions were initiated by teachers. Students were reluctant to ask questions. The few who were bold to ask questions started with the word *please, sir ...* The classroom environment at Komenda College is tense and intimidating which inhibits effective intellectual development of students. This goes against to suggestions made by Beyer (1997) that a classroom which supports thinking should create enticing opportunities and encouragement for students to engage in thinking.

4.2.3 Classroom environment

The classroom environment plays a major role in enhancing the thinking of students. Potts (1994, citing Keefe & Walberg, 1992) thinks “... thinking in the classroom is facilitated by a physical and intellectual environment that encourages a spirit of discovery” (p. 3). The classroom environment should be a motivating place for learners to express their views without fear of intimidation. There should be fairness, tolerance, and respect for each other’s opinion. Dialogue, negotiation, care, and active participation should be key elements in the classroom. The classroom environment should raise expectations and extend opportunities for students to use their ability to think (Beamon, 1997). On the other hand, an authoritarian environment associated with either the teacher or peer group and an environment that lacks the mediation of individuals who can challenge, probe, and encourage thinking inhibit thinking in learners (Beyer, 1987).

The study revealed that the classroom environment in this pre-service teacher institution inhibits thinking in students. Teachers were autocratic. The views of the
teachers observed always carry in the classroom while students’ views are disrespected.

Students are powerless and there is no avenue to channel their grievances. It was observed from the observations and interviews that teachers insisted on students doing things in a particular way and using only information they had given them which kills students’ creativity and ability to be independent thinkers as shown in the statements below:

*There is a particular master in our school, he wants you to write whatever he gives to you word to word... if you write any thing not from his notes or handout you are marked down and we feel sad but there is nothing we can do because as far as that master is concerned he wants you to put down AA, BB, but it is like what you understand that you have to write but as far as that master is concerned, no way.*

*There is also another master he will give you notes and in a quiz or an assignment he can give a statement he gave in a notes and leave a particular word and he wants you to put that particular same word there so you have to memorize “chew” the notes.*

*For example in science there are many books but if you do not use information from his pamphlet to answer a question but use other books and explain in your own words he does not like that... Last Mr. X asked what science is and a student defined it in his own language but it was not accepted because he did not use specific words from the pamphlet.*

A second year student also said

*...when we write or say something which is not in what they have given to us but is relevant to the topic... it is ignored or rejected. They say you don’t know more than they do ...For example, in an HIV class a friend gave an answer which the teacher has not come across...it was rejected but later when we were reading we found that the student was right and the teacher did not say anything.*

This was evident in the observation. In about 95% of all lessons observed, students made contributions but in the end teachers dictated their notes for students to write. When this is not done, students ask for it. In a mathematics methodology class on gender, the
teacher defined gender bias but a student said, *sir, read for us* and the teacher did. In the interview I asked the teachers why they always have to give notes to learners and their responses were unanimous; they want them to pass the examination. The science teacher said

*We are examiners so we know what is required in the examination.*

Another reason for giving notes was that there are no materials to be used as reference for learners.

In connection to the above, teachers observed most of the times do not accept contributions from learners. Students’ comments or contributions are not commented on or are rejected outright. In a social studies lesson on earth crust, a student made a contribution which the teacher could have commented on to deal with confusion which students encounter in relation to the number of layers of the earth crust. A student indicated that some authors divide the mantle into two but the teacher did not make any comment on the statement. He just continued with the teaching. The following is an excerpt from the observed lesson:

Student: Three major layers.
Teacher: Raise your hand to let me see you talk. Yes, woman.
Student: Three.
Teacher: Three, any different answer?
Student: Seconded.
Student: Sir, four [Emphatic]
Teacher: Four, yes.
Student: No, three.
[Silence]
Student: We are waiting for you.
Teacher: [Laughs] I know somebody will say four. One is divided into two. So there are three major layers. The core is divided into inner and outer but in any case they are the core. So we have the crust, mantle, and core.
Student: *And even the mantle, some books make it lower and upper mantle.*
Teacher: In any case, we have three layers and they are what we just said. What did we say?
Student: [Chorus] earth crust, mantle, core.

The statement below also captures this phenomenon:

Sir, (referring to the researcher) if you have something relevant to contribute if they are teaching, they will tell you to take whatever he has given to you and if in his exams you don’t write what he has given you, you will fail.

Such insistence on students adhering to what teachers give them without any room for students’ exploration in the learning process limits their thinking. This is presented in the statement below by a third year student:

This situation limits us on the way we should think because they don’t want us to go extra mile to look for things for ourselves. What they give you is what they want you to give them. I think they have to teach us how to learn; they have to teach us how to fish for ourselves. They have to teach us how to do things in different ways so that we take the best and not just one thing.

The statement above indicates that students are willing to find things for themselves and be creative but their efforts are thwarted by teachers.

Besides, the observations and interviews showed that the classroom atmosphere is intimidating which does not ensure effective thinking on the part of learners. Harris (1998) and Fisher (1990) indicate that positive attitudes and respect for others’ views enhance thinking in learners, but this was not the case in this study. There was teacher and peer intimidation which contributed to low participation in class. The statements below indicate what happens in the classroom in relation to intimidation and intolerance to others’ views:

... sometimes it comes from peers; if you are contributing to class discussion and you falter, the atmosphere they will create for you, you will recoil into your shells [and] sometimes from the teacher; sometimes the environment the teacher creates
before introducing a lesson... as soon as he enters the class, his face, his appearance will scare the whole class and you will not feel fine talking in class.

A third year student added that

*Sometimes when you give wrong answers they [teachers] embarrass you and nobody wants to be embarrassed.*

When peers intimidate others in class their behavior passes with no comment from the teachers; sometimes they reinforce such behavior. An interviewee says:

*The teacher relaxes or sometimes other teachers also laugh.*

In a mathematics methodology lesson on gender bias, a student decided to comment on an issue and the reaction he had from peers and the teacher was an inhibitor of thinking.

The following is an excerpt from what transpired:

**Student:** *I think gender bias is necessary because...*

**Teacher:** [interrupts] *gender bias is necessary?*

**Student:** *... because in class it may be that the boys or ladies are actually sharp, for instance ...*

**Teacher:** [interrupts] *what do you mean by sharp?*

**Student:** *They are very bright [Class shouts at him]*

**Teacher:** *You reserve your comment, we shall come to it.*

The lesson ended without the teacher commenting on the behavior of the students or did he comment on the student’s contribution. Also in a science methodology class on *improvisation*, the teacher asked a student to define the term.

**Teacher:** *What is improvisation? If you talk about replacing, modifying and making use of, you are out of the marking scheme*

**Student:** *Using materials found in the environment to bring about desirable effect in learning*

**Teacher:** *Out of respect I will give you 10 points. [Class laughs]. Anybody?*

**Student:** *It is using available local materials in the environment to bring about the same learning effect as the original material.*
Teacher: I am asking you to be very careful. When they [referring to examiners] ask you what is improvisation and you start using replacing, modifying etc. you are out of the range.

Student: Sir, What then is improvisation? What is in the marking scheme?
Teacher: Oh! So you want the marking scheme? Didn’t you hear what your friend said?
Student: It is the utilization of available materials ... [teacher cuts in]
Teacher: My friend, what is different from what your friend said?
[The class laughs and a student says]
Student: ɔkae se utilization na yentee bi da anaa? (Akan sentence literally meaning Does he think we have not heard the word utilization before?). [The entire class laughs and the teacher continues with his teaching]...

The student did not have time to complete his definition nor did the teacher comment on the behavior of the students. Such behavior shuts down students from participating in class discussions, which is a good way of enhancing students’ thinking.

4.2.4 Educational/Administrative policies

Educational policies sometimes negatively influence the enhancement of thinking skills in learners. Policies have an effect on students’ assessment (testing), teaching strategies, caliber and number of students enrolled and many more.

4.2.4.1 Testing

Most educational policies are characterized by standards and teacher accountability. Testing is the only tool available to measure how the standards must be achieved, which places pressure on teachers to prepare their learners to pass the numerous examinations. Examinations have become rampant in pre-service teacher training. This was not different in Komenda College; the teaching-learning process is geared towards passing examinations. Before the inception of the new program students wrote two external and four internal examinations in two years but they now write four external and four internal examinations in two years. Testing has influenced the teaching
strategies employed by teachers. Acheampong (2001) in a study concerning curriculum in teacher training colleges in Ghana, found that external examinations have influenced college teachers’ instructional practices and willingness to engage student teachers in activities that will enrich teaching, learning, and thinking. The social studies teacher indicated

_We sometimes resort to teacher-centered teaching; we give the learners the information they need to pass the exams... sometimes when students fail it creates the impression that you are not teaching well so you give [them] the information to read and pass so sometimes it becomes examination-centered. Examination is always forcing us to give information._

The students even agree that in the name of passing the examinations teachers should use any method to help them pass. A science student stated

_My main concern is to pass the exams and to be a teacher because if I fail, I will be sent home and can’t become a teacher so I approve any method they use._

Another student affirmed this statement with these words

_... if we don’t pass the exams we are expelled so they have to give us the information that will help us pass the exams and move on._

Examinations and quizzes were also used to intimidate students in the learning process. In one social studies lesson observation the teacher asked a question and when students were still thinking about it the teacher yelled

_Hey! I have conducted quizzes in all the classes except you ... so I will surprise you and you will ... so be ready. It will come unannounced. [Pause] You will fail my quiz. [He continued] all classes have written their quiz. I want us to move on a little “na medze abɔ hɔn” (Akan literally meaning and I hit you with it)._  

Besides using testing as an intimidating tool, it is also used to stifle students’ creative and critical thinking skills. Some teachers insist on students conforming to particular patterns so that they can pass the external examinations. A third year student indicated
Sometimes, teachers insist that we do things in a particular way so that we pass the exams. Some of our teachers are examiners so they give us notes and information that examiners expect.

This finding has been earlier documented by Acheampong (2001) in a study about teacher training in Ghana. He found that teachers insist on students conforming to certain methods of solving problems so that they can answer accurately questions asked in examinations. This phenomenon does not encourage intellectual development in learners.

4.2.4.2 Caliber of students

Another administrative issue which has repercussions on pre-service teachers’ thinking is the caliber of students recruited for pre-service teacher training. A majority of the students enrolled possess the minimum requirement for entry into the teacher training college which is “E” (the weakest pass) in at least six subjects (aggregate 24 or less) including core mathematics, core science, and core English in the Senior Secondary School Certificate Examination (SSCE). About 62% of the students have “E” in English and 40% had “E” in mathematics (Acheampong & Stephens, 2002). Teachers interviewed have this to say about the caliber of students recruited for training

In fact the caliber of students we recruit is very bad. Some of them who come here do not come with good grades. Most of them have aggregate 27.

Another teacher indicated

The caliber of students recruited is worrying... The ability to use English language effectively affects their class participation. It also affects the way they answer test items; the way the put their argument makes things difficult to understand. The language to use to express themselves on paper is a problem.

The policy to admit students with weak grades affects their language use and the way they think because language is what humans use to express their thoughts. The
mathematics teacher expressed concern about the fact that the weak academic base of the learners makes the teaching and training process very difficult. He states

*Sometimes some [students] can’t write good simple sentences which makes the whole training process very difficult and makes teaching go at a very slow pace.*

The findings made in this study that pre-service teachers are recruited from the bottom level in their class was earlier documented in Ghana by Acheampong, Ampiah, Fletcher, Kutor, and Sokpe (2000) and in the US in a report titled *A Nation at Risk* by the National Commission on Excellence in Education (1983).

4.2.4.3 Class size

The need for teachers to fill the numerous empty classrooms at the basic level has resulted in an increase in pre-service teacher intake but there has not been corresponding infrastructural development. This has resulted in overcrowded classrooms. Most classrooms in Komenda Training College were designed to accommodate between 25 and 35 students which is the number expected by policy to be in a class. The class sizes are now between 50 and 52. Classes are crowded making it difficult for effective teaching to take place. In the observation, some students were found leaving the classroom and standing outside the window when classes are in progress. In the afternoons the classroom becomes warm and makes it uncomfortable for learning. The social studies teacher said

...in some classes you go there and you have no place to stand and do effective teaching, you are pushed under the board. The classrooms are not spacious and the students are many... the class size is large you can’t give many assignments to check on students’ progress because it will pose a problem to the teacher.

*Sometimes a class has about 52 students instead of the normal class size of 35 and because the class size is large you can’t give many assignments.*
The large class sizes coupled with lack of teaching learning materials and technology has made the use of effective teaching strategies which are likely to enhance students’ thinking abandoned and replaced with information giving strategies.

4.2.4.4 Lack of materials

Lack of materials (textbooks and other teaching learning materials) and overloaded curriculum are administrative issues that influence teaching and learning and affect students’ thinking in the long run. The Teacher Education Division of the Ghana Education Service has no prescribed or sponsored published textbooks for students in the initial teacher institution. Books used are written by individuals and endorsed by the individual institutions and recommended to students. This has resulted in proliferation of handouts written by the subject masters. Some of them are questions and answers which most students love to use. At the time of the research, textbooks meant for the first year students had not arrived. The school’s library had only a few books which have outlived their usefulness. This has resulted in teachers lecturing and giving notes sometimes from their university notes. This finding has acknowledged earlier by Stuart (1994) that most teacher trainers read from their university notes to their students. Students also do not have books to do their own research and boost their ability to process information on their own. In addition to this, teaching aids were not available and teachers neither use the few materials available nor prepare or improvise on their own as a student indicated in the statement below:

Some of the materials are there but they do not want to use it and also they don’t prepare when the materials are not there.
Most of the lessons were done abstractly. This does not help students in preparing for improvising in their training.

The teachers interviewed had this to say about the lack of textbooks and other teaching learning materials

\textit{The school does not provide the needed teaching learning materials. Sometimes you request for materials from the administration and they say there is no money. They will tell you there is no money, so teachers have nothing to do than to resort to teacher-centered method of teaching.}

\textit{There are no officially written textbook for science in this new program so we use the integrated science textbook for Senior Secondary Schools and others. Besides, the few books in the library are outmoded and irrelevant. The science equipments available are also old and have outlived their usefulness.}

\textit{The school is suppose to make every student technologically competent before graduating but there are only 20 computers which are even very old for about 400 students. This is woefully inadequate.}

\textit{The materials are just inadequate which makes you put a lot of people in a group which is not the best thing to do.}

4.2.4.5 The curriculum

The designs of the curricula of the three subjects in the study showed that they do not enhance thinking. A thinking curriculum according to (Nisbet, 1993) indicates that it has problem solving and practical work at its core. It also integrates content and process (Fennimore & Tinzmann, 1990). The curriculum observed had only topics, sub-topics, and the duration for completion of each topic listed. There were no suggested methods or activities to be used for executing the topics. Beyer (1987) indicates that a curriculum that enhances thinking provides suggested strategies on how the content should be executed. This assumption therefore disqualifies the curricula of the three subject areas under study. They do not pass the test for promoting thinking. Besides they were
overloaded. The thinking curriculum is characterized by in-depth learning which helps learners develop deep understanding of the concepts and processes involved in communicating knowledge in the field (Fennimore & Tinzmann, 1990). Such a curriculum is not overloaded but the curriculum used in teacher institutions in Ghana is overloaded. Students study ten subjects in the first semester. The social studies teacher noted

The syllabus is too much loaded in such a way that at some point you have to abandon a strategy which we think will engage our students ...so that we can cover all topics.

Such curriculum will not ensure in-depth learning of concepts in the subject area.

Besides, there is too much work outside the classroom for students (extra-curricula). This engages a lot of their time leaving little time for academic work. Both teachers and students complained about work done outside the classroom by students especially the first year students. The following statements give a clear picture of the situation:

When in the first year you are a laborer to the school. You don't get time to learn. From the time you wake up at 5:00 am you do a lot of work before you go to class and before you go to class you are already tired and sleepy. You fetch water for masters and the dining hall, clean the compound, and sweep the classrooms and many more.

As a result most students come to class late and tired as expressed by a teacher in the statement below:

Sometimes you will be ready to teach and find that most of the students are not around especially the first year classes. They are engaged in fetching water to the dining hall. Sometimes classes are cut short for students to fetch water to the dining hall for cooking. In most cases students come to class tired.
4.2.5 School/society culture

The education system in Ghana is a replica of the one inherited from the former colonial master (Britain), which was characterized by theory learning and information giving. Making learning practical was deemphasized. As a result a good teacher is seen as one who knows the content and passes it on (imparts) to learners. The teacher is seen as the custodian of knowledge and his/her duty is to pass on such knowledge to learners. This trend is very prominent in the Senior Secondary School (now Senior High School) where it is examination-oriented. A teacher noted that when students come in and the teacher uses the activity method they become confused. The teacher said:

_Sometimes they are not used to the activity method because in the SS they just give them information ... so when they come here and we use the method they feel shy to participate ..._

Pre-service teachers are at a loss and disinterested when teachers use other methods apart from lecturing. A first year student said:

_At our age we and the type of course we are doing they cannot use the role play or demonstration for it because of our ages..._

Another student indicated:

_Sometimes when the teachers come and want to use the role play we the students complain because we think we are adult not children. In our class when a teacher used role play for an AIDS lesson obi bisaa de na henara ye ye mbofra a? (Akan literally meaning somebody asked but are we children). He thinks we are adults so the teacher should come and say the thing.

The mind set of the learners is that the teacher should give them the information; this is what their previous twelve years of education has taught them. Any approach short of this is a waste of time._
The culture of the society also places emphasis on the fact that the adult is always right and should be respected. In the Ghanaian society, children are to be seen not heard. We do not have the opportunity as children to ask questions about certain things in the environment, which impinge on our curiosity as done in open societies. You have to take what the adult say as the absolute truth. As a result, by the time the Ghanaian child gets to school he/she knows the adult is always right and needs not be challenged. This phenomenon does not promote thinking. This system has found its way into the educational system. Students most of the time do not question information given to them by their teachers. Expressing alternative views or questioning assumptions is seen as insubordination and disrespect. As a result the teacher’s view always reigns supreme with little or no opposition from learners. This was evident in all classes observed; the teachers’ decisions passed unchallenged when students had reservations about them. As a second year student indicated,

Everybody knows the teacher is the eldest and nobody wants to disrespect them but they should sometimes listen to our views.

Students see everything in the classroom including the physical structures like the seating arrangement as normal if even they feel uncomfortable with it. When asked if they will change their seating arrangement if they have the chance a student answered

Though we will prefer a change in class seating we see it to be normal.

This atmosphere stifles students’ thinking and their ability to reason for themselves.

4.2.6 Staff development

Staff development is essential in any educational reforms. If thinking skills of pre-service teachers can be enhanced staff development is the key. McLaughlin and Oberman
(1996) state that the teacher’s ability to execute a complex, far-reaching education reform agenda takes the center stage and that at the root of problems of any educational reform is a problem of teacher’s learning. According to Beyer (1988), a staff development program that targets teachers to develop the thinking skills of learners should be continuous, involve administrators and all teachers, and address appropriate strategies to enhance students’ thinking. Beyer adds that teachers should do cooperative planning to develop strategies that will enhance the thinking skills of learners. The researcher wanted to know how staff development in pre-service teacher institutions is organized in terms of in-service training towards developing teaching strategies that enhance the thinking skills of learners. The responses from the teachers showed that in-service training is rarely organized and in subject areas where it is done it is geared towards examination. The science teacher indicated that the Teacher Education Department does well in organizing workshops for disseminating policy information to teachers but not towards novel trends in teaching. The mathematics teachers however indicated

*Staff training happens once in a while and because of funds only a few are invited for the workshop; they do trainers of trainees who come back to brief their colleagues.*

In terms of teachers in a department meeting to talk about effective ways of teaching, the mathematics teacher said

*Members in each department do not meet as a group to share ideas on teaching*

However; the science teacher indicated that science teachers in teacher training institutions meet to talk about ways students can pass examinations. He noted

*Science [teachers] normally meet to see the way students answer question and how to help them answer question appropriately but in terms of head of*
In terms of organizing staff development programs in modern trends of teaching to enhance the thinking skills of pre-service teachers, the Teacher Education Department of the Ghana Education Service falls short in this endeavor.

4.2.7 Documents

As indicated earlier in chapter three, documents is one vital way of collecting data in qualitative research especially in case studies since researchers learn directly from them and they provide both a historical and contextual dimension to observation and interviews (Patton, 2002). Documents provide hidden information which interviews and observation could not reveal. The documents analyzed in this section include the college curriculum for the new program Diploma in Basic Education (DBE), lesson plans of students, textbooks, handouts, and test items (internal and external) in the three subject areas under study.

4.2.7.1 Curriculum Objectives

The curriculum is a major plan in the school. It indicates the academic direction of the school and holds the key to the philosophy and aspirations of the institution and the society and whether it emphasizes higher order thinking or not. The goal of education should be intellectual development (Dewey, 1899; Bruner, 1960). The traditional curriculum does not encourage learners view themselves and the world from multiple perspectives. The traditional curriculum often offers isolated low-level thinking skills. A thinking curriculum on the other hand infuses thinking into the traditional curriculum without necessarily adding a new “subject” (Nisbet, 1993). It integrates content and
process (Tinzmann, 1990) and creates a climate of inquiry in the classroom. At its core is problem solving and practical work (Nisbet, 1993). The thinking curriculum is characterized by in-depth learning; it promotes higher level processes involved in planning, evaluating, problem-solving, decision making, and teaches learners to use knowledge even after school (Nisbet, 1990). The realization of these begins with the objectives for the curriculum.

The curriculum/syllabus discussed here is for the first and second years since the third year is an out program for practical teaching. The curriculum/syllabus of the three subject areas is divided in two sections; content and methodology. The first two semesters of year one are devoted to content while the two semesters in year two are devoted to methodology with the exception of mathematics which combines content and methodology in year two. Semester one and two of year two is devoted to methodology of primary and Junior Secondary School teaching respectively. Each of this curriculum used has four sections; namely the unit, topics, subtopics, and suggested duration. Each unit has a time line assigned to it for completion. The syllabi listed only the topics and the subtopics to be treated. It was silent on the processes to be used. It failed to provide suggested activities for achieving the objectives. This falls short of a thinking curriculum which integrates content and process. There is lack of depth, problem-solving activities, and decision making processes. The syllabi are examples of the traditional type which offers isolated topics.

This section categorizes the various objectives of the syllabuses into lower and higher level thinking. As earlier indicated, for the purpose of this research lower level
thinking skills include knowledge and comprehension while higher level thinking encompasses application, analysis, synthesis, and evaluation. The objectives of a syllabus hold the key as to whether it enhances higher level thinking skills or not. They are benchmarks that set the tone for teaching and learning. Curriculum objectives facilitate the preparation of class activities, assignments, and tests (Felder & Brent, 1997). They are the pivot around which the content of a course is constructed and the basis for assessment. Knowledge of the thinking levels that the objectives of a curriculum portray is essential in determining whether the curriculum will enhance the thinking skills of learners or not. The key to analyzing these objectives lies in the major verbs used as encapsulated in Bloom’s taxonomy of educational objectives. The objectives discussed here are the broad objectives of each syllabus. The various units have no specific objectives assigned. Classifying broad objectives in this way is very difficult and contentious because some do not have key verbs which will help you classify it and also some are stated in terms of what teachers will do to ensure the success of the program. For example, “providing students with the skills that will enable them to use the methods/techniques,” “inculcating in students desirable attitudes and values for good citizenship.” These two objectives are stated in terms of what teachers will do and not students. Notwithstanding, attempts have been made to categorize the broad objectives of these three subjects into lower and higher levels of thinking. The tables below show the thinking levels of the objectives used in the curriculum of the three subject areas: (in the analysis of the documents I have used the following key: 1 = Knowledge; 2 = Comprehension; 3 = Application; 4 = Analysis; 5 = Synthesis; 6 = Evaluation; LLC =
Lower Level Thinking; HLT = Higher Level Thinking. For example, Knowledge = LLT (1)).

Table 6: Science curriculum objectives

<table>
<thead>
<tr>
<th>YEAR ONE: CONTENT</th>
<th>YEAR TWO: METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMESTER</td>
<td>VERBS</td>
</tr>
<tr>
<td>ONE</td>
<td>1. Explain</td>
</tr>
<tr>
<td></td>
<td>2. Identify</td>
</tr>
<tr>
<td></td>
<td>3. Examine</td>
</tr>
<tr>
<td></td>
<td>4. Investigate</td>
</tr>
<tr>
<td></td>
<td>5. Demonstrate</td>
</tr>
<tr>
<td>TWO</td>
<td>1. Distinguish</td>
</tr>
<tr>
<td></td>
<td>2. Explain</td>
</tr>
<tr>
<td></td>
<td>3. Classify/group</td>
</tr>
<tr>
<td></td>
<td>4. Explore</td>
</tr>
</tbody>
</table>

Table 7: Mathematics curriculum objectives (content)

<table>
<thead>
<tr>
<th>YEAR ONE: CONTENT</th>
<th>YEAR TWO: CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMESTER</td>
<td>VERBS</td>
</tr>
<tr>
<td>ONE</td>
<td>1. Demonstrate</td>
</tr>
<tr>
<td></td>
<td>2. Make connections</td>
</tr>
<tr>
<td></td>
<td>3. Pose tasks and solve</td>
</tr>
<tr>
<td>TWO</td>
<td>1. Review &amp; consolidate</td>
</tr>
<tr>
<td></td>
<td>2. Discover</td>
</tr>
<tr>
<td></td>
<td>3. Pose &amp; solve</td>
</tr>
</tbody>
</table>
Table 8: Mathematics curriculum objectives (methods)

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>VERBS</th>
<th>THINKING LEVEL</th>
<th>SEMESTER</th>
<th>VERBS</th>
<th>THINKING LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE</td>
<td>1. Identify</td>
<td>LLT (1)</td>
<td>TWO</td>
<td>1. Acquire</td>
<td>LLT (1)</td>
</tr>
<tr>
<td></td>
<td>2. Explain</td>
<td>HLT (4)</td>
<td></td>
<td>2. Plan</td>
<td>HLT (5)</td>
</tr>
<tr>
<td></td>
<td>3. Illustrate</td>
<td>HLT (4)</td>
<td></td>
<td>3. Solve</td>
<td>HLT (3)</td>
</tr>
<tr>
<td></td>
<td>4. Discover</td>
<td>HLT (3)</td>
<td></td>
<td>4. Explore</td>
<td>HLT (3)</td>
</tr>
<tr>
<td></td>
<td>5. Identify</td>
<td>LLT (1)</td>
<td></td>
<td>5. Plan</td>
<td>HLT (3)</td>
</tr>
<tr>
<td></td>
<td>6. Solve</td>
<td>HLT (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Explore</td>
<td>HLT (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Identify</td>
<td>LLT (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9: Social studies curriculum objectives

<table>
<thead>
<tr>
<th>YEAR ONE: CONTENT</th>
<th>YEAR TWO: METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMESTER</td>
<td>VERBS</td>
</tr>
<tr>
<td>ONE</td>
<td>1. Use</td>
</tr>
<tr>
<td></td>
<td>2. Develop</td>
</tr>
<tr>
<td></td>
<td>3. Participate</td>
</tr>
<tr>
<td></td>
<td>4. Acquire</td>
</tr>
<tr>
<td></td>
<td>5. Create</td>
</tr>
<tr>
<td></td>
<td>6. Appreciate</td>
</tr>
<tr>
<td>TWO</td>
<td>1. Create</td>
</tr>
<tr>
<td></td>
<td>2. Know</td>
</tr>
<tr>
<td></td>
<td>3. Acquire</td>
</tr>
<tr>
<td></td>
<td>4. Create</td>
</tr>
<tr>
<td></td>
<td>5. Appreciate</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A quick glance at the objectives of the three subjects indicates that the writers of the various curricula laid emphasis on higher level thinking skills but a closer look at the various subjects’ objectives and the various levels of thinking portray slightly a different picture. The following is the individual subject analysis of the objectives:

a. Mathematics

A look at the mathematics curriculum objectives gives the picture below. There are a total of 25 objectives for the first and second year mathematics course for both methods and content. Twelve of these are content objectives and thirteen for
methodology. On the whole, 27.88% of the objectives express lower level thinking while 72.12% indicate higher level thinking. A breakdown of this shows that 25% and 30.77% of objectives in content and methodology are lower level thinking respectively, while 75% of the content objectives and 69.23% of the methodology objectives are higher level thinking. A second look at the higher level thinking objectives shows that the lowest level, which is application, is in the majority. About 77.65% of the content higher level thinking objectives is application and 55.56% of the higher level thinking objectives of the methodology component is application. About 66.66% of the total higher level thinking objectives is application, which is the lowest on the higher level thinking spectrum. Out of the 25 stated objectives three are instances of analysis, two are examples of synthesis, and one is an example of evaluation. The high number of application objectives is not a good sign of the mathematics curriculum emphasizing higher level thinking skills since most authors classify it as lower level thinking (Bloom et. al., 1956) or intermediate level thinking (Stronge, Tucker, & Hindman, 2004).

b. Science

The picture portrayed in terms of the level of thinking reflected in the year one and two science curriculum objectives is not vastly different from that of the mathematics curriculum. Generally, the thinking skills level reflected in the science curriculum is on the lower level side. There are 19 stated objectives for both content and methods of which 9 (56.25%) are lower level thinking and seven (43.75%) reflect higher level thinking. A breakdown of this indicates that about 44.44% of the content objectives are lower level thinking and about 55.56% are higher level thinking. In the methodology section, 71.43%
of the objectives are on the lower level scale while 28.57% are higher level thinking. A critical look at the various higher thinking levels indicated that in the content section only 20% of the objectives are above application and 75% above application in the methodology section. The analysis above shows that higher level of thinking is in the content area where learners are supposed to apply the teaching methods and strategies they have acquired in their training.

c. Social Studies (Environmental Studies)

The social studies curriculum for the first two years has a total of 19 objectives, of which 10 are for content and 9 for methods. The objectives of the curriculum show that the higher level thinking objectives are more than the lower level thinking objectives. Ten of the stated objective (52.63%) are higher level thinking while nine (47.37%) is lower level thinking. A second analysis on content-methods basis shows that most of the higher level objectives are in the content area. About 70% of the content objectives are higher level and 30% are lower level. On the other hand, there are six (66.67%) of the methods objectives are lower level and four (33.33%) are higher level. The most commonly used words are know (4 times), acquire (4 times), and create (3 times). Looking further, one can see that the social studies curriculum has more objectives above application than the science and mathematics curricula. It has six (60%) of the higher level objectives above application.

4.2.7.2 Lessons Objectives:

Lesson objectives hold the key as to what teachers intend to achieve at the end of the teaching episode. They direct the lesson planning and all strategies and activities to be
employed in the lesson delivery. Research has shown that most lesson objectives stated by teachers in the teaching process reflect lower level thinking skills. Acheampong (2001) in a research study found that most specific objectives stated in mathematics and science in Ghana reflects lower level thinking. The researcher intended to look at the objectives set by the three teachers observed but none of them had a lesson plan nor had given the students course outlines where the objectives could be found. He therefore decided to look at the objectives of the third year students doing practical training to see how their training has prepared them to write objectives to enhance the thinking skills of their students. In all, 30 lesson plans were randomly selected in mathematics, science, and social studies/environmental studies. Nine of the lesson plans were selected from the teacher-trainees in the Junior Secondary school (3 from each subject). Ten from those teaching from primary 4-6 (4 from social studies/environmental, 3 each from mathematics and science), and 11 from teachers practicing at the lower primary 1-3 (4 each from mathematics and science, and 3 from social studies). There were a total of 54 specific objectives stated in the 30 lesson plans of which 19 were in mathematics, 17 in science, and 18 in social/environmental studies.
**Table 10: Frequency of verbs used by students in their lesson objectives.**

<table>
<thead>
<tr>
<th>MATHEMATIC</th>
<th>FREQ</th>
<th>SCIENCE</th>
<th>FREQ</th>
<th>SOCIAL STDS.</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>count</td>
<td>2</td>
<td>classify</td>
<td>1</td>
<td>write</td>
<td>2</td>
</tr>
<tr>
<td>solve</td>
<td>3</td>
<td>list</td>
<td>3</td>
<td>list</td>
<td>3</td>
</tr>
<tr>
<td>tell</td>
<td>1</td>
<td>state</td>
<td>3</td>
<td>state</td>
<td>3</td>
</tr>
<tr>
<td>say</td>
<td>1</td>
<td>mention</td>
<td>2</td>
<td>mention</td>
<td>2</td>
</tr>
<tr>
<td>classify</td>
<td>1</td>
<td>draw</td>
<td>1</td>
<td>draw</td>
<td>1</td>
</tr>
<tr>
<td>match</td>
<td>2</td>
<td>give examples</td>
<td>1</td>
<td>name</td>
<td>2</td>
</tr>
<tr>
<td>draw</td>
<td>1</td>
<td>label</td>
<td>2</td>
<td>identify</td>
<td>1</td>
</tr>
<tr>
<td>find</td>
<td>3</td>
<td>group</td>
<td>1</td>
<td>categorize</td>
<td>1</td>
</tr>
<tr>
<td>give examples</td>
<td>2</td>
<td>describe</td>
<td>1</td>
<td>give examples</td>
<td>1</td>
</tr>
<tr>
<td>calculate</td>
<td>1</td>
<td>define</td>
<td>1</td>
<td>explain</td>
<td>1</td>
</tr>
<tr>
<td>name</td>
<td>2</td>
<td></td>
<td></td>
<td>trace</td>
<td>1</td>
</tr>
</tbody>
</table>

An analysis of these objectives into lower and higher levels of thinking showed an overwhelming use of lower level thinking objectives. 94.5% of the objectives are lower level thinking with only 5.5% being higher level thinking. The higher level thinking objectives were all applications, which is the lowest in the higher level thinking scale. The key verbs most commonly used in the objectives include count, solve, find, match, name (in mathematics), classify, list, state, mention (in science), and write, list, state, mention (in social studies/environmental studies). This indicates that these students have not been trained in writing objectives which are engaging to their learners. It has not been part of their training.

4.2.7.3 Test Items (Test Question)

Examinations play an essential role in the training of pre-service teachers. It is the only evaluation tool used in certifying the students. Students’ assessments are made up of 40% internal examinations and 60% external examinations organized by the Institute of Education of University of Cape Coast. The researcher wanted to see how test items in these two components of examination in the new program (Diploma in Basic Education)
promote students’ thinking. Unfortunately, all efforts to gather previous test items from teachers failed. Neither the teachers concerned nor the administration kept records of them while none could be traced from the school’s archive. The researcher therefore decided to analyze only the external test items for the new program. The test items discussed in this research is for the years 2004 and 2005 for the three subject areas. In each of the years the original (first) papers were analyzed. Re-sitting papers for re-sitters were not analyzed because the researcher could not get them for all subjects. For easy analysis the two years’ test items for each subject are combined.

Mathematics

The 2004 and 2005 mathematics test items analyzed in this section is for both methodology and content. The content paper is made up of two sections A and B. Section A is made up of simple problems for students to solve without necessarily showing how the answers were arrived at, while section B involve solving complex problems with detailed step-by-step process of arriving at the solution. Students answer all questions in section A and four questions from section B. The methods paper also has two sections. Section A requires simple answers. Students answer four questions from section B. This involves a lengthy writing of at least two pages. A student must pass in both papers to have a pass in mathematics. Below is an analysis of the test items.
Table 11: Analysis of test items in the mathematics content and methodology for (2004/2005)

<table>
<thead>
<tr>
<th>VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
<th>VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find</td>
<td>LLT (1)</td>
<td>38</td>
<td>Give</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td>Illustrate</td>
<td>LLT (2)</td>
<td>2</td>
<td>Describe</td>
<td>LLT (2)</td>
<td>9</td>
</tr>
<tr>
<td>Draw</td>
<td>LLT (1)</td>
<td>5</td>
<td>Explain</td>
<td>LLT (2)</td>
<td>7</td>
</tr>
<tr>
<td>Simplify</td>
<td>LLT (2)</td>
<td>4</td>
<td>What</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Evaluate</td>
<td>HLT (6)</td>
<td>2</td>
<td>Write</td>
<td>LLT (1)</td>
<td>2</td>
</tr>
<tr>
<td>How much</td>
<td>LLT (1)</td>
<td>3</td>
<td>List</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
<td>3</td>
<td>Distinguish</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td>Solve</td>
<td>HLT (3)</td>
<td>2</td>
<td>Show</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td>What</td>
<td>LTL (1)</td>
<td>4</td>
<td>Give examples</td>
<td>LTL (2)</td>
<td>1</td>
</tr>
<tr>
<td>Calculate</td>
<td>HLT (4)</td>
<td>3</td>
<td>Prepare</td>
<td>LTL (2)</td>
<td>1</td>
</tr>
<tr>
<td>Represent</td>
<td>LTL (2)</td>
<td>2</td>
<td>How</td>
<td>HLT (3)</td>
<td>2</td>
</tr>
<tr>
<td>Construct</td>
<td>HLT (3)</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examine</td>
<td>HLT (3)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factorize</td>
<td>HLT (2)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>75</td>
<td>Total</td>
<td></td>
<td>34</td>
</tr>
</tbody>
</table>

Analyzing the above data, the following were observed: there were a total of 75 test items in the content area of which 14 test items (18.66%) and 61 (81.33%) were higher level thinking and lower level thinking skills respectively. In the methods paper, there were a total of 34 test items of which 3 (8.82%) items tested higher level thinking and 31 (91.17%) tested for lower level thinking skills. In the content section, find (LLT-1) was used about 38 times (50.66%) followed by draw (5) and simplify (4), while in the methods section describe was used 9 times (26.47%) followed by explain (7) and show (4). Only three test items in the methods section tested for higher level thinking skills (How which is level three (HLT-3). In general, about 86.25% of the test items in mathematics for the two years in the methods and content papers tested lower level thinking skills while 13.75 tested higher level thinking skills.
Social Studies

As indicated above, the test items discussed here are selected from the years 2004 and 2005. The content and methods test items for the two years are discussed separately. Each paper is made up of two sections A and B. Test items in section A involves completing statements, writing a sentence or two and sometimes selecting from multiple answers while test items in section B involves detailed writing. This is the same for the methods paper. Below is an analysis of the test items.

Table 12: Analysis of test items in the social studies content and methodology for (2004/2005)

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>METHODOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERB</td>
<td>THINKING LEVEL</td>
</tr>
<tr>
<td>State</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>List</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Why</td>
<td>HLT (4)</td>
</tr>
<tr>
<td>What</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Examine</td>
<td>HLT (3)</td>
</tr>
<tr>
<td>Describe</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Draw</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Which</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Explain</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Name</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Give examples</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Express</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Discuss</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Suggest</td>
<td>HLT (3)</td>
</tr>
<tr>
<td>Assign</td>
<td>HLT (3)</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
</tr>
</tbody>
</table>

An analysis of the test items shows the following. There were a total of 56 test items in the content area and 17 in the methods. Out of the 56 content questions 50, 89.28% test Lower Level Thinking (LLT) skills and 10.71% (6 questions) test Higher Level Thinking (HLT) skills. In the methods section all test items test Lower Level Thinking skills. Only one out of the six higher level questions was synthesis while the remaining was
application which is the lowest in the higher level category. The most frequently used verbs in the content area were state (11), explain (10), list (7), and what (6) while explain (5), what (4), and write (3) were in the methods section. In general, test items in social studies for the two years tested for lower level thinking skills of learners. On the whole, 91.78% of the test items (content and methods) were lower level thinking skills.

Science

The science examination paper like the previous ones discussed is made up of two separate papers; content and methodology. The content paper is made up of four sections. Candidates are expected to answer all questions in section A and one each from section B, C, and D. Questions in section A require simples answers while does in the three other sections require students to write at least two or more pages. The methods paper consists of two sections. Candidates are expected to answer all questions in section A and four questions from section B. Section A questions require short answers while those in section B require detailed writing. The following is an analysis of the test items.
Table 13: Analysis of test items in the science content and methodology for (2004/2005)

<table>
<thead>
<tr>
<th>CONTENT VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
<th>METHODOLOGY VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why</td>
<td>HLT (3)</td>
<td>2</td>
<td>What</td>
<td>LLT (1)</td>
<td>14</td>
</tr>
<tr>
<td>State</td>
<td>LLT (1)</td>
<td>13</td>
<td>Why</td>
<td>HLT (3)</td>
<td>2</td>
</tr>
<tr>
<td>What</td>
<td>LLT (1)</td>
<td>18</td>
<td>Give</td>
<td>LLT (1)</td>
<td>2</td>
</tr>
<tr>
<td>Describe</td>
<td>LLT (1)</td>
<td>7</td>
<td>How</td>
<td>HLT (3)</td>
<td>1</td>
</tr>
<tr>
<td>Give</td>
<td>LLT (1)</td>
<td>10</td>
<td>State</td>
<td>LLT (1)</td>
<td>8</td>
</tr>
<tr>
<td>Explain</td>
<td>LLT (2)</td>
<td>6</td>
<td>Which</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Which</td>
<td>LLT (1)</td>
<td>1</td>
<td>Write</td>
<td>LLT (1)</td>
<td>10</td>
</tr>
<tr>
<td>Name</td>
<td>LLT (1)</td>
<td>7</td>
<td>Describe</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
<td>4</td>
<td>Outline</td>
<td>HLT (3)</td>
<td>1</td>
</tr>
<tr>
<td>Tabulate</td>
<td>LLT (1)</td>
<td>1</td>
<td>List</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>How</td>
<td>HLT (3)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide (give)</td>
<td>LLT (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differentiate</td>
<td>LLT (2)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draw</td>
<td>LLT (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify</td>
<td>LLT (1)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss</td>
<td>LLT (2)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label</td>
<td>LLT (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copy and complete</td>
<td>LLT (1)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Define</td>
<td>LLT (1)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>86</strong></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>43</strong></td>
<td></td>
</tr>
</tbody>
</table>

The analysis above shows that there are a total of 86 content questions and 43 methods questions. On the whole the questions in the science external examination are skewed towards lower level thinking. In the content area 83 test items (96.51%) were lower level thinking and 3 (3.48%) tested higher level thinking. The most commonly used type question are *what* (18 times), *state* (13 times), *give* (10), and *describe* and *name* (7 times). The three higher level thinking test items were all *application* (the lowest in the higher level thinking category). The methods section had a total of 43 test items of which 4 (9.30%) were higher level thinking and 39 (90.69%) were lower level thinking questions. The most frequently used type questions were *what* (14 times), *write* (10 times), and *state* (8 times). Overall, approximately 94.51% of the test items were in the lower level thinking category and 5.46% in the higher level thinking category. Earlier studies by
Holden (1992) in mathematics and science, Black (1990) in science, Hummel and Huitt (1994) and others by Ole Takoma (1999), and Bloom et. al. (1956) support this finding that test items in these subject areas test lower level thinking. This finding is not different from what earlier studies have identified in other countries.

4.2.7.4 Textbooks and Handouts

Textbooks influence the content and strategies used in their teaching. Textbooks in most cases form the focal point in curriculum and/or course design. They also play a major role in enhancing the thinking skills or cognitive development of learners. As Stiggins, Rubel, and Quellmaiz (1988) put it, if we want to boost thinking skills in our learners, our instruction and materials used must be conducted and planned in the same manner. Lower level thinking skills have been identified as overwhelmingly dominant in fifth grade science textbooks (Risner, Nicholson, & Myhan, 1991), in mathematics (Niecly, 1991), and in reading textbooks (Hoeppel, 1980). These research findings motivated the researcher to find out whether the textbooks in the subject areas under study portray higher order thinking or not. This section takes a critical analysis of the questions in science, mathematics, and social studies textbooks and handouts (popularly called pamphlets) both in content and methodology to see how they reflect the two main levels of thinking.

4.2.7.4.1 Textbooks

In the teacher training institutions in Ghana there are recommended textbooks and those that students privately own. The textbooks analyzed in this research are those recommended by the institution. These books are highly valued by students because they
are written by renowned writers in the field of teaching. In addition, these are the best textbooks to lay hands on since the school’s library lacks quality books related to the program being pursued. The books were written for the new Diploma program (Diploma in Basic Education). The criteria the researcher used in selecting the books include the following: the books must be recommended by the institution, liked by both teachers and students, have questions or student activities at the end of each unit or chapter. The researcher intended to analyze the objectives and questions at the beginning and end of each unit respectively but avoided the issue of objectives because some of the textbooks did not have objectives for each unit. So he analyzed only the questions for the selected textbooks in both methodology and content. The researcher analyzed every single question in each unit. For double-barrel questions they were viewed as two separate questions and analyzed as such. The researcher first wrote the key verbs or expressions in each question and began to tally them to see the frequency of each. After this he found the total and calculated the percentage of the lower and higher level thinking questions. At each thinking level, the percentage of the questions with the highest frequency was also calculated. The following is the analysis of the questions in the textbooks in the three subjects.

a. Social Studies

The social studies content book analyzed here is *Environmental and social studies for teacher training institutions in Ghana* published by Salt and Light + Mantdik Press in 2006 while the methodology textbook is *Teaching social studies in basic schools* published by the Ghana Education Service, Accra in 2001. The content textbook was
written by three renowned social studies experts and teachers while the methodology book had two authors. There are 13 units in the content textbook and 10 units in the methodology textbooks. An investigation by the researcher indicated that most of the 38 teacher training colleges use these textbooks. In analyzing the questions, the researcher first wrote the key verbs in each question and matched them against the levels of thinking they reflect using Bloom’s cognitive domains as a guide. After this, the researcher worked the frequency of verbs used. Simple percentage was used in showing the representation of the levels of thinking the questions in the book represent. The analysis showed that lower level thinking questions are highly favored in the two textbooks. The following is the analysis of the questions:

Table 14: Analysis of questions in the social studies content and methodology textbooks.

<table>
<thead>
<tr>
<th>CONTENT VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
<th>METHODOLOGY VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define</td>
<td>LLT (1)</td>
<td>1</td>
<td>Design</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Fill in</td>
<td>LLT (1)</td>
<td>1</td>
<td>Describe</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Compose</td>
<td>HLT (5)</td>
<td>1</td>
<td>Explain</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Why</td>
<td>HLT (4)</td>
<td>1</td>
<td>How many</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Show relation</td>
<td>HLT (4)</td>
<td>4</td>
<td>Identify</td>
<td>LLT (1)</td>
<td>2</td>
</tr>
<tr>
<td>Identify</td>
<td>LLT (1)</td>
<td>5</td>
<td>List</td>
<td>LLT (1)</td>
<td>2</td>
</tr>
<tr>
<td>Describe</td>
<td>LLT (1)</td>
<td>8</td>
<td>Mention</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Differentiate</td>
<td>LLT (2)</td>
<td>3</td>
<td>State</td>
<td>LLT (1)</td>
<td>5</td>
</tr>
<tr>
<td>Discuss</td>
<td>LLT (2)</td>
<td>10</td>
<td>Suggest</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Explain</td>
<td>LLT (2)</td>
<td>5</td>
<td>What</td>
<td>LLT (1)</td>
<td>10</td>
</tr>
<tr>
<td>What</td>
<td>LLT (1)</td>
<td>8</td>
<td>Write</td>
<td>LLT (1)</td>
<td>6</td>
</tr>
<tr>
<td>Distinguish</td>
<td>LLT (2)</td>
<td>1</td>
<td>Why</td>
<td>HLT (3)</td>
<td>1</td>
</tr>
<tr>
<td>Classify</td>
<td>LLT (2)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How</td>
<td>HLT (3)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make suggestions</td>
<td>HLT (3)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examine</td>
<td>HLT (3)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>LLT (1)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicate</td>
<td>LLT (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>LLT (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>58</strong></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>32</strong></td>
<td></td>
</tr>
</tbody>
</table>
From the analysis above, there 58 and 32 questions in the content and methodology textbooks respectively. This gives a total of 90 questions which indicates that there is an average of about four questions (3.91) per unit. Further analysis indicates that about 96.875% of the methodology and 82.75% of the content questions are lower level thinking (LLT), while only approximately 3.12% of the methodology and 17.24% of the content questions reflect higher level thinking (HLT). The most commonly higher level thinking question used in the content textbook is in the area of analysis while application is the most commonly used in the methodology textbook. What questions are the most (about 31%) commonly asked in the methodology textbook while discuss type questions were the most common (about 17%) in the content textbook. Other frequently used verbs/question types in the content textbook are describe (8 times), what (8 times), explain (5 times), identify (5 times), and show relationship (4 times). In the methodology textbook, write (6 times) and state (5 times) were the next frequently used after what. In summary, the questions in the social studies textbooks for both content and methodology emphasize lower level thinking as oppose to higher level thinking; 89.81% and 10.18% of the questions are lower level thinking and higher level thinking respectively.

b. Mathematics

The main textbooks found to be in use in the study of mathematics in the three year program are Mathematics for Diploma Colleges (content) written in 2006 and published by Ash Metro printing Press, Kumasi, Ghana and Teaching basic mathematics for colleges of education, 2006 and published by Learner’s Publishers, Kumasi. These books have been endorsed by the mathematics instructors of the institution and therefore
sold at the college’s bookshop to all students. Students indicated that they are the best mathematics textbooks among the few available. The books were purposely selected because they were written with the syllabus of the new Diploma in Basic Education program as a guide. The books have twenty-nine and eighteen chapters in the content and methodology respectively. There were a total of 288 questions in the content textbook and 141 questions in the methodology textbook.
Table 15: Analysis of questions in the mathematics content and methodology textbooks.

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
<th>METHODOLOGY</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define</td>
<td>LLT (1)</td>
<td>2</td>
<td>Comment</td>
<td>HLT (3)</td>
<td>1</td>
</tr>
<tr>
<td>Specify</td>
<td>HLT (5)</td>
<td>2</td>
<td>Describe</td>
<td>LLT (1)</td>
<td>47</td>
</tr>
<tr>
<td>Illustrate</td>
<td>HLT (3)</td>
<td>9</td>
<td>Design</td>
<td>LLT (4)</td>
<td>1</td>
</tr>
<tr>
<td>List</td>
<td>LLT (1)</td>
<td>2</td>
<td>Distinguish</td>
<td>LLT (1)</td>
<td>9</td>
</tr>
<tr>
<td>Find</td>
<td>LLT (4)</td>
<td>102</td>
<td>Explain</td>
<td>LLT (2)</td>
<td>22</td>
</tr>
<tr>
<td>How many/much/long</td>
<td>LLT (1)</td>
<td>18</td>
<td>List</td>
<td>LLT (1)</td>
<td>2</td>
</tr>
<tr>
<td>Represent</td>
<td>LLT (2)</td>
<td>4</td>
<td>Why</td>
<td>HLT (3)</td>
<td>2</td>
</tr>
<tr>
<td>Show (to prove)</td>
<td>HLT (3)</td>
<td>4</td>
<td>State</td>
<td>LLT (1)</td>
<td>14</td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
<td>11</td>
<td>Name</td>
<td>LLT (1)</td>
<td>4</td>
</tr>
<tr>
<td>Simplify (change)</td>
<td>LLT (2)</td>
<td>14</td>
<td>What</td>
<td>LLT (1)</td>
<td>10</td>
</tr>
<tr>
<td>What</td>
<td>LLT (1)</td>
<td>13</td>
<td>Write</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Calculate</td>
<td>HLT (4)</td>
<td>22</td>
<td>Give reasons</td>
<td>HLT (3)</td>
<td>2</td>
</tr>
<tr>
<td>Express</td>
<td>LLT (2)</td>
<td>8</td>
<td>Evaluate</td>
<td>HLT (6)</td>
<td>1</td>
</tr>
<tr>
<td>Evaluate</td>
<td>HLT (6)</td>
<td>5</td>
<td>Give</td>
<td>LLT (1)</td>
<td>12</td>
</tr>
<tr>
<td>Arrange</td>
<td>HLT (4)</td>
<td>2</td>
<td>Make a list</td>
<td>LLT (2)</td>
<td>3</td>
</tr>
<tr>
<td>Examine</td>
<td>HLT (3)</td>
<td>1</td>
<td>How</td>
<td>HLT (3)</td>
<td>1</td>
</tr>
<tr>
<td>Convert</td>
<td>LLT (2)</td>
<td>1</td>
<td>Outline</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Solve</td>
<td>HLT (3)</td>
<td>9</td>
<td>Illustrate</td>
<td>HLT (4)</td>
<td>3</td>
</tr>
<tr>
<td>Change</td>
<td>LLT (2)</td>
<td>1</td>
<td>Rearrange</td>
<td>HLT (4)</td>
<td>1</td>
</tr>
<tr>
<td>Draw</td>
<td>LLT (1)</td>
<td>8</td>
<td>Show</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Construct</td>
<td>HLT (3)</td>
<td>7</td>
<td>Prepare</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Determine</td>
<td>HLT (4)</td>
<td>14</td>
<td>Use examples</td>
<td>HLT (4)</td>
<td>1</td>
</tr>
<tr>
<td>Expand</td>
<td>LLT (2)</td>
<td>3</td>
<td>Identify</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Factorize</td>
<td>HLT (3)</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make</td>
<td>LLT (2)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>HLT (3)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure</td>
<td>LLT (2)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe</td>
<td>LLT (1)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimate</td>
<td>HLT (3)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organize</td>
<td>HLT (3)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derive</td>
<td>HLT (5)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deduce</td>
<td>HLT (5)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draw conclusion</td>
<td>HLT (5)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>288</td>
<td></td>
<td><strong>Total</strong></td>
<td>141</td>
<td></td>
</tr>
</tbody>
</table>

An analysis of the cognitive level of questions in the textbooks indicated that in the content area there were 194 lower level thinking questions about 67.36% and 94 higher level thinking questions about 32.63%. The type of question with the highest frequency in the lower level questions is *find* which is 102 about 52.51%. Other question types with high frequency include *how many/much/long?* (18 times), *simplify* (14 times),
what? (12 times), and write (11 times). Further analysis revealed that calculate was the most commonly used; 23.4% (22 times) among the higher level thinking type questions. Others include determine (14 times), solve and illustrate (9 times each), and draw (8 times). The trend in the content area is the same for the methodology component. There were a total of 141 questions of which 129 about 91.48% were lower level questions and 12 about 8.51% were higher level questions. In the lower level questions, describe (knowledge) had the highest frequency of 47 about 36.43% followed by explain (22), state (14), give (12) and what? (10) in that order. Illustrate had the highest frequency of 3 (25%), followed by why (2), and give reasons (2) in the higher level questions category. Generally, the questioning level in these two textbooks was skewed towards lower level thinking; 20.57% higher level thinking and 79.43% lower level thinking.

c. Science

The methodology textbook under discussion Methods of teaching elementary school science was written by a three member panel of the Center for Continuing Education at University of Cape Coast in 2005. It is a two hundred and twenty-five (255) page book. Though the book was meant for distance education teacher students for a diploma certificate, it is liked by teachers and students of initial pre-service teacher. The content textbook Integrated Science 1 written by three authors of three teacher training institutions and published by the Ministry of Education, Youth and Sports has 499 pages with ten units and lessons. It was published in 2004. There are trial questions at the end of every lesson and sample examination questions at the end of the book. All these
questions were included in the analysis. Below is the analysis of the questions in the two textbooks.

Table 16: Analysis of questions in the science content and methodology textbooks.

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>METHODOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERB</td>
<td>THINKING LEVEL</td>
</tr>
<tr>
<td>What</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Explain</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Mention</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Find</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>How</td>
<td>HLT (3)</td>
</tr>
<tr>
<td>Indicate</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>List</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Give</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Why</td>
<td>HLT (3)</td>
</tr>
<tr>
<td>Differentiate</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Classify</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Describe</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>State</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Identify</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Outline</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Define</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Determine</td>
<td>HLT (4)</td>
</tr>
<tr>
<td>Calculate</td>
<td>HLT (4)</td>
</tr>
<tr>
<td>Balance</td>
<td>HLT (3)</td>
</tr>
<tr>
<td>Name</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Where</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Tabulate</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Distinguish</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Draw</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Label</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Discuss</td>
<td>LLT (2)</td>
</tr>
<tr>
<td>Which</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
</tr>
</tbody>
</table>

The picture portrayed in the science textbooks through the analysis is not different from that in the social studies and mathematics textbooks. There were a total of 171 questions in the content textbook and 153 questions in the methodology textbook. In the content textbook, there were 12 (7.02%) and 159 (92.98%) higher level thinking and lower level thinking questions respectively. The higher level thinking questions were from the
application and analysis categories. The most frequently asked questions required students to explain (39), state (20), describe (13), draw (13), and what (10). The methodology textbook portrayed a similar pattern. There were 14 (9.15%) higher level thinking questions and 139 (90.85%) lower level thinking questions. The most commonly asked questions in this area were what (45), list (18), state (17), give (15), and explain (13). In totality, there was 8.08% higher level thinking questions and 91.92% lower level thinking questions in the two science textbooks which is consistent with previous studies by Risner, Nicholson, & Myhan (1991) in science textbooks, and Nicely (1991) in mathematics textbooks.

4.2.7.4.2 Handouts (pamphlets)

Handouts, popularly known as pamphlets among students and teachers, are an indispensable material in pre-service teacher training. This is due to lack of textbooks in teacher institution libraries. Handouts hereafter known as pamphlets are found all over the place. Every student in training is in possession of a pamphlet in every subject. They are either prepared by teachers of the institution or by teachers of other institutions. To curb the proliferation of pamphlets in teacher institutions the Institute of Education of University of Cape Coast and principals of pre-service teachers institutions have instituted a review committee which vet all these pamphlets before they are sent to schools but due to delays and the demand for them most pamphlets find their way to students without approval. This happens very often when they are prepared by teachers of the institutions. What came out of the interview was that students sometimes ask subject
teachers to prepare them but teachers force them to buy them if even they had copies or similar ones from other institutions. A student said

*If you don’t have the handout ... you will be marked down. The teacher wants you to use his handout and information. Teachers are concerned with students buying their handouts and will do everything to get students buy them.*

Another student added:

*As for the handouts, they force us to buy and woe unto you if you don’t buy. Some of the masters they say if you don’t buy the handout you will fail in their exams, for example, PE (Physical Education).*

Teachers insist on students using the information in their pamphlets because they are prepared in line with the demands of the external examination. Some pamphlets are responses prepared for previous external examination questions which students love the most. Teachers interviewed were of the opinion that the pamphlets cannot be avoided in teacher institutions due to lack of textbooks as indicated in the statement below

*In the absence of books and other materials, teachers compile notes based on issues discussed at the marking center (examination centers) and give to students as handouts. This helps them on how to answer questions.*

Due to the weight put on pamphlets by both teachers and students, the researcher wanted to see how they engage the thinking skills of learners; hence the inclusion of pamphlets in this study. Initially, the researcher wanted to analyze both content and methodology pamphlets but there were no content pamphlets in science and mathematics at the time of the research for the new program. The analysis was therefore restricted to only methodology pamphlets.

The mathematics pamphlet under discussion is *Mathematics methodology for teacher training colleges* which was written in 2004 by the then mathematics head of
department in Komenda College but it is sent to the institution every academic year. Every student in the second year possesses this pamphlet. Students expressed their interest in using this pamphlet because it is concise and addresses their needs in relation to passing the external examination. The topics treated include nature of mathematics, how children learn mathematics, gender issues in mathematics, methods of teaching mathematics, teaching the four mathematical operations, lesson design, teaching learning materials, and the basic education school curriculum.

The social studies pamphlet *Environmental and social studies for Diploma in Basic Education* was written in 2005. It was a revised form of the one written in 2002 to reflect the new program. A few students I interviewed about the pamphlet nicknamed it *Agyenkwa* (Akan word which literally means *savior*). Most of the students indicated that this is one pamphlet which has helped them a lot in passing their social studies external examination. The topics are concisely treated in point form. Some topics treated include the field of social studies, lesson integration, approaches to social studies teaching, lesson preparation, and the basic education curriculum. At the end of each topic are questions for students’ practice of which most of them are past examination questions.

The science pamphlet used in this study was written by the head of the science department of Komenda College and is patronized by all students in the school. Methods of teaching science was written in 2004 and for the then post-secondary program and revised in 2006 in line with the Diploma in Basic Education syllabus. The topics include the nature of science, instructional methods, instructional planning, practical skills in science, improvisation, safety in the science classroom, profile dimension, and the
primary and junior secondary school curriculum materials. The topics are treated in points form to reflect the way the external examinations are set. At the end of each unit are possible examination questions for students practice. The following table shows the thinking levels portrayed in these pamphlets.

*Table 17: Analysis of questions in the mathematics, social studies, and science methodology pamphlets.*

<table>
<thead>
<tr>
<th>VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
<th>VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain</td>
<td>LLT (2)</td>
<td>12</td>
<td>Explain</td>
<td>LLT (2)</td>
<td>14</td>
</tr>
<tr>
<td>Give</td>
<td>LLT (1)</td>
<td>7</td>
<td>Discuss</td>
<td>LLT (2)</td>
<td>3</td>
</tr>
<tr>
<td>List</td>
<td>LLT (1)</td>
<td>3</td>
<td>Write</td>
<td>LLT (1)</td>
<td>2</td>
</tr>
<tr>
<td>Find</td>
<td>LLT (1)</td>
<td>1</td>
<td>Who</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Distinguish</td>
<td>LLT (2)</td>
<td>3</td>
<td>Prepare</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Identify</td>
<td>LLT (1)</td>
<td>1</td>
<td>Name</td>
<td>LLT (1)</td>
<td>5</td>
</tr>
<tr>
<td>Describe</td>
<td>LLT (1)</td>
<td>31</td>
<td>Describe</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td>Illustrate</td>
<td>HLT (3)</td>
<td>2</td>
<td>List</td>
<td>LLT (1)</td>
<td>8</td>
</tr>
<tr>
<td>What</td>
<td>LLT (1)</td>
<td>4</td>
<td>What</td>
<td>LLT (1)</td>
<td>11</td>
</tr>
<tr>
<td>Demonstrate</td>
<td>LLT (2)</td>
<td>1</td>
<td>State</td>
<td>LLT (1)</td>
<td>18</td>
</tr>
<tr>
<td>Show</td>
<td>LLT (1)</td>
<td>7</td>
<td>Demonstrate</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How</td>
<td>HLT (3)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>LLT (1)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use</td>
<td>HLT (3)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total** 79 **Total** 67
An analysis of the methodology handouts/pamphlets showed that the questions at the end of each chapter/unit are heavily skewed towards lower level thinking (LLT). Overall, only 3.16% of the total number of questions were higher level thinking (HLT) and an overwhelming 96.84% were lower level thinking. On individual subject basis, all questions in social studies were lower level thinking. The frequency of verbs/key words used in the questions are state (18), explain (14), what (11), and list (8) in that order. In mathematics, there were a total of 79 questions of which 4 (5.06%) were higher level thinking and 75 (94.94 %) were lower level thinking. The four higher level thinking questions were all application, the lowest in the category. The questions most frequently asked were describe (31), explain (12), give (7), and show (7). The science methodology handout had a total of 75 questions of which 3 (4%) were higher level thinking and 72 (96%) were lower level thinking. The three higher level thinking questions were

**Table 17: (Continued)**

<table>
<thead>
<tr>
<th>VERB</th>
<th>THINKING LEVEL</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>List</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td>State</td>
<td>LLT (1)</td>
<td>22</td>
</tr>
<tr>
<td>What</td>
<td>LLT (1)</td>
<td>13</td>
</tr>
<tr>
<td>Draw</td>
<td>LLT (1)</td>
<td>2</td>
</tr>
<tr>
<td>Distinguish</td>
<td>LLT (2)</td>
<td>2</td>
</tr>
<tr>
<td>Give</td>
<td>LLT (1)</td>
<td>11</td>
</tr>
<tr>
<td>Write</td>
<td>LLT (1)</td>
<td>5</td>
</tr>
<tr>
<td>Outline</td>
<td>LLT (2)</td>
<td>2</td>
</tr>
<tr>
<td>Explain</td>
<td>LLT (2)</td>
<td>3</td>
</tr>
<tr>
<td>Match</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Indicate</td>
<td>LLT (1)</td>
<td>1</td>
</tr>
<tr>
<td>Classify</td>
<td>LLT (2)</td>
<td>1</td>
</tr>
<tr>
<td>Which</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td>Why</td>
<td>HLT (3)</td>
<td>2</td>
</tr>
<tr>
<td>Formulate</td>
<td>HLT (5)</td>
<td>1</td>
</tr>
<tr>
<td>Describe</td>
<td>LLT (1)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>75</strong></td>
</tr>
</tbody>
</table>
application (2) and synthesis (1). The commonly used questions were state (22), what (13), and give (11).

4.3 Enhancing the thinking skills of learners

This section tries to look at the how we can improve the thinking skills of pre-service teachers. It answers the second research question.

Research Question 2: How can the thinking skills of pre-service teachers be enhanced?

Cotton (2001) has noted that enhancing students’ thinking results in high academic achievements. There must therefore be diligent efforts to improve the thinking skills of pre-service teachers. Enhancing the thinking skills of pre-service teachers must be a collective endeavor; teachers, learners, administration, and the institution must all be involved.

4.3.1 Teacher’s role

Teachers have a major role to play in enhancing the thinking skills of pre-service teachers. The suggestions made in this study for teachers border on teaching strategies, teacher/learner relations, and teacher attitude. For effective enhancement of learners’ thinking skills, teachers need to use cognitive approaches (Beamon, 1997), use probing questions to increase students’ participation (Cotton, 2001), and increase student curiosity (Harris, 1998). Students are of the opinion that teachers need to use methods that pre-service teachers are likely to use after completion. One student said

_The methods of teaching we are going to employ in the classroom needs to be used and that they should be introduced in the first year. Again, I suggest teachers should give room for personal research._
Besides, learners suggested that they should be allowed to read and do discussions in class. Additionally, teachers should allow students to research information for themselves. A third year students commented,

*Teachers should not allow us always to depend on their notes. It is difficult to memorize ... they should allow us to find information for ourselves.*

Another way students think teachers can teach to enhance their thinking skills is to use appropriate methods. A student suggested

*They should stop using the lecture method and use appropriate method of teaching so that we can learn from them. The society needs effective teachers to help children learn for themselves.*

For teachers to effectively engage a class he should know what he/she is teaching.

Students interviewed were of the opinion that teachers should do a lot of research before embarking on teaching any topic. A third year student pointed out

*Teachers need to do a lot of research before coming to class so that when learners provide information outside their handout they will be able to comment on it.*

To enhance students’ thinking teachers need to be flexible and be receptive in the classroom. A student said

*I will advise them to open up and allow the students to come to make meaningful contributions in class which the teachers may not have ideas about.*

Effective teaching occurs when there is cordial relationship between teachers and learners to ensure effective collaboration. There should be open communication between teachers and learners in the classroom. A student noted,

*There should be open communication between us and teachers. They should open up so that we can approach them with problems. They should also involve us in the classroom decision making process and any other decision that involves our training.*
Another student said,

*I will advise them [teachers] to open themselves up and allow the students to come to them ...*

Such change of attitude will boost student moral and encourage student participation in class.

4.3.2 Learners’ role

In the classroom, learners have a role to play in enhancing thinking skills. Wilks (1995) suggests learners need to concentrate on what others are saying, be tolerant, and say what they think and feel freely. Harris (1998) indicates that learners should do away with negative attitudes that block thinking. Learners should tolerate each other in the learning process as seen in this quote by a first year student

*Students should learn to tolerate each other’s views and should not look down upon their friends who do not know much but rather help them to [encourage] (make) contributions in class.*

The Center for Critical Thinking (1996) suggests that teachers should let their students be aware of what they are in for the first day they attend classes. This will make them aware of teaching strategies and their new roles. In the first week of their admission, learners should be orientated on becoming a teacher. The mathematics teacher confirms this when he said

*Students should be made to understand the need to accommodate the use of effective teaching methods by teachers.*

Such orientation is essential since they would be put in the right frame of mind for what they are in for as pre-service teachers. In sum, learners need to develop positive attitudes like curiosity, challenge assumptions behind ideas, and see the good in the bad.
4.3.3 Administrative/institutional roles

In Ghana, decisions concerning teacher education are top-down with policies trickling down from the Teacher Education Division of the Ghana Education Service to teacher training institutions. One decision which has had immense impact on teacher training is testing conducted by the Institute of Education of the University of Cape Coast. Students write four external examinations by the end of the second year. Students are expelled when they fail. All teaching and learning is geared towards students’ passing the examination to the detriment of enhancing student thinking. The research revealed that there is the need to reduce the number of examinations taken so that attention can be laid on the purpose of their training. A student said

*The number of examinations must be reduced. I think the exams must be twice a year; one at the end of year one and another at the end of year two.*

The social studies teacher also added

*I recommend a reduction in the number of examinations because students are always asking for information to pass the exams so we have to abandon all strategies and resort to the lecture method.*

One other administrative issue that hinders student thinking is overload of the curriculum. Students and teachers were of the opinion that the school curriculum is overloaded and this has made it possible for the scratching of the surface of most topics. This is not a characteristic of a thinking curriculum. A teacher said

*The content of the syllabus is too much. It should be reduced to make us refrain from giving information to complete the syllabus in a hurry*
A student indicated

*I suggest a reduction in subjects studied per semester; 10 subjects in a semester is too much. Subject not taught at the basic level should be removed from the syllabus.*

The physical structures of the school need to be improved to cater for the increase enrolment. A first year indicated

*There is lack of space, if you are learning there should be more space for air to come in.*

A teacher had this to say about the physical structure,

*the environment is not good for teaching and learning for example light offs [sic], lack of water, lack of teaching learning materials and these must be properly attended to ensure effective teaching and learning.*

The issues of learning materials was a concern to both teachers and learners and were of the view that the Teacher Education Division should equip the school library with recent textbooks, the school should be connected to the internet so that students can do research on their own and be effective in the classroom. In addition to the above, administrative policies pertaining to students recruitment should be reviewed. The required grade for enrolling students should be increased to be in line with other diploma institutions. A teacher suggested that the entry requirements should be reviewed from a 3-year program should to four years where the fourth year can be used for the out program. The first three years must be used to consolidate and strengthen academic base of the learners since most of them come in with lower grades. On staff development the science teacher has this to say

*The Teacher Education Department should make staff development a priority so that teachers can be exposed to modern trends in teacher education. The usual excuse that there is no money should be dealt with.*
4.4 Summary

This chapter has answered the two research questions asked at the beginning of the study by analyzing the data collected. The analysis of the interview, observation and documents showed that the enhancement of the thinking skills of pre-service teachers is inhibited by poor teaching strategies, hostile classroom ecology, educational policies, school/society culture, lack of staff development, and documents used. These practices work against the achievement of the objectives of the Diploma in Basic Education program for teachers which is to make learners lifelong learners through the use of problem-solving techniques. The study also found that the thinking skills of pre-service teachers can be enhanced by concerted efforts of teachers, learners, educational/institutional administrators, and development of appropriate documents.
CHAPTER FIVE
CONCLUSION: SUMMARY AND RECOMMENDATION

5.0 Introduction

The previous chapter analyzed and presented the findings of the data collected from interviews, observations, and documents. In this concluding chapter, the researcher will present a summary of the methodology of the study which includes the purpose and the methods and design of the study. The chapter also deals with the limitations of the study, summary of findings and recommendations for improving teaching to enhance the thinking skills of pre-service teachers in teacher training colleges with particular reference to Komenda Teacher Training College and areas for further research.

5.1 Summary of Methodology

This section gives a summary of the methodology employed in conducting the research. This encompasses the purpose and the methods and design of the study.

5.1.1 Purpose of the study

The purpose of the study was to investigate the factors that have worked against the enhancement of pre-service teachers in initial pre-service teacher institutions in Ghana with particular reference to Komenda Teacher Training College, Komenda and how the situation can be improved. The study first aimed at finding the obstacles that have worked against the enhancement of thinking skills in pre-service teacher education institutions in Ghana and second, to attempt to find out how the thinking skills of pre-service teachers can be enhanced. The study addressed the following two global questions:
1. What factors have affected the enhancement of thinking skills in pre-service teacher education institutions (Teacher Training Colleges) in Ghana?

2. How can the thinking skills of pre-service teachers in teacher education institutions (Teacher Training Colleges) be improved?

These two research questions guided the researcher in investigating areas like perception about teaching, teaching methods/strategies, classroom environment, educational/administrative policies concerning teacher education in Ghana, the culture of the school/society, and documents used in initial pre-service teacher education institutions.

5.1.2 Methods and Design

As stated earlier, this is a qualitative single case study which used interview, observation, and documents analysis as the field strategies to collect data. The use of these field strategies allowed the research to capture data from three sources: persons, situations and contexts, and time (Denzin, 1989). These three strategies were triangulated to give credibility to the study. The sampling strategy used to get participants for the study was the purposive sampling. Two groups of participants; tutors and students of Komenda Teacher Training College were involved in the study. Three tutors were selected from mathematics, science, and social studies for the interviews and class observations. Thirty students were selected to form three focus groups of ten each for the interview. Students in the classes where the selected teachers taught also became part of the observation process. The selection of the site for the study was based on the fact that
Komenda Teacher Training College is representative of teacher training institutions in Ghana. It recruits students from all the ten regions of the country, it is coed, it also trains teachers for both programs A and B, and is both science and liberal arts bias.

To ensure credibility and respect for rules of research, I first wrote a letter to Komenda Teacher Training College for permission to use the site and its facilities for the study. On arrival at the site, I met and presented a consent letter to the principal for official approval to use the institution and its facilities for the study. This was followed by a meeting with the staff of the institution to brief them on my mission in the school and later met the science, mathematics, and social studies teachers to select participants for the study. After selecting the participants, they signed consent forms indicating their willingness to participate in the study. This was also followed by a meeting with the students and selecting participants who were given consent forms to sign. The data collection then proceeded. Each teacher was interviewed for at least 45 minutes and observed for at least six times. The students were interviewed in focus groups for at least one hour per group. The data collection process took about two months.

In this study, I analyzed the data collected by using the inductive analysis and creative synthesis approach. Adopting this approach allowed me to group responses based on my judgment that the responses are similar. I first started by looking for recurring regularities particularly in the interview and observation data which represents a pattern and sorted them out into categories taking into consideration internal homogeneity and external heterogeneity. Working back and forth between the data, I created categories and placed the data available in the appropriate category to make
meaning to readers. I continued and created a profile for the factors that have impeded the enhancement of the thinking skills of pre-service teachers and how it can be improved. In drawing conclusions, I matched the literature to the themes from the findings. I analyzed the documents using the concept of higher and lower level thinking as defined in this research. The documents were qualitatively described in relation to the thinking skill level they reflect. Data analysis occurred simultaneously with data collection. I employed the narrative-logic approach in presenting the data. I used this approach to enable me transition from one exemplar to another as a storyteller.

5. 2 Limitations of the study

The study has the following limitations. First, it involved only one teacher training college out of the 38 public and three private teacher training institutions in Ghana. This may not be a fair representation to make generalizations but the aim of this study is not to draw general conclusions. This study therefore refers to the issue as pertaining to Komenda Teacher Training College but any investigator wishing to venture into such area of research will find the findings useful as a starting point.

Second, the population chosen was very limited. The result might differ from a study which uses a larger population especially teachers from all subject areas. This will involve using more documents like textbooks, test items, and curriculum materials which may give a different result.

Third, the use of Bloom’s taxonomy of educational objectives to analyze the documents has it own shortcomings which might have affected the outcome of this study. It made the categorization of certain objectives not stated in terms of what learners can
accomplish very difficult and contentious. Using a different taxonomy of educational objectives may have a different outcome from the findings of this study.

Fourth, this study may not lend itself to replication since the situation/context might change as a result of the findings of this study.

5.3 Summary of Findings

The findings of the study are summarized in relation to the two main questions posed at the beginning of the investigation and the data collected. There is a plethora of research on developing the thinking skills of learners in their educational process. Such studies are conducted outside Ghana and therefore have a foreign flavor. The conditions under which these studies are conducted are quite different from what exist in Ghana. Such studies are done in educational environments where there are availability of textbooks, good libraries, adequate and well trained teachers, good classrooms, and other equipments which enhance students’ learning which is contrary to what exist in Ghana. This study was done to serve the needs of the Ghanaian initial pre-service teacher and teacher trainers. A good qualitative single case study serves the “local context and needs of the site professionals” (Ritchhart, Palmer, Church & Tishman, 2006, p.2). The uniqueness of this study is that it takes a comprehensive approach to looking at the factors that directly or indirectly inhibit students’ thinking in pre-service teacher institutions and what needs to be done to improve the situation as oppose many studies on promoting thinking, which look at specific components. It is also unique because it satisfies local conditions and needs. It is context based.
Education in Ghana most of the time emphasizes on literacy and numeracy. This is a system the country inherited from the British during the colonial period. The nature of the educational system in Ghana places premium on teaching to pass examinations, which does not promote students’ thinking or critical literacy. Examinations have become a major component of the system to the extent that learners are taught what to learn and pass examinations to progress to the next stage as oppose to how to learn to become life long learners. Though there have been reforms over the years this phenomenon has permeated into the fiber of the educational system that much effort in planning is needed to overhaul the situation to make it critical and functional. In a democratic society like Ghana and in this age of technological development, education should empower people to think and make meaningful decisions and solve problems. Education should promote critical literacy and this should begin at the teacher training levels so that the teachers can inculcate such skills into their learners. This study has taken a critical look at the situation at the initial teacher training institution level and has found the following and made recommendations as to how the situation can be improved:

1. What factors have affected the enhancement of thinking skills in pre-service teacher education institutions (Teacher Training Colleges) in Ghana?

The study through the analysis of the interviews, observations, and documents has provided the factors that have affected the enhancement of thinking skills in pre-service teacher institutions in Ghana with particular reference to Komenda Teacher Training College. The factors are the following:
a. Perception of teaching and good teachers:

The study revealed that most pre-service teachers opted for teaching for more altruistic motives than intrinsic and extrinsic. This is collaborated by Acheampong (2000) on the identity of student teachers in Ghana. The present study also showed that good teachers have good relationship with learners, possess knowledge in content and methodology for effective delivery of lessons, are good models both in and outside the school, and are dedicated to work. Additionally, teaching was seen in the study as the imparting of knowledge using appropriate strategies but these appropriate strategies were not used by the teachers. This perception impacts the way teachers are trained and their roles in the classroom after program completion.

b. Teaching strategies/methods employed in teaching

The investigation showed that teachers did not use methods that stimulate students’ thinking. Teachers mostly used the lecture method with occasional blending of discussion, demonstration, and role play methods. The same finding has been made by Acheampong (2001) on teacher training in Ghana, Acheampong and Stephens (2002) on exploring background of students teachers in Ghana, and Stuart (1999) on primary education curriculum delivery. Teaching was presented in a mechanistic manner-a transmission model as pointed out by Jossep and Penny (1998) in their study on pre-service teacher training in the US. The use of the lecture method as established in the study resulted in low class participation by students, lack of students’ engagement, lack of use of thought provoking questions, and lack of use of meaningful activities. Learners were passive in the teaching learning process. Added to the above is the fact that teachers
teach without the use of teaching learning materials which made lessons abstract and boring. The study established that students found this teaching approach inappropriate and boring. In a nutshell, teacher trainers used inappropriate teaching methods as found in earlier work in the US by Sarason, Davidson and Blatt (1986).

c. Classroom environment

It was found in the study that both the intellectual and the physical classroom environments inhibited the development of the thinking skills of pre-service teachers. Teachers were autocratic and insisted on students conforming to certain patterns of answering questions and doing things. Classroom decisions were controlled by teachers. There was peer and teacher intimidation, lack of open communication between teachers and learners, and lack of use of positive reinforcement in the classroom. The classrooms had poor ventilation and lighting systems. In addition, the classrooms were small, congested, and the furniture was difficult to move around which made the use of intellectual stimulating teaching methods like discussions and group work very difficult to implement. The large class sizes affected the teaching strategies employed by teachers. For example, it resulted in giving few assignments to learners with the ripple effect of difficulty tracking students’ performances and progress.

d. Educational/administrative issues

The observation revealed that most of the activities conducted in the teacher training institution (Komenda Teacher Training College) are dictated by policies of the Teacher Education Division of the Ghana Education Service. These decisions are top-down in approach. Students are not involved in the decision making process. One policy
decision which has had negative effect on the enhancement of the thinking skills of pre-service teachers that was evident in the study is testing. There are too many tests which have made teachers resort to the lecture method to provide learners with information to pass the examinations and students frequently ask for and learn only materials that will help them to pass the tests and not to make them reflective teachers. Examinations are also used as intimidating tool by teachers. Other administrative policies that were evident from the study, which inhibit the enhancement of the thinking skills of pre-service teachers at Komenda Teacher Training College include large class sizes, overloaded curriculum, lack of provision of teaching learning materials, lack of staff development, and enrolment of students with low academic standing.

e. Society/school culture

The culture of the society and that of the educational system also inhibits students’ thinking. The education system in Ghana relies predominantly on given information. The teacher is the provider of information and the learner; a receiver. It is theoretical in nature. In addition, the society sees the elder as being right all the time and questioning authority is a sign of disrespect. This has resulted in students not doing a lot of research work on their own and not questioning the authenticity of information provided them by teachers. The domineering authority of the teacher in the classroom is seen as normal by students because it is in line with what happens in the larger society and the entire educational system. This kills the creative and critical thinking powers of learners.
f. Documents

The documents used in the pre-service teacher institutions observed do not support the enhancement of the intellectual development of learners. All documents analyzed were skewed towards developing lower level thinking with the exception of the curriculum objectives which emphasize higher level thinking skills of learners. The tables and figures below give a summary of the documents analyzed.

*Table 18: Summary of percentages of thinking levels in the various documents in mathematics, science, and social studies.*

<table>
<thead>
<tr>
<th>SUBJECTS</th>
<th>Textbooks</th>
<th>Handouts</th>
<th>Curriculum</th>
<th>Test Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLT</td>
<td>HLT</td>
<td>LLT</td>
<td>HLT</td>
</tr>
<tr>
<td>Mathematics</td>
<td>96.84%</td>
<td>3.16%</td>
<td>94.94%</td>
<td>5.06%</td>
</tr>
<tr>
<td>Science</td>
<td>91.92%</td>
<td>8.08%</td>
<td>96.00%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Soc. Studies</td>
<td>89.81%</td>
<td>10.18%</td>
<td>100.00%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

In sum, the study found the following the thinking levels in the three subject areas: mathematics (76.47% LLT and 23.52% HLT), science (81.55% LLT and 18.52% HLT), and social studies (82.24% LLT and 17.76% HLT). On the whole, there was no vast difference between all three subjects in both LLT and HLT. After diligently calculating the percentage representation of LLT in the three subject areas, it was found that social studies had 34.23% followed by science with 33.94% and mathematics with 31.83%. This means social studies has the highest number of LLT and mathematics the least. In HLT, mathematics tops the list with 39.38%, followed by science 30.89% and social studies with 29.73%. The document analysis showed that HLT skills are
underrepresented in teacher training institutions documents at Komenda Teacher Training College; 80.09% of the total numbers of documents analyzed are LLT while only 19.91% are HLT. A critical look at the documents analysis indicates that on the whole, there is gap between the stated objectives of the teacher training college curriculum and actual textbooks, handouts and test items developed and used. The curriculum document has 60.33% HLT represented, while only 19.91% HLT is represented in all documents combined. This finding is in line with that of Risner, Nicholson, and Myhan (1991) in their study of level of questioning in fifth grade science textbooks in the United States. While a greater number of the curriculum objectives in the three subject areas indicate higher level thinking, textbooks, handouts, and test items emphasize lower level thinking. As reported in this study, other factors like poor teaching strategies employed by teachers, perception about teaching, hostile classroom environment, educational policies, and the culture of the school and society have also contributed to this gap. The pie charts below give a diagrammatic representation of the thinking levels representation in the three subject areas.

*Fig. 1: Lower level thinking skills in mathematics, science and social studies*
Fig. 2: Higher level thinking skills in mathematics, science and social studies

Higher Level Thinking Skills in mathematics, science, and social studies

Maths: 29.73
Science: 30.89
S. Studies: 39.38

Fig. 3: Lower level thinking and higher level thinking in Komenda Teacher Training College documents.

Lower Level Thinking (LLT) and Higher Level Thinking (HLT) in Teacher Training College Documents

LLT: 80.09
HLT: 19.91

Fig. 4: Lower level thinking and higher level thinking in Komenda Teacher Training College mathematics, science and social studies curricula.

LLT and HLT in mathematics, science and S. studies curriculum

LLT: 60.33
HLT: 39.67
2. *How can the thinking skills of pre-service teachers be improved?*

a. Teachers’ Roles

The study revealed that teachers have a major role to play in improving the thinking skills of pre-service teachers. Teachers need to be tolerant, have positive attitudes toward students, have open communication with students in and outside the classroom, and be democratic in their teaching. They also need to use teaching methods that engage students intellectually. In addition, teachers should be involved in a lot of research so as to help their learners in the classroom.

b. Learners’ Roles

The study found that learners can help improve their thinking by being tolerant to each others’ ideas and accommodate new teaching methods or strategies employed by their teachers. Learners need to develop positive attitudes to thinking such as curiosity, and question assumptions.

c. Administrative/Institutional Roles

The Ghana Teacher Education Division (TED) in collaboration with the Institute of Education of the University of Cape Coast should reexamine the assessment system of pre-service teachers by reducing the number of tests taking in the program, and in addition, Cape Coast University should change test items to include more HLT. Test items should be constructed to reflect Higher Level Thinking test items. Also the content of the curriculum, which students think has some irrelevant courses, should be reduced. The study also revealed that TED and teacher training institutions should place premium on the development of human (in-service training for staff, increase in entry requirements
of pre-service teachers) and non-human resources (textbooks, teaching-learning materials, buildings, furniture). The study also found out that learners’ thinking skills can be improved when they are involved in the decision making process which affects their training.

5.4 Theory Generated: Determinants of thinking skills in pre-service teachers

Teacher preparation in Ghana like most nations is influenced broadly by the culture of the society and the educational system. In Ghana, the culture of the society does not encourage questioning assumptions. Questioning assumptions and authority are seen as insubordination and disrespect for authority. This phenomenon has permeated into the Ghanaian classroom, which has made education more focused on giving information and outcome oriented. The perception of teaching therefore is seen as imparting or transmitting knowledge to the learner. This perception has influenced decisions and policies formulated by the TED of the Ghana Education Service in relation to students’ recruitment, documents (curriculum, textbooks) used in teacher institutions, staff development, and students’ assessment in the case of the Institute of Education of the University of Cape Coast. The Teacher Education Division collaborates with the Institute of Education in terms of students’ assessment. The perception of teaching, the culture/educational system of the society, and the policies of the Teacher Education Division also influence the way University of Education, Winneba and University of Cape Coast, Cape Coast prepare teachers for the initial teacher training institutions of which Komenda Teacher Training College is one of them. The policies of the Teacher Education Division, the assessment system employed in pre-service teacher institutions,
and the training given to teachers who graduate from University of Education and University of Cape Coast influence the teaching strategies/methods employed by teacher trainers, materials developed, student-teacher relationship, and classroom environment, which has major repercussions on students’ training. These factors culminate into either inhibiting or enhancing students’ thinking. In the case of this study, they culminate to inhibit the thinking skills of pre-service teachers in Komenda Teacher training college. Below is a graphical presentation of the determinants of enhancing the thinking skills of pre-service teachers in Komenda Teacher Training College. The determinants or factors influencing pre-service teachers’ thinking are cyclical. Pre-service teachers are trained in such a way that they come to reinforce the culture of the society and the educational system, which does not enhance thinking in the educational process.
Fig. 5: Determinants of enhancing the thinking skills of pre-service teachers
5.5 Recommendations

This section deals with recommendations for further research and recommendations for improving the thinking skills of pre-service teachers in Ghana.

5.5.1 Recommendations for further research

This study covered only one teacher training college in Ghana with only 33 participants in relation to enhancing the thinking skills of pre-service teachers, but more areas in teacher education need to be researched to improve pre-service teacher education in Ghana.

1. Though the research method employed in this study focused on enhancing the thinking skills of pre-service teachers at Komenda Teacher Training College, other research of similar kind can be done in other teacher training colleges in Ghana with more participants to determine the degree to which the findings of this study can be generalized.

2. This study has identified issues like teaching strategies, teacher-learner relationship, staff development, teaching-learning materials, classroom environment, perception of teaching, why people choose the teaching profession, students’ assessment, the teacher training curriculum, and many more which can be investigated independently in more depth to improve teacher training in Ghana.

3. Further research can be done in this area to see how the culture of the larger society and the system of education affect teaching and learning in Ghanaian schools including teacher training institutions.
4. Other areas like decision making relating to policy of teacher training in Ghana was beyond the scope of this study which can be studied in detail to see how it affects the enhancement of thinking skills in pre-service teachers.

5.5.2 Recommendations for improving the thinking skills of pre-service teachers

To improve students thinking in pre-service teacher institutions in Ghana, the following recommendations are made based on the findings of the study. The recommendations are broadly categorized into teaching strategies, classroom environment, staff development, materials, and administrative.

1. Teaching strategies

The extent of students’ thinking is directly influenced by the teaching strategies employed by teachers in the classroom. It is therefore prudent for teachers in pre-service teacher institutions to use cognitive instruction approaches as indicated by Beyer (1987), Beamon (1997) and Cotton (2001) like problem solving, brainstorming, class discussion, and group work. Teachers need to first recognize that the students have ideas to contribute in class which they need to respect. They need to recognize the pre-existing knowledge of their learners and expand it. It is recommended that teachers speak less in class, use concrete examples to make lessons practical and meaningful, use higher level questions, motivate learners to reinforce them to think, and provide opportunities for students to think by engaging them in meaningful learning activities. In the teaching process, teachers should practice thinking and make it visible and explicit (Beyer, 1987). Besides, teachers need to use integrative approach to teaching methods and contents as advocated by Bell (2000) and use appropriate methods which they expect their learners to
employ in their respective classrooms after graduation. Teachers need to provide opportunities, support and challenge teacher trainees to be creative and critical thinkers as enunciated by Hill (2000). Lastly, teachers need to give enough waiting time in their teaching to ensure increase in students’ responses and also to increase students’ participation in class (Rowe, 1972; Tobin, 1987).

2. Classroom environment

The classroom environment plays a crucial role in developing students’ thinking. If our pre-service teachers can improve their ability to think, the classroom must be a ‘thinking place.’ It is recommended that pre-service teacher trainers create conducive classroom atmosphere that improves students’ willingness to think as advocated by Harris (1998), Potts (1994), and Beamon (1997). Teachers need to create a classroom which is devoid of intimidation. There should be tolerance of each others’ views (Harris, 1998; Wilks, 1995). Democratic values like dialoguing, negotiating, and consensus building should be cultivated in the classroom to allow students to have the freedom to express their views. Most importantly, there should be cordial relationship; a relationship of mutual respect between teachers and students. The physical structure of the classroom needs to be improved. The classrooms need to be renovated to ensure proper ventilation, good lighting system, enlarged to accommodate more students, and provision of movable chairs and tables that can facilitate discussion in class.

3. Staff development

Any attempt to enhance the thinking skills of pre-service teachers without a corresponding improvement in staff will be a mirage. It is recommended that there should
be institutionalized in-service training for teacher trainers to sharpen their skills in teaching to enhance the thinking skills of pre-service teachers and in their knowledge of modern trends in teacher training as suggested by Beyer (1998). This should be done both at the Teacher Education Division and the institutional levels. Teacher trainers need to be trained in conducting research on teacher training and classroom issues. At the college level teachers should be encouraged to conduct research and share their findings with colleagues. Conducting research should be part of teacher promotion as done in tertiary institutions in Ghana. With upgrading of initial teacher institutions from three year postsecondary to Diploma in Basic Education, teachers need to possess a master’s degree in their area of specialization. This can be facilitated by teachers of initial teacher institutions pursuing distance learning at University of Cape Coast, Cape Coast and University of Education, Winneba. The University of Education, Winneba and University of Cape Coast, Cape Coast should train teachers who can enhance the thinking skills of learners, especially those going to function at the initial teacher training institutions. Technology should be an integral part of such programs to facilitate technology development in pre-service teachers. In addition, teachers need to be trained in teaching-learning materials development to help solve the acute problem of teaching-learning materials in teacher institutions. Breaking the cycle should begin with training teachers who are reflective thinkers. This is where University of Education, Winneba, University of Cape Coast, Cape Coast, and the 38 pre-service initial teacher training institutions have a major role to play.
4. Materials

The Teacher Education Division of the Ghana Education Service, Institute of Education of the University of Cape Coast, University of Education, Winneba, and initial teacher institutions should pursue an aggressive agenda in textbook development. Teachers of the various subject areas should be trained and encouraged to write textbooks in their subject area with particular reference to teacher training. Such textbooks should have activities which emphasize developing the thinking skills of learners. The libraries of initial teacher training institutions should be furnished with textbooks (content and methods) relevant to teacher training. In addition, textbooks and tests developers should take into consideration what the curriculum seeks to achieve and do accordingly. The annual budget of teacher training institutions should have textbook procurement and development as a component and used for the intended purpose. Besides, teacher institutions should be equipped with computers to enhance technology development among students. Pre-service teachers may have high probability of improving their intellectual development when they have access to the computers and the internet.

5. Administrative policies

It is recommended in this study that the Teacher Education Division of the Ghana Education Service should embark on policies that will facilitate the enhancement of students’ thinking in pre-service teacher institutions. First, the number of external examinations should be reduced. At most there should be two external examinations in the course of the program. Too much emphasis on examinations has made teacher training in Ghana more product-oriented as oppose to process-oriented. Teachers and
learners are focused on passing examinations and therefore use any method that will help them achieve this. Internal assessment should be strengthened and used effectively in assessing students. Effective guidelines need to be put in place to ensure quality internal assessment. Reliance on tests should give way to other forms of assessments like portfolio, students’ research, and students’ projects. Second, the curriculum of pre-service teacher institutions should be reduced. A well-tailored thinking curriculum ensures in-depth treatment of topics which facilitates students’ knowledge in the subject area. The curriculum should address the needs of students to make them functional in Ghanaian schools. The curriculum should also integrate technology into all subject areas. Third, the existing facilities of pre-service teacher institutions should be improved to accommodate the ever-increasing number of students wanting to attend teacher training institutions. This will reduce the large class sizes that have characterized pre-service teacher institutions and made the use of cognitive instruction teaching methods difficult to implement. Fourth, the entry requirements for initial teacher institutions should be increased to be in line with other diploma awarding institutions. This will ensure that the caliber of students recruited are academically good. The recruitment of students with good grades will make the teaching profession more attractive in Ghana and respectable in the eyes of the society. Fifth, pre-service teachers in initial teacher training institutions need to be involved in decision-making processes that affect their training to ensure that their needs and concerns are addressed in their program. This is a good training process for them to do the same in their classrooms. Lastly, the Teacher Education Division
should put in place orientation programs for first year pre-service students before they begin their training program to educate them on their new roles.

5. Society/school culture

It is recommended that democracy which has gain roots in the political system of the country can be extended to families and homes. There should be intensive education on the need to encourage children in the decision making of their day to day life activities. The old adage that children should be seen and not heard should give way to children both seen and heard in areas they matter. Information giving which has characterized Ghana’s educational system should give way to making learning practical and meaningful. The society’s perception of teaching as imparting knowledge needs to be changed. The traditional role of the teacher as custodian of knowledge and information giver should change. Teachers need to play the role as guides, facilitators, negotiators, motivators, planners, designers, and organizers in the teaching learning-process. The traditional teacher-centered approach needs to be abandoned for learner-centered approach. Teachers need to be trained in the art of engaging learners in the teaching-learning process. The training of teachers should emphasize on changing the negative perceptions teacher trainees and the society have about teachers and teaching. Schools especially teacher institutions should provide an ecosystem that nurtures, supports, and honors skillful thinking (Beyer, 1988).
5.6 Summary

This section began with the methods and design of the study and the limitations of the study. This was followed by the summary of the findings which included the factors that have inhibited the enhancement of the thinking skills of pre-service teachers and how the situation can be improved. In this same chapter, the theory generated from the research has been discussed. The chapter concluded with recommendations for further research and the enhancement of the thinking skills of pre-service teachers in Ghana.
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APPENDICES

APPENDIX 1: INTERVIEWS

1) Structured interview for teachers.

1. Name: .................................................................
2. Age: .................................................................
3. Educational Background: ..................................................
4. Academic qualification: ..................................................
5. Professional status: ..................................................
6. University attended: ..................................................
7. Teaching experience: ..................................................
8. Teaching experience as teacher trainer: .........................
9. Area of specialization: ..................................................
10. Subject(s) taught: ..................................................
11. Additional duties: ..................................................
12. Other comments: ..................................................

2) Semi-structured interview guide for teachers

1. Teaching methods/strategies
   a. What teaching strategies/methods do you use very often?
   b. Why do you use these methods/strategies?
   c. How do these methods enhance the thinking skills of learners?
   d. How do students react to these methods/strategies?

2. Perception about teaching
   a. What is your perception about teaching?
   b. How does it affect you teaching and classroom practices?
3. Students’ engagement
   a. What strategies do you use to engage your students in the teaching learning process?
   b. How often do you use them?
   c. Why do you use them?
   d. How does it affect students’ learning and your teaching?
   e. How does the materials you use engage student thinking?
   f. What suggestions do you have for improving students’ engagement in the learning process?

4. Classroom environment
   a. How does the physical structure of the classroom affect the teaching strategies you use?
   b. What strategies do you employ to create a classroom atmosphere that enhances effective learning?
   c. What factors are likely to inhibit the creation of conducive classroom atmosphere to ensure effective learning?
   d. What suggestion do you have for the improvement of the classroom environment in relation to student learning/enhancing of thinking skills?

5. Staff development
   a. How often do you have in-service training as teacher trainer?
   b. How often do you as colleagues share ideas about teaching and ways of enhancing the thinking skills of learners?
   c. Have you had a staff development program on how to teach to enhance the thinking skills of learners?
   d. What suggestions do you have for staff development of teacher trainers?

6. Government/administrative policies
   a. What government/administrative policies affect the way you teach?
   b. How does it affect students’ learning?
   c. How can government/administrative policies be made to improve learning and students’ thinking?

7. Culture of society/school
   a. How does the culture of the society affect teacher-student interaction in the classroom?
   b. How does the culture of the society/school affect students’ interaction in the classroom?

8. Caliber of students
   a. What is the caliber of students recruited into teacher training programs?
   b. How does this affect the teaching strategies/methods you employ in the teaching learning process?
   c. How can the caliber of the students be improved?

9. Suggestions for the improvement of students’ thinking skills.
3) Structured interview for students

1. Age: ………………………………………………………………………

2. Sex: ………………………………………………………………………

3. Class: ………………………………………………………………………

4. Teaching experience: ……………………………………………………

5. Major as pre-service teacher: …………………………………………

6. Major at Senior Secondary School (SSS): ……………………………

7. Level to teach after program completion: ……………………………

8. Years after SSS before enrolling as pre-service teacher:
…………………………

9. How long will you teach as a teacher: …………………………………

10. Other comments: ………………………………………………………

4) Semi-structured interview guide for students

1. Perception of teaching.

2. Perception of a good teacher.

3. Teaching strategies used by teachers.

4. Teaching methods/strategies that engage you in the learning process.

5. How teacher involve students in the teaching learning process?

6. Factors that hinder students from participating adequately in the teaching learning process.

7. Creating conducive classroom atmosphere.

8. Suggestions for the enhancement of thinking skills among pre-service teachers.
APPENDIX 2: LETTERS

1) Permission letter to Komenda Teacher Training College

Ohio University
361 Gordy Hall
Athens, OH 45701

20th January, 2006

The Vice Principal (Academic)
Komenda Teacher Training College
P. O. Box 5
Komenda, Ghana.

Dear Sir,

REQUEST TO CONDUCT RESEARCH AT KOMENDA TEACHER TRAINING COLLEGE

My name is Charles Owu-Ewie, a student of Ohio University, Athens, Ohio and I am working with Dr. David Bower of College of Education at Ohio University, Athens as my project director. Based on discussions I had with you on the telephone about conducting research in your institution, I wish to follow it up with this letter. I am writing this letter to ask permission from the institution to use the site for conducting a research on the topic “Enhancing the thinking skills of preservice teachers: A case study at Komenda teacher training college” for my PhD dissertation project. The study will use tutors and students of the institution as participants. The participants will be interviewed and later observed in the classroom during teaching. In addition, the study will involve analysis of documents used at the institution. The researcher will be the sole investigator. The study is expected to begin on the 1st of November, 2006 and end on the 10th of January, 2007.

The researcher assures the institution of the highest level of security and confidentiality of the participants and the information they provide. The information collected will be solely used for this study and nothing else and kept under lock and key in the investigator’s office. It is anticipated that this study will not cause any risk to the participants. I count on your cooperation in this endeavor. For any questions, please contact me on 740 274 9897 or email me at co314501@ohio.edu.

Yours Sincerely,

Charles Owu-Ewie
(Researcher)
KOMENDA TEACHER TRAINING COLLEGE
P.O. BOX 5
KOMENDA

REF: ...KTC/0012/2006

DATE: ...10th May 2006

Mr. Charles Owu-Ewie
Ohio University
361 Gordy Hall
Athens, OH 45701, USA

Re: REQUEST TO CONDUCT RESEARCH AT KOMENDA TEACHER TRAINING COLLEGE

This is in response to your letter dated 20th January, 2006 expressing interest to conduct research on the topic “Enhancing the thinking skills of preservice teachers: A case study at Komenda Teacher Training College” in this institution from 1st November, 2006 to 10th January, 2007. The institution attaches great importance to any research activity that will enhance the course of teacher training in Ghana and is willing to assist you in the project and will therefore provide you with all facilities that will enhance a speedy completion of the research.

The institution takes pride in your achievement as an alumnus and will do all it can to ensure that you succeed in this endeavor. You are assured of total support from both tutors and students of the institution. You must however, note that the institution will be on Christmas break for a week during the time of your research. If there is anything the institution can do to assist you in your project, please do not hesitate to contact us. For any question contact me on 011 233 42 33739.

Thank you,

John Kweku Sekum
(Vice Principal, Academic)
Cc
The Principal, Komenda Teacher Training College, Komenda.
The Vice principal (Administration), Komenda Teacher Training College, Komenda
The Regional Director, Ghana Education Service, Cape Coast.
The District Director, Ghana Education Service, Elmina.
3) Letter of consent to participants for participation in the study

Dear …………….,

This letter is to invite you to participate in my doctoral research project “Enhancing the thinking skills of preservice teachers: A case study of Komenda teacher training college”. Currently, I am a PhD candidate in the College of Education, Department of Teacher Education at Ohio University, Athens. My interests is in teacher preparation, particularly training teachers to be reflective thinkers so that they can transfer such skills to the children they teach.

Teacher preparation is seen as the anchor to any educational reform and development. In view of this, efforts must be put in to ensure that teachers are trained to face the challenges of the ever-changing world and prepare their learners for it. However, preparing reflective teachers for this task has not been the priority of most teacher institutions. The purpose of this study is to find out factors that have impeded the enhancement of thinking skills among preservice teachers and how the thinking skills of preservice teachers can be enhanced.

Your participation in the study as a teacher trainer/teacher trainee is very crucial and will assist the researcher in gathering the needed information for this study. If you agree to participate in this study, you will participate in the interview and observation process. In addition, you also agree that some of your teaching materials will be used in the study as research documents. You are assured of the highest confidentiality and security of the information and materials you provide. Anonymity will be the key issue in this study. It is my sincere hope that you will participate in this all important study. Please, indicate your interest to participate in this study by appending your signature below. For any concerns please do not hesitate to contact me on 740 274 9897 or email me at co314501@ohio.edu.

Thanks and I look forward to your response.

________________________________________

(Code Number)                                                            (Signature)
4) Letter of consent to teachers

Dear Participants,

The interview and observation you have agreed to participate in is part of a study of a doctoral dissertation project to investigate the topic “Enhancing the thinking skills of preservice teachers: A case study at Komenda teacher training college”. The purpose of this study is to find out factors that have impeded the enhancement of thinking skills among preservice teachers and how the thinking skills of preservice teachers can be enhanced. The interview process will be approximately between forty-five minutes and one hour while the observation will last for the normal class period times and will be audio-taped. Your participation in the interview and observation process is essentially voluntarily and you have any right to withdraw from they study at anytime during the interview or the observation. The interview will sometimes relate to your beliefs and attitudes regarding the teaching of preservice teachers but this in no way will present any risk to your personal welfare. Your experiences with teacher preparation will result in better understanding of the problem under investigation.

The project director and the investigator attaches great importance to anonymity of participants and will be ongoing throughout the entire research. The following steps will be undertaken to protect your confidentiality:

- All interviews and observations will be conducted in a save environment, mutually agreed upon by participant and the investigator.
- You will be interviewed individually.
- The audiotapes of the interview or the observation will be transcribes by the investigator only and the information shared with the project director when demanded. Such video tapes will be identified by numbers and not real names.
- The transcript of the interview or observation will be shared with you prior to any publication or presentation of data. The audiotapes will be keep in the investigators office and solely used for the purpose of this investigation.

Any questions in relation to this research project or your rights as a participant should be directed to me (740 274 9897 or email co314501@ohio.edu) or the director of the project Dr. David Bower, College of Education, 202 McCracken Hall, Ohio University, Athens, OH 45701.

Please, take time to read the statement below carefully before appending your signature;

I agree that all risks pertaining to this study have been explained to me and I understand that no compensation is available from Ohio University and its employees for any injury resulting from my participation in this study.

Sign _____________________________          Date _____________________

Thanks.
5) Letter of consent to student-teachers

Dear Participants,

The interview and observation you have agreed to participate in is part of a study of a doctoral dissertation project to investigate the topic “Enhancing the thinking skills of preservice teachers: A case study at Komenda teacher training college”. The purpose of this study is to find out factors that have impeded the enhancement of thinking skills among preservice teachers and how the thinking skills of preservice teachers can be enhanced. The interview process will be approximately between fifty minutes and one hour while the observation will last for the normal class period time and will be audio-taped. Your participation in the interview and observation process is essentially voluntarily and you have any right to withdraw from they study at anytime during the interview or the observation. The interview will sometimes relate to your beliefs and attitudes regarding the teaching-learning process of preservice teachers but this in no way will present any risk to your personal welfare. Your experiences as student-teacher will result in better understanding of the problem under investigation.

The project director and the investigator attaches great importance to anonymity of participants and will be ongoing throughout the entire research. The following steps will be undertaken to protect your confidentiality:

- All interviews and observations will be conducted in a save environment, mutually agreed upon by participant and the investigator.
- You will be interviewed in a focus group with your colleagues but your right to your opinion will be respected.
- The audiotapes of the interview or the observation will be transcribes by the investigator only and the information shared with the project director when demanded. Such video tapes will be identified by numbers and not real names.
- The transcript of the interview or observation will be shared with you prior to any publication or presentation of data. The audiotapes will be keep in the investigators office and solely used for the purpose of this investigation.

Any questions in relation to this research project or your rights as a participant should be directed to me (740 274 9897 or email co314501@ohio.edu) or the director of the project Dr. David Bower, College of Education, 202 McCracken Hall, Ohio University, Athens, OH 45701.

Please, take time to read the statement below carefully before appending your signature.

I agree that all risks pertaining to this study have been explained to me and I understand that no compensation is available from Ohio University and its employees for any injury resulting from my participation in this study.

Sign _____________________________          Date _____________________

Thanks.
APPENDIX 3: SAMPLE LESSON PLANS

1) Sample Lesson 1

SUBJECT: SOCIAL STUDIES (CONTENT)
CLASS: 1B CLASS SIZE: 50
DATE: 12/07/06 TIME: 1:00PM-2:00PM
TOPIC: THE STRUCTURE OF THE EARTH

Introduction:
Teacher enters the class and all students stand up to greet teacher.
Students: Good afternoon, sir.
Teacher: Good afternoon (He looks at the class and says), sit down.
Students: Thank you, sir.
(Lesson began with revision of previous lesson)
Teacher: Where were we the last time we met?
Student: Latitudes and longitudes.
Teacher: Yes, we finished with latitudes.
Students: Yes.
Teacher: So latitudes, we said something about latitudes. What did we say about latitudes?
Student: They are imaginary lines.
Teacher: They are imaginary lines........ (a students cuts in)
Student: They are imaginary lines that divide the earth into two
Teacher: Any one to polish it........we said something but she has gone away from it.
Student: They are imaginary lines that run from west to east.
Teacher: Yeah, you were talking about latitudes dividing the earth into two. Which line of latitude does that? In the first place not all latitudes divide the earth into two equal parts. What is that line?
Students: (In chorus) Equator.
Teacher: Okay, so the equator divides the earth into two equal parts. We said another thing. What was it?
Student: They run from east to west and horizontally.
Teacher: They run from east to west so if we have this (he draws on the board to illustrate) they run this way. They run from east to west unlike the longitudes which run from north to south, these ones they are from east to west. What again? We have said it runs from east to west (writes on the board). She also said that the equator is the only line that divides the earth in two equal parts. So the equator is what? The only line that line that divides the globe into two equal parts with the latitudes. So we can say the equator is what?
Students: (In chorus) The great circle.
Teacher: the equator is the great circle. Do you know what the great circle is?
Students: (In chorus). No.
Teacher: Yes, we said the great circle is the line that divides the globe into two equal parts. So when we come to the lines of latitudes it is the only the equator. What again?

Student: They are parallel ....

Teacher: Don’t be afraid. Say what you want to say. *Se itsi a, wɔmmfa wo admission mma wo ma enkɔ fie* (Akan Language literally meaning if you are wrong they will not give you your admission to go home).

Student: They are parallel to each other.

Teacher: They are parallel to each other. Thank you (he writes on the board)

We said of the lines of longitude that they do what? (He responds by himself).

They meet at the poles. You don’t read, Hey, I have conducted quizzes in all classes except you. So I think you are not reading what I have taught you. So I will surprise you and you will (he pauses) so be ready. It will come unannounced. Yes.....

Student: Parallel to each other.

Teacher: They are parallel to each other and I was saying the lines of longitudes meet at the poles. For latitudes they do not meet, so they are parallel. What again?

Student: They have equal length.

Teacher: They have equal length, anything? She is saying they have equal length. Do you agree that they have equal length?

Student: No, because they are parallel.

Teacher: (Laughs) because they are parallel they are not equal?

Student: No, I am not saying that; because of the spherical shape of the globe.

Teacher: (Yells) the spherical shape has done what?

Student: That cause it to ........ (Teacher cuts in)

Teacher: So what will you say to prove that they are not equal? Can you give an example?

Student: It is........ (Teacher interrupts)

Teacher: Let us see this and see that He draws the globe with the latitudes)

Student: If you consider the positions of the lines, one sees that the top line is shorter than the one in the middle.

Teacher: thank you. Because we said that the earth is not a complete circle and is spherical so the middle part opens more than the poles. So when you consider the equator and we measure round the earth and we take the length of the equator and that at the North Pole they will not be equal. You will see that the equator is longer that the one at the poles. So they are not equal in length.

Student: Latitudes are measured in degrees north and south of the globe

Teacher: Very good. North and south of the equator. When we take this as the equator (He points to the diagram of the globe on the Board) what is its value in degrees?

Student: Zero.

Teacher: So we can also write that the zero degree line of the lines of latitudes is the equator. In the same way, the zero degree line of longitude id known as.....

Students: (Mumbles)
Teacher: The Greenwich meridian. So the zero degree line is the equator. So when we are measuring we take the equator as the base; the starting point so we measure from zero to north and south from the equator. Are you listening?

Students: (In chorus) Yes sir.
Teacher: Very good, so they are measured north and south of the equator.
What again?
Students: (No response)
Teacher: We said that the lines of longitudes measure up to….. lines of longitudes measure up to….
Students: 180 degrees. (Others) 360 degrees
Teacher: 360 degrees. The lines of longitudes measure up to 360 degrees. So when we come to the latitude what can we say? Latitudes measure up to ….
Students: (in chorus) 180 degrees.
Teacher: 180 degrees. 90 degrees north and 90 degrees south. So when we start from the equator all the latitudes here we will term as North, North, North…. 1 degree N, 2 degrees N, 3 degrees N…. to 90 degrees N. and the same for the south; so we say they are measured N and S of the equator.
Any more?
Student: Sir, they are used in calculating times and positions.
Teacher: Is it time or position? (Teacher laughs). When we are talking about position we use longitudes and latitudes to determine position on the globe but when you are talking of time it is the longitude and when it comes to distance. So longitudes are used to calculate distance. They are used in calculating distance (Teacher says it 3 times). When we were looking at longitudes we said that an interval of what degrees equals what hours? We gave an example like that? (Silence in class) You will fail my quiz
Student: (in fear, inaudible and in pleading mood) No, sir.
Teacher: What interval of degrees equal what time?
Student: Please, you did not say that.
Teacher: I said it.
Student: No.
Teacher: I said it, when I said that they are used in calculating time, I didn’t give you an example… Yes, help us.
Student: 6 degrees is equal to 1 minute.
Teacher: is it six degrees? No, not 6 degrees.
Student: 15 degrees equals 1 hour.
Teacher: So 1 degree equals 4 minutes.
Student: Sir, I was right.
Teacher: Every 1 degree on the latitude is equal to what distance? Any ideas? (Silence)
Every 1 degree is about 111km. So, the longitudes are used in calculating distance, so if we are in Ghana and we know what latitude Ghana is, and maybe we are told on what latitude Nigeria is then we can calculate the distance between Ghana and Nigeria. Are you with me?
Students: Yes (In chorus)
Teacher: Knowing that 1 degree equals 111km and let us say Ghana is on 40 degrees N and Nigeria is on maybe 23 degrees N. then we should know the distance between Ghana and Nigeria by subtracting 23 from 40 and calculate with the difference by multiplying the difference by 111km. Are you with me?
Students: Yes sir.
Teacher: nobody will ask you this question so don’t worry. Later we will start the calculation so start going for your mathematical ideas these days. Anything to say about lines of latitudes and longitudes? Any addition or any question?
Student: They have equal intervals.
Teacher: They have equal intervals so the distances between them are the same. What again? We are moving on. Any question? Let’s move on.
Students: Yes sir.
Teacher: But let me remind you that we are the only class that has not written the quiz.
Student: Yes, sir.
Teacher: The other classes have written quiz, assignments, you have heard that…
Students: No, sir.
Teacher: if they have not told you, I have so we will do it.
Student: Ei!
Teacher: I told you we are slightly behind so I want us to move ahead a little “Na medze abɔ hom” (Akan expression meaning “and hit you with it”).
Students: Yes, sir.
Teacher: So any moment from now, we can write something. We can even write it now (he laughs) so get ready for it.

[The revision took 20 minutes of the entire class period]

Teacher: Today, let’s look at the structure of the earth (Teacher writes topic on the board). For sometime now, about two weeks we have been looking at the outside of the earth, shape, size, and others. Now we want to go to the inside of the earth [he turns to a student who is dozing and says, ‘master, don’t sleep). So we are going to see the earth as if we are gong to use a cutlass [machete] to cut through, into two and view the cross section. So we are going for a big chainsaw for the cutting. What is the arrangement within the earth? [He turns to the board and point to the drawing] take this to be the earth, what do you know about the inside of the earth? The inside of the earth, what can you say? [Teacher uses vernacular to explain the question] “No mu tse dɛn? (Akan literally means what does the inside look like?)
Student: I know there is a liquefied mass those…
Teacher: (Teacher interrupts) No! No! No!
Student: Liquid of fire… (Teacher completes with her] in the inside of the of the earth)
Teacher: What again?
Student: Heavy particles of blocks.
Teacher: So what is the structure? What is the alignment?
Student: They are made of layers.
Teacher: They are layers.
Student: That is the earth crust which is the core.
Teacher: Very good, yes.
Student: It is solid.
Teacher: The inside is solid, very good; so which is which?
Student: Liquid of fire and solid.
Teacher: (Points to a student) What do you also know? They are all right. So what we are going to do is to go into the structure of the earth. It is in layers as the gentleman said that they’re in layers. (Teacher draws the earth on the cross section of the earth). It is like when we cut through an onion. The earth has concentric layers. So how many layers does the earth have?

Student: Three major layers.
Teacher: Raise your hand to let me see you talk. Yes, woman.
Student: Three.
Teacher: Three, any different answer?
Student: Seconded.
Student: Sir, four (Emphatic)
Teacher: Four, yes.
Student: No, three.
(Silence)
Student: We are waiting for you.
Teacher: (Laughs) I know somebody will say four. One is divided into two. So there are three major layers. The core is divided into inner and outer but in any case they are the core. So we have the crust, mantle, and core.

Student: And even the mantle some books make it lower and upper mantle.
Teacher: In any case we have three layers and they what we just said. What did we say?
Student: (Chorus) earth crust, mantle, core.
(Teacher writes it on the blackboard)
Teacher: So we have the layers of the earth as the crust, mantle, and core.
The earth crust, what is it? What is it? Once upon a time you heard something about the earth crust what is it? The women are not talking. Where is Elsie?
Student: Gone out.
Teacher: Gone out. So Elsie is gone out nobody will talk again. The rest what are you doing? Yes, the earth crust what can we say about the earth crust?
Student: It is the outermost layer of the earth.
Teacher: That is the first layer. The earth crust is the outermost layer. It is the layer on which you are standing on. It is on which we do everyday thing. It is made up of continents, and the floor of the ocean. It is the main land on which we live and the ocean crust and meat the next layer, the mantle. How deep will we dig? So we are going to look at the thickness of the earth crust. Any idea of the depth?
(Silence ….. murmuring from students)
If we are digging through the earth crust, how deep will we dig? The thickness is from 16km and 40km. $40km on the continent but when it’s from the floor of
the ocean it is 16km. So the thickness ranges from 16km to 40km. Are you with me?

Students: (Chorus) Yes, sir.

Teacher: So that is the thickness of the earth. Now the mineral composition on the earth crust. What minerals are found in the earth crust? When we talk about the earth crust it is made up of what? Any ideas? Any body? Anybody to say something? You don’t know?

Student: Sulphur, bauxite, gold etc. silicon, aluminum.

Teacher: For mineral composition we have aluminum, as you said and silica. That is the composition of the continent (Teacher writes al for aluminum)

Student: Sir, it is capital Al.

Teacher: We are not doing science in social studies. This is what we write so take it as I have written. So the mineral composition of the earth crust is referred to as Sial (Si+al). Si for silica and al for aluminum. (Teacher sees somebody sleeping and shouts) Woman, woman, are you dreaming [class bursts into laughter] What is the time? We have ten minutes. So on the continent the mineral composition of the earth crust is sima and sial. Is it clear?

Students: (Chorus) Yes. What about the mantle?

Teacher: What we are saying is that we are looking at the earth crust. The mantle and the core we are taking them one by one and we started with the earth crust and we are describing what it is. I think it is clear now.

Students: Yes sir.

Teacher: Very good. So the earth crust is also called the lithosphere. Any problem? Any contribution? Anything you will like to add?

Student: I have heard of earth quakes and volcanoes and I have read from books that according to researchers it comes about as a result of sulphuric and magnum quantities in the earth and I want to know if they are part of the earth crust.

Teacher: They are not part of the earth crust, the minerals of the earth crust is what we have talked about. Maybe we will come to it sometime but the mineral composition is what I have said. Any other? Yes, the mantle. (some students stand to avoid sleeping) Sit down and write. What have you heard about the mantle? (A student tries to raise his hand) He is not sure so he can’t raise his hand properly. (He finds a student dozing) Gentlemen, sit up.

Student: It is made up of liquefied fire.

Teacher: ΕΕ! Somehow. Yes what do you also know?

Student: It is known to be the next layer after the earth crust and made up of heavy rocks.

Teacher: So what he is saying is that it follows immediately after the earth crust. After the earth crust when we go down we meet the mantle and is made up of very heavy blocks. And the composition?

Student: Iron and Nickel.

Teacher: Iron and Nickel is found somewhere else not in the mantle. The mineral composition in the mantle is only Olivian. The thickness of the mantle, are you listening? It is about 2900 km.

Student: Where does the digging starts?
Teacher: Where the crust ends. The mantle is also known as the methosphere. Is it time?  
Students: Yes sir.  
Teacher: Any question?  
Student: How did they measure the distance of the mantle, earth crust, and the core?  
Teacher: They use machines. We will continue.

LESSON ENDS

2) Sample Lesson 2

SUBJECT: MATHEMATICS (METHODS)  
CLASS: 2C  
CLASS SIZE: 52  
DATE: 12/09/06  
TIME: 9:00 A.M-10:00 A.M  
TOPIC: GENDER BIAS IN MATHEMATICS TEACHING

Introduction:  
Teacher enters the class and all students stand up to greet teacher.  
Students: Good afternoon, sir.  
Teacher: Good morning, sit down.  
Students: Thank you, sir  
Lesson Presentation:  
Teacher: Last we looked at the Developmentalist’s theory in relation to how children learn mathematics but when we come to the classroom we learn that we have two groups. We have the boys, we have the girls. Some of them stand out when it comes to mathematics learning. These are issue relating to gender. So you need to understand gender. So what is gender? Yes, Mavis (Silence).  
Student: sir, females and males.  
Teacher: Females and males. Yes… what is the meaning of gender?  
Student: Sex determination.  
Teacher: Any other?  
Students: (murmuring)  
Teacher: (Calls a male student). This man has characteristics which are different from this lady. What are some of his characteristics?  
Student: The gentlemen has flat chest while the lady has protruding chest.  
Teacher: Yes…  
Student: They have different reproductive parts  
Teacher: They have virgina, and you have penis.  
Students: (laughs)  
Teacher: These and others are some of the characteristics that distinguish the two genders. So gender is different characteristics attributed to boys and girls. That is gender. Have you understood that?  
Students: Yes sir.
Teacher: (Writes definition on the blackboard) gender is characteristics attributed to boys and girls. We are looking at terms related to gender. One, we have understood gender. What is gender bias? Because bias is something everybody knows.

Student: Sir, I don’t know.

Teacher: are you sure? If I give something to everybody in the class and I do not give you, I am trying to be bias. So how do you relate bias to gender?

Students: (Silence)

Teacher: Yes.

Student: Being specific on the type of a particular gender.

Teacher: What do you mean by specific? (no response) for example, if I come to class all the time I ask ladies questions, sometimes I ask only one or two men some questions, I am being bias. That is I am one-sided; that means I am being bias to boys or girls (Teachers reads definition from handout). So gender is given unequal opportunity to boys or girls.

Student: Sir, read the definition.

Teacher: (reads the definition).

Student: I think this is necessary because…

Teacher: (Interrupts) gender bias is necessary?

Student (Continues) because in the classroom it may be that the boys or ladies are actually sharp. For instance…

Teacher: (interrupts). What do you mean by sharp?

Student: They are very bright

(Class shouts on him)

Teacher: You reserve your comment we shall come to that. So what we are saying is gender is giving unequal opportunity to boys or girls depending on their social roles.

Students: (Still murmur about student’s comment)

Teacher: Gender balance (Teacher writes on the board). These issues are very important in the classroom because it will help you structure your lesson to benefit everybody in the class irrespective of their social roles. Once you have acknowledged the fact that there is gender bias, what we have to do is to create equal opportunities for everyone to participate in the learning process. When this is done it is gender balance. You have to balance your questions so that every lady or man can benefit. Gender balance is giving equal opportunity to all learners to participate in class (Teacher waits for learners to write down the definition). Gender sensitivity; what do you understand by being sensitive?

Student: Someone who is greater to emotional feelings

(Class laughs)

Teacher: Yes…

Student: Responses. Responses

Teacher: Yeah, being responsive to something we are relating it to gender. You have acknowledged that there is gender imbalance in class because whenever we come to class because of the nature of the mathematics we do being difficult you ask only boys questions to solve the problems and you have acknowledge
that this is happening in the classroom so what you are going to do is to be responsive so that everybody in the class can participate. So you have acknowledged that there is gender imbalance so you are trying to solve the problem by putting in some measures for all to benefit. So the acknowledgement that there is gender imbalance and there is the need to solve the problem is termed gender sensitivity.

Student: Please sir, repeat for us to write
Teacher: (Repeats) being acknowledged that there is gender imbalance and making efforts at correcting it.

Now we are looking at terms related to. Now raise your question.

Student: Sir, I was talking about gender bias and you said if you take a particular class, we have the low-minded, the average minded, and the high-minded (Class murmurs)

Teacher: (Teacher yells) please, listen.

Student: You see, the brilliant ones only partaking we have to pose questions to the average and low minded to see whether they understand or not.

Teacher: Yes, that is happening in the classroom but if we realize that some are low minded and all the time we give them simple questions we are not going to help that person that is why we are saying that if that happens we are being gender bias. What we are trying to do is to give equal opportunities so that those low minded can benefit from the lesson and become high-minded. So if you always assume that people are low minded and therefore you give them simple questions these people will never, never pick up. So as a teacher in the classroom we have to be sensitive to all children. If you always think a particular group is supposed to be like this, this is gender stereotype. These are fixed set of ideas which are sadly believed to be true which is not true. What we are saying is all the time we see women in the kitchen while boys are busy working in their rooms. This does not necessarily mean men can not cook but we have fixed idea that women’s place is the kitchen. That is what we term gender stereotypes. There is a fixed set of ideas about boys and girls which are sadly believe to be true (Teacher dictates for learners to write the definition) and that is what exactly this man is saying.

Student: Sir, repeat the sentence for us to write.
Teacher: If in the community women are operating machines, women can also do it but there is a fixed idea that women can not operate machines.

Student: At first, I said that there should be gender bias because if you think the girls are good in mathematics, why not concentrate on them?
Teacher: No, that is gender bias. What we are saying is that as a teacher you are in the classroom and have acknowledged that there is gender bias we have to balance it by creating equal opportunities for both. So we are going to look at the reasons why girls do not do mathematics. Yes….

Student: Sir, it is put at the back of their cognitive faculty that (other students shout)
Teacher: Hmmm…

Student: (Continues) (There is murmuring in class)
Students: Bring the words, **tutu bra** (Akan phrase meaning pull and bring – dig and bring out the big words)

Student: (Continues) they actually not good in mathematics.

Teacher: Yes, any other? It is a good contribution.

Students: Mathematics involves much thinking and ladies do not want to think much (murmuring among students).

Teacher: Ladies are they true?

Student: (A lady student) because if I get it wrong they will laugh at me.

Teacher: But you can also think. Yes, any other?

Student: They see mathematics to be abstract.

Teacher: Yes…

Student: Mathematics involves much calculation and women feel lazy to calculate.

Teacher: (Laughs).

Student: They also think mathematics belongs to men.

Teacher: Mathematics does not belong to men.

Student: (lady) We like reading that calculation.

Teacher: All these ideas you have brought forward has be done by a man called Cockport. He did a research on gender issues in mathematics and brought the following reasons.

Students: (They take their pens and notes and began to write)

Teacher: (Dictates notes for learners) All you have said is contained in Cockport’s research. (A student asks a colleague what the teacher said). Be quite and direct everything to me. Once we have seen the reasons, let us see strategies we can use to solve the problem. Let us get ideas.

Student: This is why the question I asked comes in. This is why we have to consider gender bias by considering only the girls so that they will get the interest in mathematics.

Teacher: No, you don’t need to be gender bias because if this happens you will have to concentrate on the boys also so you have to create a balance opportunity for all. Yes, any other?

Student: I don’t think that, because if you give any difficult subject the ladies will move away from it (Teacher interrupts).

Teacher: But we are doing mathematics so we are interested in mathematics.

Student: So the real issue is their conception towards mathematics.

Teacher: (Yells) This is the conception they have. It does not mean they can not do it so we have to encourage them.

Student: We have to give them more opportunities. We have to prevent hectic approaches to solving mathematics problems.

Teacher: What do you mean by hectic approaches? Difficult ones?

Student: Yes.

Teacher: If you don’t take care you will scare them.

Student: I said to prevent.

Teacher: I thought you said to provide. Yes, any other?

Student: Use of proper materials.
Teacher: Proper materials like….
Student: Using books which give emphasis to women in mathematics.
Teacher: Any other?
Student: Making mathematics teaching and learning more activity oriented and refrain from making it abstract.
Teacher: We have to encourage them to answer questions. Yes…
Student: Girls should involve themselves in mathematics and continuously practice what they are giving.
Teacher: (Dictates strategies for encouraging girls to do mathematics to class) … materials should be girl-friendly.
Student: Give us concrete examples because we want to put this into practice when we go out.
Teacher: Concrete examples like….
Student: Like an attractive girl-friendly material.
Teacher: Qnaree rod that is standard.
Student: Sir, what about chart.
Teacher: If its cards, they can be of different colors. We are trying to do that to attract pupils’ attention. Use also flowers, the ladies like flowers (Teacher continues to dictate notes).
Student: Changing the position of girls to work with boys who are good in mathematics will also work.
Teacher: That is also good. In the classroom we can let them sit among the boys and not grouping themselves at one place.
Student: I think we can give cheap questions to the girls in terms of mathematics.
Teacher: Cheap questions to girls and difficult ones to boys?
Student: That will create imbalance.
Teacher: Yes, if the questions are even difficult, find a way which will help them to understand what you mean.
Student: At times we have to consider them.
Teacher: I am not saying we do not have to give them difficult questions but to make it easier for them to answer.
Student: When you pair them with those who are intelligent they will copy from them and you will think they are doing well.
Teacher: That is why you do not have to copy from them.
Student: Sir, if you are given examples make sure they are girl-related.
Teacher: That is very good.
Student: Yet the market issue has come to his example which indicates that women are always in the market.
Teacher: What market issue? What is more important is making the material girl-friendly.
Student: Sir, it is time. Some of us have another class.
Teacher: We shall continue next week.

LESSON ENDS
3) Sample Lesson 3

SUBJECT: SCIENCE (METHODS)  
CLASS SIZE: 51  
DATE: 12/12/06

TOPIC: IMPROVISATION OF TEACHING/LEARNING MATERIALS

Introduction:
(Teacher enters the class. Students get up and greet. Teacher responds and asks class to sit down)

Teacher: At our last meeting we talked about teaching learning materials and their importance in teaching and learning. Today we are going to talk about improvisation for teaching learning materials. When you are sent to a school and you are teaching and there are no teaching learning materials do you say well there are no TLM so I should forget about it?

Students: (Chorus): No sir.

Teacher: What do you do?

Students: (chorus) We improvise.

Teacher: Yes, so we are going to talk about improvisation. So what is improvisation?

Student: Sir, using the materials available in the natural environment to teach a lesson to bring the same effect as the commercial ones.

Teacher: You use the materials in the environment to teach your science so that you get the same learning effect as the original or commercial materials. Any other? Any addition? Aha! What do you also say?

Student: Modifying something in the environment to teach to bring the desired effect as the original teaching learning material.

Teacher: you are also saying modifying things in the environment to help you teach your science. Yes, any other?

Student: Replacing the commercially prepared ones with those in the locality to teach science.

Teacher: You say something we pick from the environment and use to teach science to bring the same learning effect. All the answers you gave are true. They are very, very right. Now, when we talk about improvisation, just as our friend said they are making use of available materials of the local environment to bring about learning effect which the original could have done. That is improvisation. Now our friend suggested that there are types. So let us look at the types [teacher writes the topic on the board]. Depending on the way you approach it, we have three main types. These are substitution. What then is improvisation by substitution?

Student: It is replacing the originally prepared one with something from the environment to bring about the same learning effect.

Teacher: Yes, right. It is something we take from the environment to replace the original one. Any example?

Student: using rain or purified water in place of distilled water.
Teacher: Yes. When we do this we are substituting the rain water for distilled water. When we do that we are practicing improvisation by substitution. Let’s look at modification [Teacher writes on the bb]. How do we explain that too?

Student: I think it is changing part of equipment [teacher cuts in]
Teacher: Are you suggesting or asking?
Student: I am suggesting.
Teacher: don’t say I am suggesting again. Say that I am saying. You must be bold.
Student: It is changing part of an equipment to make it work like the original one.
Teacher: to change a part of equipment for a specific function. Adding or taking a part of an original material for a specific purpose. This is what is termed improvisation by modification. I hope that is clear.

Students: [Chorus] yes sir.
Student: the modification; the new one that you have prepared, is it the natural one or [teacher interrupts]
Teacher: Oh! It can be anything you pick from the environment. The idea is that the material is for a specific function so you add something to it to use for another purpose. Now the last one is improvisation by construction [teacher writes on the bb]. How do we explain that too? Nobody? [Teacher continues] Let’s say you are posted to the village school where you will not get this object [Teacher shows them a globe] but it is not available. What do you do? So you look for materials in the immediate environment; get something and make it look like a globe. Sometimes you can go to the local carpenter and say papa Carpenter, this is the picture of what I want to make to teach a lesson can you, please construct a similar thing for me? When it happens this way it is termed improvisation by construction. For example, if you need a funnel for a lesson and there is none in the school, you can cut the top of a frytol oil plastic container and use it as a funnel. When we do this we are improvising by construction. So that is it. Any question?

Student: No.
Teacher: Let’s go on and see the principles behind improvisation [Teacher writes principles behind improvisation on the bb]. The first principle to consider is workability. Whatever improvisation you do must be workable. It should work like the original one. Don’t just take anything because you want to improvise. Make sure it will work like the original one and bring the same learning effect. The second principle is where and how you are going to use the improvised material. First, where? Where are you going to get the material? So where do you think we should go for the materials?

Student: Workshop.
Teacher: What workshop?
Student: the carpenter’s workshop.
Teacher: So we have the carpenter’s workshop and all workshops around.
Students: The market place.
Teacher: The market place. You go to the market and collect materials like pieces of foams, cellophanes etc. and hospital and many other places. Then the question is how.

Student: Ask school to buy.

Teacher: if you ask the school to buy then it is not improvisation. Also, you can ask the pupils to bring them. For example, you are teaching and you need a beaker, you can ask the children and they will bring graduated cup from their homes which you can use. The third is consultation. You can consult people who have technical know how. For example, you want to prepare something and you have no idea about it, you can see the local carpenter who can prepare it for you. You want an electrical board. You can see the local electrician for help.

Student: sometimes they will not want to help.

Teacher: Humble yourself before them and they will help. So the principles we have seen so far is workability, where and how, and construction. Any question?

Student: What about when we are on practical teaching?

Teacher: you are free to consult people with technical know how in the school here; the carpenter, electrician etc. These people have more knowledge in the material you want to prepare than you think of. Even you can use them as resource persons. Any other?

Student: You made mention that when getting the materials it should be free. Can you elaborate that?

Teacher: We are saying that if you are going to improvise, the material should be free. What we mean is that you don’t need to take a big sum of money to buy new materials. If you do that it is no more improvisation so you need to consult the folks.

Student: Sometimes the original material costs 10,000 cedis but the improvise costs 100 cedis. What do you say about that?

Teacher: What do you think? We are not looking at the cost but using something that will work as the original.

Student: Sir, you say we are not looking at the cost but you will still buy some other items like glue for instance which also costs. Some times some improvised material may cost close to the original.

Teacher: This is why we say consult people with technical know how who will help you with the construction of the material for class and he will be willing to help.

Student: Sometimes some of them will charge you [teacher cuts in] 

Teacher: You may be thinking they will charge but approach them and see.

Student: Sometimes in improvisation money involved if even it is little, should it come from the pocket of the teacher or the school? 

Teacher: It should not come from the teacher so you should ask for it when you go.

Student: Sometimes using the local materials available to bring about the desired learning effect… [Teacher interrupts] 

Teacher: The same learning effect, make sure the improvise material brings about the same learning effect. Let us go on and see the rationale for improvisation. [student responds] if you want to talk, put up your hand and I will call you.
Student: To make material durable to replace the fragile ones.
Teacher: You know in our school the children are so many so we need a durable material that is why we sometimes improvise. Yes. Any other?
Student: It makes the teacher resourceful.
Teacher: Yes, the teacher has to a lot of looking round to get the needed materials to use to improvise. Any other?
Student: It makes the teacher do advance preparation before coming to calls.
Teacher: That is right. Any addition?
Student: Why don’t you and other teachers do improvisation when teaching us? [Class laughs]
Teacher: We will talk about it later. Any other question or comment?
Student: Improvisation cuts down cost.
Teacher: Yes, it cuts down cost because the teacher uses other things which are not costly. The school can then use the saved money to procure other vital things. Yes………………
Now let us look at the importance of improvisation.
Student: Is it only the commercial materials that we can be improvised?
Teacher; Mmm, what do you think? Asking whether it is only the commercial materials we can improvise. We can improvise anything.
Student: Sir, I think we can improvise anything that we want to use which is not available to us.
Teacher: Sometimes we can not improvise anything depending on the local materials available. You can not improvise when the materials you wan to use are not available in the locality.
Student: I think we should not restrict ourselves to our immediate environment. If we can’t get in our locality we have to go out and search for some.
Teacher: Yes, but some materials are more available in some areas that others. It is not because of that that you will travel far to look for the materials when they are not available in the environment. Remember we said an improvised material should not be very expensive but if you are traveling to that place for a week end yes you can get those materials. If you think traveling for the materials will cost more forget about it. Can we go ahead and look at the importance?
Student: What is the difference between the importance and the rationale?
Teacher: The rationale deals with the why while the importance is about the benefit we get by using improvised materials. If the materials are available you need not improvise because it brings the context. It makes learners actively involved in the lesson because they interact with the material. It also ensures understanding of the lesson since things which would have been abstract are made practical. Learners see things firsthand. I have opened the gate, now what are the other importance?
Student: it makes learning very interesting.
Teacher: It makes learning interesting. Can you explain that?
Student: Because the materials are in the classroom children are happy to use them. Since the learners were part of getting the materials they are interested to see how they are used.
Student: It makes learners pay attention in class.
Teacher: Any other?
Student: It makes science learning practical.
Teacher: Yes…
Student: It avoids breakages.
Teacher: Very good. Because the materials we make are durable we are not afraid that the children will break them and cost much to the school. Improvisation can also help learners to acquire creative skills.
Student: the child will not be involved in the preparation of the material. How will his creative skills be improved?
Teacher: He will interact with them in the classroom. Any question up to this point? Now let’s look at the designing characteristics of improvising materials. Materials we improvise should have certain characteristics. What are these characteristics? The ladies do not want to talk so I will call on them.
Student: Durable.
Teacher: Durable; can you explain?
Student: The materials should be strong to last longer.
Teacher: Any addition to the material being durable.
Student: the material should be safe to use. Something that will not hurt or cause paint to the learners.
Teacher: Yes, safety must be essential
Student: workability.
Teacher: Should help achieve the objective of the lesson.
Student: Workability can also mean easy to work with.
Student: Portability.
Teacher: What do you mean?
Student: Should be able to be transferred from one point to another easily.
Student: It should be attractive.
Teacher: Can you explain?
Student: Something which is nice and will make children want to use them.
Teacher: availability is also essential. The materials you use should be available in the environment.
Student: Consider diversity to suit all children.
Teacher: The material should be free from bias to a particular group of students in class.
Any question? Okay, let’s continue. Let us recap what we have done today. What is improvisation?
Teacher: If you talk about replacing, modifying and making use of, you are out of the marking scheme
Student: Using materials found in the environment to bring about desirable effect in learning
Teacher: Out of respect I will give you 10 points. [Class laughs]. Any body?
Student: It is using available local materials in the environment to bring about the same learning effect as the original material.
Teacher: I am asking you to be very careful. When they [referring to examiners] ask you what is improvisation and you start using replacing, modifying etc. you are out of the range.

Student: Sir, What then is improvisation? What is in the making scheme?
Teacher: Oh! So you want the marking scheme? Didn’t you hear what your friend said?
Student: It is the utilization of available materials … [teacher cuts in]
Teacher: My friend, what is different from what your friend said.

[The class laughs and a students says]
Student: ɔkae sɛ utilization na yɛntee bi da anaa? (Akan sentence literally meaning He thinks we have not heard the word utilization before?). [The entire class laughs and the teacher continues with his teaching]…
Teacher: Let us write what we have discussed so far. [Teacher dictate note for learners to write]

LESSON ENDS