UNIVERSITY OF CAPE COAST

INFLUENCE OF TRADITIONAL AND RELIGIOUS BELIEFS ON STUDENTS' LEARNING OF SCIENCE: A CASE OF TAMALE COLLEGE OF EDUCATION

MOSES KOJO ASARE MABEE

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BY

MOSES KOJO ASARE MABEE

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2014

DECLARATION

Candidate's Declaration

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

Candidate`s Signature:……. Date:……

Name: Moses Kojo Asare Mabee

Supervisor`s Declaration

I hereby declare that the preparation and presentation of the dissertation were in accordance with the guidelines on supervision of dissertation laid down by the University of Cape Coast.

Supervisor's Signature ……..... Date. ……..

Name: Mr. Richmond Quarcoo-Nelson

ABSTRACT

Ghana, like any other developing country, needs to give particular attention to the study of Science in the various educational institutions, and provide the necessary conditions which promote effective teaching and learning of the subject. However, there seems to be a conflict between science and the belief systems of students in the learning of science. The purpose of the study was to find out the influence of traditional and religious beliefs on the learning of science by students in Tamale College of Education.

The sample size of the study was 70 and comprised of first and second year students of the college. A questionnaire was used to collect data which was analysed and presented in tables with brief explanations. The findings showed that traditional and religious beliefs have an impact on the learning of science by students involved in the study. For instance, the belief that pregnant women who eat eggs or snails will give birth to thieves had both negative and positive impact on the students' learning of science at the College .Among others, it was recommended that public fora should occasionally be organized to educate people on the effects of certain cultural beliefs.

ACKNOWLEDGEMENTS

The production of this dissertation is the fruit of the immeasurable contributions of many academicians whose ideas, perceptions, experience and efforts I have relied on. I am most grateful to all of them for their important contributions.

It is not possible to list the name of everybody who has contributed in diverse ways to this work. However, my heartfelt gratitude goes to Mr. R. Quarcoo-Nelson, my supervisor, at the Department of Science and Mathematics Education of the University of Cape Coast. His constructive criticisms coupled with his resourcefulness, optimism and special knowledge and rich experience has had a positive impact on my final work. I wish to register my sincere appreciation and gratitude to all.

DEDICATION

I dedicate this work to all the science tutors of Tamale College of Education.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

The background to the study, the statement of the problem, the purpose of the study, and research questions are dealt with in this chapter. The significance of the study, delimitation, limitations and the organization of the study are also highlighted in this chapter.

Background to the Study

The development and application of science is recognised worldwide as vital for a nation's development. When used effectively science is able to improve productivity and meet the needs of society. This has been demonstrated in developed countries where science and technology have been responsible for more than half of the increase in productivity (Joof, 2007).

Since Ghana attained independence, it has pursued various developmental strategies including the adoption of science and technology and industrialisation policies. Science education in Ghana has gone through many changes over the course of history. These changes were influenced by political, academic and societal pressures. Each period brings with it a renewed interest and desire to improve what takes place in the classroom. Since the implementation of the Educational Reform in 1987, Science has been viewed as a fundamental aspect of our culture and is therefore an essential part of the curriculum (Ministry of Enviroment, Science and Technology, 2000).

During the first quarter of the 20th century, population and industrialization continued to grow rapidly. Technological advancement and development flourished in the wake of the automobile, oil, rubber, steel, chemical and electronic industries. These technological and industrial growths were associated with advancement in science. It is therefore not surprising when much emphasis is being placed on science and technology, and the acquisition of vital scientific practical skills by educational authorities.

Any country striving to develop in order to raise the standard of living of its population and maintain a balanced economy must as a matter of absolute necessity adopt science and technology as the basis for achieving sustainable development. This seems to be the message from countries which have transformed their economies from a developing to a developed one.

Since the attainment of independence, successive governments in Ghana have endeavoured to make science and technology a critical basis for the county's development. The National Research Council was established in 1958 with the broad aim of coordinating scientific research to support the country's development. Out of the Council, we currently have the Ghana Academy of Arts and Sciences and the Council for Scientific and Industrial Research. The Noguchi Memorial Medical Research Institute, the Ghana Atomic Energy Commission, the Ghana Standards Board and the Cocoa Research Institute of Ghana have all been established over the years to promote scientific activities geared towards specific sectors of the national economy.

Science education has also been deemed to be an important aspect of the national programme for introducing science and technology into the

country's development efforts. Both at the secondary and tertiary levels, capacities have been developed to ensure that the country has a high caliber of technical and scientific personnel needed for her to achieve her development objectives.

These measures, unfortunately, have had their attendant problems, mainly that of finance. Though the Lagos Plan for Action called on African countries to devote some 1% of their Gross National Product for scientific and technology activities, over the years Ghana has only been able to make available an average of about 0.3% of her GNP to support the country's science and technology programmes. Another area, which has affected the country's science and technology efforts, relates to coordination of these activities. Essentially, there was no coordination mechanism to make it possible for activities to be integrated to reduce duplication of efforts and to promote synergy.

Despite the various actions taken by successive governments, Ghana, unlike countries such as Singapore, South Korea and India, has not been able to develop the scientific and technological base fully to address the country's basic human needs of food security, shelter, clothing and transportation. This need has been understood in Ghana's Vision 2020, the long-term programme of objectives for Ghana, which stakes its achievements on the adoption of science and technology as the tool by which socio-cultural and economic problems of the individual, the community and the nation will be solved.

It is this aspiration of Vision 2020 which has called for the formulation of a science and technology policy for the country. The implementation of the policy is envisaged to move the country's economy to a middle-income status

and an immersely improved standard of living by the year 2020. The science and technology policy outlines a clear vision, goals and objectives and policy measures which if well-articulated will enable Ghana to realize her dreams. In addition, the policy calls for the establishment of mechanisms for the finance, management and evaluation of the performance of science and technology. The document also outlines sector-specific policy objectives and strategies which have been developed collaboratively with various stakeholders. Recognising that science is dynamic, the policy needs to be reviewed periodically to meet the challenges of change taking note of the fact that the world is gradually becoming one global village (Ministry of Environment, Science and Technology, 2000).

In view of the critical role that science and technology could play in economic and industrial developents to achieve the objectives of Ghana's Vision 2020, it is imperative to build up sound national programmes and infrastructure. The science and technology policy, among other things, focuses on addressing the basic needs of the people, especially those who are less able to assert themselves in the national economy. At the same time, the policy seeks to maintain a competitive stature in the global market.

The Ghanaian is noted for his capacity to modify existing systems to achieve specific goals, a characteristic which needs to be appreciated and nurtured for the good of the country. The national policy, therefore, puts innovation above all else, and reveres it as the critical force in national development.

Science is necessary in all aspects of human development. In response to this, Ghana has designed and maintained a compulsory integrated science

curriculum for all pupils from the basic schools up to the second cycle institutions. This is to pave way for national growth and development, healthy living and disease- free environment.

Since science and technology form the basis for simple logical thinking and action, it means that scientific and technological literacy is necessary for all individuals especially in developing countries which have to move faster in an attempt to raise the standard of living of their people. Integrated science is the fusion of the major branches of science. The study of science at the basic school level equips the young person with the necessary process skills and attitudes that will provide a strong foundation for further study in science at the junior high school level and beyond.

The study of science helps to understand the natural world and secondly helps to approach challenges in life and in the workplace in a systematic and logical manner. Development in the current world is knowledge- based. Knowledge is gained through the use of science and technology. More knowledge then helps nations to advance faster on the road to increased development and progress. For a country to develop faster, it is important for students to be trained in the processes of seeking answers to problems through scientific investigation and experimentation. The science syllabus at the basic school level is a conscious effort to raise the level of scientific literacy of all students and equip them with the relevant basic scientific knowledge needed for making valuable contributions to production in the country. Scientific literacy also provides excellent opportunities for the development of positive attitudes and values in the youth.

It is usually said that "a teacher cannot enlighten his/her students if the teacher is ignorant" (Farrant, 1980). The science teacher must therefore be well-equipped in scientific concepts to make teaching and learning meaningful. A well-structured activity saves the teacher much effort in explaining all the various concepts since students find out certain information for themselves by performing activities using concrete objects. This makes learning meaningful to students. As the saying goes:, "what I see I remember, what I hear, I forget, and what I do, I understand".

Despite the efforts to boost students' confidence in science, most of them still have a misconception about science as a discipline. This negative attitude towards science influences the performance of students at all levels of science education in Ghana. Also, many of the cultural beliefs and practices that pupils learn at home affect their performance in science (Asimah & Owusu, 2010). This turn of events in students' poor performance in science at the junior and senior high school levels has become an issue of concern to science educators, parents, government and other stakeholders, each of whom is making a huge investment in education.

In recent times, there has been a growing public anxiety about the teaching and learning of science in Ghanaian schools. Studies show that a large number of students seem to learn very little at school; learning tends to be by rote. For that matter, students find the learning of science to be difficult (Fiador, 1998). Studies have also shown that many of the cultural beliefs and taboos that pupils learn at home influence their learning of science (Asimah & Owusu). Students of Tamale College of Education come from different cultural backgrounds. These students may hold firmly certain cultural beliefs

which may have an influence on their learning of science. There is therefore the need to find out the influence of traditional and religious beliefs on the learning of science by students in the Colleges of Education in Ghana.

Statement of the Problem

Science has greatly affected the way man thinks about the world. Over the years scientific findings have increasingly influenced philosophical and religious thoughts about the nature of human beings and their place in the universe (Bunnet, 2002).Until the very recent past there has been little debate between culture and science education. According to Jure (2003), this scenario is now changing because students who live in communities in which traditional practices and beliefs guide daily actions are being exposed to science.

For students in traditional setting (ie,settings that are mainly non-industralised), daily living is guided at least to some extent by knowledge system that is different from conventional science taught in schools.Even students who live in Western (Euro- American) settings may sometimes draw on common sense knowledge in making some of their decisions. According to Jure (2003), if meaningful science programmes are to be devised for such students, then their background experience must be considered.

Public acceptance of scientific facts may be influenced by religion.Many people in the United State of America rejected the idea of evolution by natural selection especially regarding human beings because of their religious faith (Barry,2008).Olugbemiro (2005), pointed out that science education that incorporates socio- cultural beliefs and practices can help; access different ways of thinking about scientific concepts,bridge the gap

between cultural beliefs and conventional science and draw upon cultural experiences of students to promote the learning of science.

In Ghana , pupils learn many cultural beliefs and practices in their homes. Pupils with these beliefs and prejudiced minds come into conflict with the science they learn at school. Scientific research has shown that many cultural practices that pupils learn at homes have an influence on the manner they learn science in school (Asimah,2006)

Students in Tamale College of Education come from different cultural settings.The socio- cultural beliefs and practices of these students play a role on the way they learn science. For example,during instructional period, the following ,among others were noted

1. Misfortunes such as miscarriage, infertility,convulsion, etc, were attributed to either the work of gods, or witchcraft
2. The formation of eclipse,rainbow, rainfall and the occurance of earthquake were given religious or traditional interpretations contrary to scientific view.
3. Religious beliefs of some students could not permit them to mention vigina, penis, testis and clitoris.
4. Most students firmly believe that daily activities of humans are guided by angels.In many instances,attempt to give scientific explanation to these beliefs proved difficult.

The study was thus designed to examine the influence of traditional and religious beliefs on the learning of science by students in Tamale College of Education.

Purpose of the Study

The purpose of the study was to determine the influence that traditional and religious beliefs might have on the learning of science by students in Tamale College of Education.It sought to examine both the influence of positive and negative beliefs on students learning of science in Tamale College of Education.

Research Question

The study was based on the following question:

What influence do traditional and religious beliefs have on students' learning of science in Tamale College of Education?

Significance of the Study

The findings of the study will be made available in the library of the Tamale College of Education, Bagabaga College of Education and Bimbila College of Education to make other researchers have available information on any influence of traditional and religious beliefs on students' learning of science. Valuable information will also be made available through publications, seminars, etc to classroom teachers in Tamale College of Education in order to promote the teachers' knowledge in science and belief system. The findings of the study will also be a rich source of information for students in Tamale College of Education.It will enable them educate members of their societies on the influence of traditional and religious beliefs on the learning of science in Tamale College of Education.

Delimitation of the Study

Dusick (2006), stated that delimitations are those characteristics selected by the researcher to define the boundaries of the study.The following

delimitations were defined to help confine reviewers to specifics,so that they could understand the focus of the study

1. Considering the envisioned significance of the study, all colleges of education in Ghana should have been involved. However, the population of the study was restricted to Tamale College of Education because of inadequate time and funds.
2. A sample size of 70 students made up of 35 males and 35 females from the first and second year group only was used.This was because the third year students were on an out segment programme so it was difficult to involve them.
3. The study employed the questionnaire to solicit views from students on how their belief system influence the learning of science.The study did not seek to address how these beliefs affect the academic performance of students.

Limitations of the Study

Dusick (2006), defined research limtations as those elements over which the researcher has no control. To further explain this point, Dusick asserted that in most instances, any assumption the researcher makes becomes a limitation. Since assumptions are inevitable in empirical studies, this study had some unavoidable limitations. Some of these limitations are:

1. It was assumed that the population for the study is homogenous in character, and hence the sample size was not very large. If this assumption was wrong, then the data may not effectively represent a large population, and consequently generalization of findings over a very large population would be inappropriate. However, the population

was limited to only one college in Ghana, hence reducing the socio – cultural and socio – economic heterogeneity of the referred population. This was to ensure that the ensuring generalization could hold, at least within the context of the referenced population.

2. Most of the items in the instrument were the close – ended type. The respondents were constrained to express divergent opinions on how their belief system influence the way they learn science. Divergent opinions could have enriched this study.
3. Some respondents showed negative attitude to some items in the questionnaire, ie they did not respond to those items. Responses to those items might enrich the findings.
4. Anohter limiting factor is that conclutions and generalizations emanating from this study are in respect to only students in Tamale College of Education.A much broader sample size to include other colleges might produce different results.

Organization of the rest of the Study

The work is organized in five chapters. Each chapter indicates some aspect of the research topic.

Chapter Two deals with review of related literature. This basically is about what other people have said or written on the topic in terms of theories, concepts or ideas and empirical evidence (scientific research studies). Chapter Three consists of the methodology of the study. This chapter describes how the entire study was conducted. It includes the research design, population and sampling techniques, research instrument and data collection and data analysis procedures.

Chapter Four is the results and discussion stage. It involves a description of the data obtained from the respondents through the use of tables and graphs, the aspects of the problems addressed and the general outcome of the results. Chapter Five, which is the last chapter, contains a summary of the entire study, conclusions, suggestions and a recommendation for future studies.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter discusses the related literature to the study. It focuses on the meaning of science, the history of science, process of science, product of science, the characteristics of scientific knowledge and basic assumptions of science. It also covers the importance of science, traditional knowledge and beliefs, characteristics of traditional knowledge and beliefs, relationship between science and traditional beliefs in the learning of science as well as relationship between traditional beliefs, religion and science.

Theoretical Framework

Science

The definition of science varies from one scientist to another. To some, science is an organized body of knowledge. To others, it is the search for meaning or explanation of events in nature. Sonnes and Stevenson (2004) in the Concise Oxford English Dictonary defined science as the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experimentation.

Science can be defined in terms of its processes and methods. It can also be defined in terms of its products such as facts, concepts, laws, theories, generalizations and conclusions . Another definition is that it is man's attempt to understand the universe. The universe is indeterminate and has no end.

Science is man's way of solving problems and predicting as well as explaining natural phenomena.

One school of thought believes that true science can be recognized by its methodology. This methodology is known as the experimental method based on a theory. This theory must be built on and tested against the result of observations and experimentation. That school of thought believes that true science is defined simply by its content, for example, physics, chemistry, biology, geology, anthropology and many others. Thus, the content defines the science (Ladyman, 2008).

Science can be grouped broadly into two main branches. These are pure science and applied science. Jenkins and Nelson (2005) see pure science as a body of established scientific research studies. Applied science uses scientific knowledge from pure science to solve problems in our daily lives.

Science can also be put under two fields. These are natural science and social science. Natural science deals with problems of nature. Examples are biology, physics, chemistry, geology, astronomy, etc. Social science deals with problems of human society and social relationships. Subjects within the field of social science are economics and politics. Both natural and social scientists use the scientific method or processes to acquire knowledge and achieve their objectives. However, their products or findings differ. The findings of the social scientists are not reliable. It is also not reproducible because the taste of people changes with time. The products of natural scientists are universal, can be reproduced, predictable and reliable.

History of Science

Many of the ingredients of what is regarded as science now were certainly present in the practices of people who lived in the pre-Greek times. Pieces of ancient and medieval knowledge for all practical purposes were identical to what would now be known as science. Although differences exist in what used to be known as medieval and premedieval science and today's science, the expression "science" or "natural science" in the context of antiquity in the middle ages are the ancestors of modern scientific discipline and therefore they are integral part of human history. What we call science today emanated from pre-historic science (Lindberg, 2007).

The way early generations approached nature may be different from the modern way. During the medieval times they were engaged in philosophy. Ancient and medieval scholars engaged in natural philosophy. They preoccupied themselves with questions of cause and materials things rather than engaging in mathematical analysis of things.For example, they were preoccupied with thoughts such as the causes of day and night, causes of diseases and identification of poisonous and non-piosonous herbs . Pre-historic people developed technologies for obtaining food, shelter, medicine, etc. and these technologies sustained them. Examples are how to gather fruits, how to make fire, how to make tools, etc. They studied the behaviour of the animals they hunted, and learnt to distinguish between poisonous and therapeutic herbs. They also developed a variety of crafts including pottery, weaving, metal work, etc. They were also aware of the seasons, and the perceived connection between the seasons and various celestial phenomena.

Prehistoric people were very familiar with their environment and were also very curious about the world around them. One can engage in a successful venture without knowing why the venture was successful. So we can say that practical rules can be effectively employed in the face of total ignorance in the theoretical principles underlying the operation of the venture. Thus, one can have the "know-how" without theoretical knowledge (Ladyman, 2008).

They relied much on oral tradition and this has the limitation of being distorted, but it serves as a repository of collective experience and the general attitude of general beliefs and values of the community. These achievements marked the beginning of science, and were among the first attempts by man to understand and control nature (Nault, 1999). In general, mathematics and medicine were the first sciences to be developed, followed by physical science, life science and the social sciences.

The Greeks left the greatest scientific heritage of all the ancient peoples. The Greeks stressed the development of general theories about the working of the world. They were the first to begin the systematic separation of scientific ideas from superstition (Ladyman, 2008).

About 400 B.C, a Greek physician named Hippocrates taught that diseases have natural causes and that the body can repair itself. He was the first physician known to consider medicine as a science apart from religion. Greek philosophers studied many areas of science. Aristotle gathered vast amounts of information about the variety, structure and behavior of plants and animals. He showed the need for classifying knowledge and recognized the importance of observation. He also developed deductive logic as a means of reaching a conclusion.

Although the ancient Greeks made many important scientific advances, their approach to science had limitations. Believing mathematics to be eternally true, unchanging knowledge, the Greeks never saw that it could be used to analyse the physics of motion and other constantly changing properties of nature. Nor did they discover the importance of testing their observations systematically. Many of their conclusions were false because they were founded on common sense instead of experiments. For example, Aristotle mistakenly thought, on the basis of common sense, that heavier objects fall to the earth faster than lighter ones (Wayne, 2001).

During the dark ages, the word of the scholastics was considered as final. The general philosophy of the times was "accept and inquire no further". It was not until the solar system was found to be incommensurable with the pronouncements of Plato and Aristotle that mankind began to inquire about the universe. This was the dawn of the scientific age. Science with its emphasis on observation and experimentation, as opposed to purely reflective thought, provides man with the only universal truth (Bennet, 2002).

According to Nault (1999), Aristotle was a tireless scholar, and a controversial public figure. He was driven by the desire for knowledge. His influence was enormous and his thinking directed science for almost 2000 years. It must be noted that Socrates, Plato and Aristotle were philosophers rather than scientists.

Scientific progress is faster today than ever before. This progress is reflected not only by many discoveries made each year but also by the thousands of scientists involved in research and by the vast sums of money spent on scientific work. As the number of scientists have grown cooperation

and competition among them have become increasingly important. Many recent achievements have resulted from scientists working in research teams. Hundreds of scientific journals, professional societies and computerized information systems make it possible for scientists to exchange information quickly and easily.

Increasingly powerful and advanced equipment is helping scientists in many different fields expand our knowledge about the world. The science of today and tomorrow promises to continue to improve our understanding of the universe and to give us ever greater control over nature.

Science is always and often connected to craftsmen and scholars. Science had its historical roots in two sources. The first is the technical tradition in which practical experience and skills are handed on from one generation to another. These skills and practical experiences also develop from one generation to another. The second is the spiritual in which human ideas and aspirations are passed on and as it passes from one generation to another there are modification (Ladyman, 2008).

The pre- Socratic Greek philosophers abandoned the idea that gods were responsible for happenings in nature. Thales (640 – 546 B.C) indicated that water was the fundamental substance of materials and therefore he tried to explain the cause of earthquake to the agitation of water which causes the earth to shake. Following Thales was Anaximander, who explained that lightning was caused by the splitting of clouds and thunder bolts were also caused by wind. He again postulated that the heavenly bodies were made up of rings of fire surrounded by mist and that the perforations in between the mist

particles allow light to pass through and this represents the shining stars (Ladyman, 2008).

There was also a group of philosophers called Pythagoreans long after Anaximander and his colleagues emerged. These Pythagoreans were speculative thinkers and were primarily concerned with making enquiries about nature. The Pythagoreans believed that number is the prime cause of everything and also believed in the harmony of the spheres. Their views led to the establishment of the quantitative and mathematical foundations of science (Lindberg, 2007).

Plato's motive of natural science is to reveal the operation of reason in the universe. Therefore he believed that for every natural phenomenon one has to unravel the reason behind the phenomenon and that every natural phenomenon has order and rationality underneath. It means that scientists must be engaged in making enquires and these enquiries must be directed towards the discovery of laws.

The declining of natural philosophy and the search for pleasure lead to the emergence of Platonism. More time was spent on writing commentaries rather than postulating new philosophies and because more attention was shifted to writing commentaries the spirit of criticism came down. There was also unrest in the Roman World after 200 AD so scientific research could not go on. It should be noted that Alexandra was captured and so the centre of learning came down. There was also the rise of Christian institutions. As a result a place like Plato's academy was closed down because the philosophers were considered as pagans.

Science and Culture

The main difference between a developed country and a developing one such as Ghana is the large difference in scientific and technological achievement. The gap has a direct bearing on the quality of life enjoyed by the citizens(Asare-Ahene).

To answer the obvious question 'what is science?' One may simply say that there is no complete definition. One school of thought defines science as 'the organized attempt by man to discover how things work as causal system.' Technology is defined a 'the systematic application of scientific knowledge to practical tasks in commerce and industry'. So scientists investigate the properties to the world around us and technologists then put that knowledge to practical use (Nyavor, &Seddoh, 2000).

Whatever definition is used, both science and technology depend on a particular way of thinking called objective reasoning. This uses calm logic to investigate reliable information that has been collected. The beauty of science lies in the simplicity of its fundamental theories, principles and the way just a small number of basic equations, concepts, and assumptions can describe our view of the world (Bennet, 2002).

The goal of science is to provide an understanding of nature by developing theories based on the experiments. These theories are usually expressed in mathematical form. Fortunately, it is possible to explain the behavior of a variety of physical systems with a limited number of fundamental laws. For examples, the myriad physical phenomenon in our world are parts of one or more of the following five areas of physics

mechanics, thermodynamics, electromagnetic, quantum mechanics and relativity

Basic Assumptions in Science

From time immemorial man has concerned himself with the study and interpretation of nature. Science thus started as philosophy. Shayer (2001) stated that some basic assumptions made in science are:

1. Space is real and has definite dimensions.
2. Scientists believe that a real world exists and can be understood.
3. Matter is real and exists between time and space.
4. Time is real and irreversible. Parameters such as temperature, rainfall, humidity pressure, etc on a particular day and time can never be gotten again.

   Conditions under which one experimenter carries out an investigation are different from other conditions sometime later.
5. The universe is orderly and nature is not capricious. For example, the seasons, day and night, etc follow an orderly pattern.
6. Science does not accept superstition.

Process of Science

If science were only a set of explanations and a collection of facts, a teacher could teach it with blackboard and chalk. The teacher could assign students to read chapters and answer the questions that follow. Good students could take notes, read the text, turn in assignments, then give the teacher all this information back again on the final examination (Byers, 2002). Science is traditionally taught in this manner. Everybody learns the same body of information at the same time, class togetherness is preserved (Byers, 2002).

According to Byers (2002), science is a process – a dynamic interaction of rational inquiry and creative play. Scientists probe, poke, handle, observe, think up theories, test ideas, jump into conclusion, make mistakes, revise, synthesize, communicate, disagree and discover. Students can understand science as a process only if they are free to think and act like scientists in a classroom that recognizes and honours individual differences. Science is both a traditional body of knowledge and an individualized process of creative inquiry. Science as a process cannot ignore tradition, nor can traditional science continue to evolve and redefine itself without process. Science without this cutting edge of discovery is a static dead thing.

The scientific method gives students knowledge of science which helps to develop desirable attitudes. Many people are superstitious. This means that they have false beliefs about the causes of certain happenings.For example, the belief that Ghanaian witches eat people in the form of mutton,chicken or beef and cast spells on them(Abbey,1990).

In order to have a scientific attitude, students and scientists should be willing to change their opinions when they discover new evidence. In forming opinions or solving problems scientistsshould search for the whole truth, without prejudice. Students should realize that there must be a cause for every happening (Davis, 2001). In solving problems one must distinguish between fact and assumption. To find an explanation for things one does not understand, one should propose possible solutions for problems. But assumptions must not be considered as facts until proven.

According to Bunnet (2002), one must ask himself/ herself these questions once in a while: Whether he/she is willing to change his or her

opinions on the basis of new evidence; whether he/she searches for the whole truth without prejudice; whether for every action he/she tries to find the true cause; whether he/she bases his/her judgment on facts or let his/her feelings interfere with his/her judgment; whether he/she attempts to distinguish between fact and guess work; whether he/she gets rid of all fears and superstition when he/she acquires facts which prove that there is no foundation for these fears and superstition.

Products of Science

The scientists end up an investigation or research by making discoveries of facts and concepts, formulating generalizations, theories and laws. These are known as products of science. Examples are laws drawn from experiments, theories such as atomic theory and Mendel's laws, laws such as law of gravity, law of conservation of matter, law of flotation, and principles such as Archimedes' principle.

The process and products of science relate to one another. One depends on the other and they are both inseparable. Thus without process there is no scientific knowledge.

Characteristics of Scientific Knowledge

Scientific knowledge according to Asare-Arhin (2006) is characterized by its being:

1. Tentative – It is subject to change and therefore does not claim to be absolutely true in its final stage. For example, Dalton's atomic theory has changed in this 21st century as atoms are bombarded into electrons, protons and neutrons.

2. Replicable - It is based on evidence which could be obtained by other investigators working at different places.
3. Humanistic - It is the product of mankind resulting from an effort to impose order on nature and involves creative imagination.
4. Empirical - Scientific knowledge is based on observation and experiment not theory. However, theory may serve as a useful guide for further work.
5. Historic – Scientific knowledge of the past has provided the basis for today's knowledge, which will in turn provide the basis for tomorrow's knowledge.
6. Unique – It can be identified from other realms of knowledge by its nature and procedures for generating new knowledge.
7. Public – It is based on evidence that is public as opposed to personal.

Importance of Science

Science has greatly affected the way people view themselves and the world around them. In ancient times, most people believed that natural events such as earthquakes, eclipse, lightning and thunder and everything that happened to them resulted from the action of the gods and spirits. For example, they believed that angry gods and spirits caused diseases by invading or attacking the body. The ancient Greeks were among the first people to begin to use systematic observation and reasoning to analyse natural happenings (Nault, 1999).As scientific thinking gradually developed, nature came to be seen less and less as the product of mysterious spiritual forces.

Instead, people began to feel that nature could be understood and even controlled through science.

Increasingly powerful and advanced equipment is helping scientists in many different fields to expand people'sknowledge about the world. For example, particle accelerators, which speed up the movement of particles that make up atoms, have enabled physicists to create and study quarks and other basic units of matter. Magnetic resonance imaging and other advanced techniques produce images of tissues inside the body and help identify certain diseases and injuries. Improvements in the computer have enabled mathematicians to solve problems at previously unheard-of speeds. New telescopes, satellites, orbiting observatories, and space probes have provided astronomers with information about distant reaches of the universe.

A process called genetic engineering has become a valuable tool in genetic research. In this process, an organism's hereditary makeup is altered. Geneticists have engineered bacteria to produce human insulin, a hormone used to treat diabetes, and human interferon, a protein that fights vital diseases.

Scientists still have many new areas to explore. Through genetic engineering, for example, they hope to find new ways to diagnose and treat hereditary diseases. Astronomers are only beginning to investigate the idea of the inflationary universe – that is, the idea that the universe expanded extremely fast in the first fraction of a second following its origin during the big bang.

In ancient times people were governed largely by fear and superstition. In the superstitious-belief stage, people often based their beliefs on emotions

without good evidence. Today, science has made people much less superstitious. People depend more and more on facts for solving problems (Reynolds, 2008).

Joof (2007) stressed that science and technology are tightly coupled. He also stressed further that a sound scientific understanding of the natural world is the basis for much of the technological development today. Over the years, scientific findings have increasingly influenced philosophical and religious thoughts about the nature of human beings and their place in the universe. In the mid 1500s, for example, the Polish Astronomer, Nicolas Copernicus proposed that the Earth and other planets travel around the sun. Although his theory was later proved to be correct, it stirred a strong opposition among philosophers and religious leaders of that time. They had long believed that the Earth and the people on it had special importance because the sun, stars and planet revolved around the Earth (Bennet, 2002). The theory of evolution proposed by Darwin stirred controversy among many scientists and religious opponents at that time. Many scientists did not belief his theory until modern genetics began in the early 1900s Most attacks on Darwins ideas came from religious opponents.They thought that evolution denied the devine creation of human beings and made people and animals equal (Alton- Brigg & Kathlenn, 2005).

Many people, including Christians, Muslims and Orthodox Jews, did not accept the theory of evolution because it conflicted with their religious beliefs. For example, the Biblical accounts of creation stated that human beings were elevated above all forms of life. Some people found it difficult to reconcile this view with the idea that human beings evolved through natural processes

(Nault, 1999). The theories developed by Sigmund Freud and Albert Einstein have also changed people's view about nature.

Negative Impact of Science

Although scientific and technological achievements have benefited man in numerous ways, they have also created serious problems. The rapid growth of industrial technology, for instance, has resulted in such grave side effects such as environmental pollution and environmental degradation. Breakthroughs in nuclear research have led to the development of weapons of mass destruction.

The science of today and tomorrow promises to continue to improve people's understanding of the universe and to give them greater control over nature. But serious debates have arisen over such science-related issues as to whether it is moral to interfere in the genetic make-up of human beings or to use lasers for destructive purposes.

Some people fear that advanced biological research will produce new disease – causing bacteria or viruses that would be drug resistant. People are also concerned that computerized information systems may destroy personal privacy (Mackean &Clegg , 2007).

Traditional Beliefs and Taboos

Asimah and Owusu (2010)defined traditional beliefs as beliefs handed over to a group of people by their ancestors. These beliefs are not challenged but are accepted. Pearsal (2000) defines a taboo "as a social or religious custom placing prohibition or restriction on a particular thing or person". Traditional beliefs and taboos differ from one ethnic group to another. In America, for example, the number 13 is considered a bad omen. That is, they

do not use it to number their houses, rooms and floors. In many cultures in Ghana, it is a belief that whatever the elders say is absolutely true and should therefore not be challenged. Ellen and Harris (2006) listed a number of characteristics of traditional beliefs stating that they are:

1. local, i.e., they are rooted to a particular place as set of experiences and generated by people living in those places,
2. empirical rather than theoretical,
3. the consequence of practical engagement in everyday life, and are constantly reinforced by experience and trial and error,
4. repetitive,
5. characteristically shared,
6. not systematically documented,
7. the basis for decision making and survival strategies, and
8. oral and rural in nature.

Relationship between Science and Traditional Beliefs in the Teaching of Science

In Ghana, there are many cultural beliefs and practices that pupils learn at home. Pupils with these beliefs and prejudiced minds come into conflict with the science they learn at school. Scientific research has shown that some traditional beliefs and taboos have real scientific basis so the ancestors have good reasons for formulating such beliefs and taboos. The traditional beliefs and taboos which have scientific basis are termed "positive" beliefs but those without good scientific basis are known as "negative" beliefs" (Asare-Arhin, 2006).

All beliefs and taboos have their own particular misfortunes that will befall the persons who do not obey those taboos. For example, a taboo associated with personal safety is that one should not cut his or her finger nails in the afternoon when his body is hot, or after a bath. The scientific explanation for this taboo is that if one accidently cuts himself or herself at such a time, the person will bleed profusely. Another taboo associated with personal safety is that one should not sing while bathing else the offender's mother would die. A scientific explanation for this superstition is that locally produced soaps contain chemical substances that could be harmful if accidently swallowed.

There are also scientific foundations for beliefs and taboos associated with social behaviour. A taboo that says that no girl should become pregnant before puberty rites have been performed has the effect of discouraging girls from giving birth before they are matured enough to take good care of them. A taboo that says one should not greet people who are on their way to the public latrine ensures that such people are not inconveniently delayed.

Taboos which say people should not defecate in rivers also have a good foundation in science. This taboo is aimed at preventing the pollution of water bodies. Taboos connected with the conservation of wildlife include the idea that there should be no fishing in certain lagoons and estuaries at certain times of the year, e.g., the Bakatue festival that celebrates the end of the period of no fishing at Elmina and Cape Coast. The scientific explanation is that such closed seasons give the fish the opportunity to breed.

According to Asimah and Owusu (2010), traditional beliefs and taboos which have no scientific basis are known as "negative beliefs". For example, a

belief that whatever elders say is indisputably true and should not be questioned has no any scientific basis. It is used to deter people from asking questions about taboos. This particular belief is in conflict with the rationale in science which states that pupils must develop curiosity to explore their environment and question what they find.

Also, it is a belief in most Ghanaian cultures that pregnant women are not supposed to eat snails or eggs, else the unborn baby will become a thief in future. This taboo deprives pregnant women of proteins, which the unborn baby needs in order to build new body cells. It has no scientific basis and can lead to a miscarriage.

According to Capp (2002), traditional beliefs are often based on superstition of phenomena in the world, typically with little or no basis on facts and are inconsistent with rational explanation. Scientific knowledge, on the other hand is based on natural, consistent and rational processes that depend on evidence and facts. Traditional beliefs are quite the opposite. They are usually built around a specific worldview, with intrusion into every aspect of the society. Put simply, traditional beliefs and science are almost opposite- one depends on subjective interpretation, the other, on objective reality (Atkins, 1997).

Religion and Science

No simple definition can describe the numerous religions in the world. For many people, religion is an organized system of beliefs, ceremonies, practices and worship that centre on one supreme God or the deity. People practise religion for several reasons. Many people throughout the world follow a religion simply because it is part of a heritage of the culture, tribe or family.

Religion gives many people a feeling of security because they believe that a certain divine power watches over them. These people often look up to this divine power for help and protection.

Smith (2000) sees religion as a mystical pact between the worshippers and their totem. Kant (2003) defines religion as the recognition of people's duties as divine commands.

The above discussion of religion explains the assertion that the African is incurably religious. Religion is not left out in every aspect of people's life, for instance, in daily greetings, business, festivals, rites of passage like puberty, naming ceremonies, etc. Even when someone is to embark on a journey, religious rites are performed, asking for protection from the gods. There is therefore no sphere of life that is led by the African which has no religious connotations, since life is viewed as having both spiritual and physical dimensions (Tjikuua, 2001).

Religion is aphenomenon that lays down principles and practices for moral behaviour in society. Religious people are therefore expected to exhibit certain moral standards that will not only ensure good relationship among its members but also for the societies in which they live (Tjikuua, 2001).

Many people also follow a particular religion because it promises them salvation and happiness. For many people, religion brings a sense of individual fulfillment and gives meaning to life. In addition, it provides answers to such questions as: What is the purpose of life? What is the fate of the soul of a person after he or she has died? What is the difference between right and wrong? And what are one's obligations to other people in the society?

Religion is part of culture. Most religions involve having faith and belief in higher unseen and controlling powers. Monotheistic religions such as Islam, Christianity and Judaism talk about one supreme power called Allah or God. Traditional African religion such as animism has different gods.

It is socially acceptable to dismiss certain types of beliefs, such as false scientific or historical beliefs. For example, people openly ridicule those who hold to the fact that the holocaust did not occur, or man never walked on the moon. However, it is not acceptable to ridicule a religious belief of any kind regardless of how absurd it might be. People tend to get more offended when their beliefs are abused. This is because religious beliefs can really be important and be a tradition that is passed down through generations (Bishop &Darton, 2002).

In the past, and even the present, people have used religion to separate families and discriminate between people of different religious beliefs. In the process of accepting all religions, races and ethnicity which is obviously a good thing, man has stepped into the zone of going too far and now no one can say something to criticize a religion without being a blasphemer (Bishop &Darton, 2002)

Science, Religion and Society

The aim of any religion is to bring about the moral and spiritual development of its adherents. Different religions have different moral and spiritual values, but without intellectual development these values cannot develop. This means that a religion must encourage literacy and secular education if it wishes to stand as the centre of the development of the culture of its followers. Both science and such a progressive religion aim to instill the

spirit of enquiry, probity and honesty; both search for the truth, but in their own ways (Bishop & Darton, 2002).

Science and religion may disagree in some areas but both have their limitations (Ferngren, 2002). Scientists recognize the limitation of science and admit that there are some problems they will never be able to answer. On the other hand, leaders of the Christian religion, for example, now admit that the suppression of the work of the Italian astronomer, Galileo (1564 – 1642), was wrong and that it showed the limitation of strict interpretation of scriptures, (Ferngren, 2002).

According to Atkins (1997), "religion is the antithesis of science. Science is competent to illuminate all the deep questions of existence, and does so in a manner that makes full use of, and respect the human intellect. I see neither need nor sign of any future reconciliation. It may be concluded by saying that while true science is proof without certainty, true religion or faith is certainty without proof. Despite these differences, science and religion can live together as parts the same culture".

There has always been a controversy between science and many cultural and religious beliefs. Studies have revealed that the belief systems of learners have an influence in the science classroom(Asare-Arhin,2006).

Empirical Studies

Findley (2001) working for the rural systemic initiative programme in the Louissiana State conducted a study to determine the impact of religious beliefs on the learning of science. The purpose of the study was to address barriers to systemic and sustainable improvement in science in Louisiana's

rural, economically disadvantaged parishes. It was also meant to adapt a high quality challenging curricula to address culture diversity.

The study consisted of 155 college Biology students in order to ascertain their perceived beliefs about the concept of evolution. The students responded to questions pertaining to their own beliefs concerning science, religion and evolution.

Findings from the study revealed that the students as a whole appeared to be more accepting of evolution than of creationism. It also revealed that a large percentage of the students considered creationism, belief and supernatural explanation as being part of science.

The study concluded by stressing that science instructions in the rural parishes may be less effective due to religious beliefs. It suggested that what students bring in terms of beliefs should not be ignored. It also suggested that teachers should endeavour to understand and respect individuals from different cultures in order to make them succeed in science.

The socio-cultural characteristics which children in non-western societies bring from their environment according to an article by Olugbemiro (2005), create a wedge between what they are taught and what they learn. The study was conducted to investigate how instruction through the use of socio-cultural mode had on students' attitude toward the learning of science.

The sample study consisted of 6oo senior secondary school year-one female students from 15 secondary schools in Nigeria. The study used the socio-cultural environment scale to measure the Biology achievement and change in attitude of the students. Findings from the study revealed that science instructions which deliberately involved the discussion of socio-

cultural science concepts engenders positive attitudes towards the study of science.

Summary

Asare-Ahene (2006), stated in his research work "science and local beliefs" that superstition is the irrational fear of the unknown. He went further to say that superstition has total disregard for the system of cause and effect and leads to unreasoned belief in taboos, magic and witchcraft. In Ghana, it is perceived that a witch is a person, usually an old woman, who is believed to be using some special powers for evil purpose.

Turkson (2001) echoed in his research work, "science and cultural beliefs" that "there may be sound scientific reasons why some people are regarded as witches". He stressed, for example that the onset of menopause at the age of 45years can afflict a woman with severe depression or extreme changes of mood. This he said is due to the changes in hormone levels as ovulation slowly ceases. The effect can be so severe and the behavior, so abnormal that the woman is declared, out of ignorance, to be a witch and is then despised or even driven away from the community. High fever can also cause people to be misunderstood and so be called witches. Fetish priests claim to have powers to expose witches and counteract their activities.

Findley (2001) undertook a study to determine the impact of religious beliefs on the learning of science. This study was also undertaken in Tamale College of Education to determine the influence of traditional and religious beliefs on the learning of science. Religion played a major role in both studies but the study undertaken in Tamale College of Education also considered traditional beliefs in order to widen the scope. Findley's study centered on the

concept of evolution, an aspect of Biology. The study undertaken in Tamale College of Education considered not only Biology but science as a whole.

Olugbemiro's (2005) study dealt with the socio-cultural characteristics of children in non-western societies towards the learning of science. The sample size was 600 female students in 15 secondary schools in Nigeria. The present study was conducted to determine the influence of traditional and religious beliefs on students learning of science in Tamale College of Education involved both male and female students. It was necessary to involveboth sexes in order to reduce the element of bias as students had to respond to some items which were gender sensitive.

CHAPTER THREE

METHODOLOGY

This chapter seeks to provide a systematic description of the method used in carrying out the study. It specifically describes in detail the research method used in the data collection process. The chapter is therefore subdivided into research design, population, sample and sampling technique, research instrument, pilot study, data collection procedure and data analysis procedure.

Research Design

The design employed in the study was a case study. This design is an intensive study geared towards a thorough understanding of a given social unit. The social unit may be an individual, a group of individuals, a community, or an institution. For the purpose of this study, the researcher employed a group of individuals.

Case studies employ a variety of data gathering techniques such as questionnaires, observation, interventions and tests. Case studies are useful in providing relevant background information which gives rise to more extensive investigations. They also provide specific instances for testing or validating earlier findings or important theories.

Single units or very few units are involved in case studies and as such cannot be generalized to the entire population. Some element of bias may be involved in the selection of the unit(s) to be studied. The quality of a case study depends to great extent on the experience and skills of the investigator.

These skills include the formulation of relevant and precise questions, ability to use all the sense organs, in - depth knowledge of what is being studied, and lack of bias.

One of the main disadvantages of the case study is that the data collected cannot be generalized over the wider population. Also, in most case studies, only one experimenter is engaged in collecting data. This can lead to bias in data collection which can influence results.

Population

Table 1: Year Group and Programme of Students

Year	1		2		3	
Programme	Science	Gen	Science	Gen	Science	Gen
No. ostudents	105	180	95	190	90	190
Total	285		285		280	

The target population for the study was made up of all students of the 850 students of Tamale College of Education. The accessible population was the 570 first and second year students consisting of 420 males and 150 females.

Table 2: Gender of Students

Gender	Year 1	Year 2	Year 3
Male	205	215	223
Female	80	70	57
Total	285	285	280

Sample and Sampling Technique

From the accessible population of 570 students, a sample size of 70 students was selected for the study. This was made up of 35 males and 35 females. Eighteen were chosen from the 205 first year male students. Seventeen females were chosen from the 80 first year female students. Seventeen males were chosen from the 215 second year male students and 18 female students were chosen from the 70 second year female students.

The respondents were selected through the simple random sampling technique. This gave each student in the first to the second year students an equal and independent chance of being included in the sample.

The lottery method was used to select the sample unit (students)This was done by preparing a list of the students of the accessible population and assigning a number to each student.The students were put into two groups with group one consisting of first years and group two consisting of second years.

The numbers were written on slips of paper and put in two different containers (ie slips of first years in container number one, and those of the second years in container number tow. The papers were well mixed and one slip of paper was removed at a time from each container without looking into it. The number on the slip of paper was recorded and the slip put back into the container before the next one was picked.

The removal of slips from each container and recording of the numbers were continued until the number of respondents required was achieved. If an already drawn number was selected for a second or third time, it was ignored,

ie it was put back into the container. This process is known as picking or drawing with replacement.

Research Instrument

The questionnaire was used for collecting the data. The reason for choosing this instrument was that all the respondents could read and understand the items. It was designed to seek responses from students. The questionnaire for the study was made up of a list of statements or questions which the respondents were required to answer by either ticking or writing. The items consisting of both the close-ended and open-ended types were direct, specific, precise and clear for easy responses. Students were required to respond to 23 items made up of two open-ended statements, 12 close-ended questions and nine statements indicating the extent to which they agreed or disagreed to some statements.

In the close - ended form of items, the respondents were to mark a "yes" or "no" to a given statement or question, choose from alternatives provided based on how one felt about an issue, and also indicate by ticking how one agreed or disagreed with a statement. A copy of the questionnaire is attached as Appendix

Pilot Study

The instrument was subjected to a pilot study in Bagabaga College of Education on the 30th of May, 2011. This was a suitable choice because the students in that college had similar characteristics to those in Tamale College of Education. For example, they also offered Integrated Science and Methods of Teaching Science. The pilot study consisted of 20 students of the college

who were required to respond to the items of the questionnaire under conditions similar to those of the main study.

The essence of the pilot study was to see how the respondents would react to the items of the questionnaire, whether the items were clear enough and easily understood. It was also meant to determine whether there was the need to include more items in certain areas, or whether there were some items to which the respondents would not like to respond, etc. Item number 6 which was an open-ended type in the pilot study was changed to close-ended in the main study. This was because most students could not respond to this item as open-ended. All the other items were adequately responded to.

Table 3: Reliability Coefficient of Piloted Questionnaire determined using the Cronbach alpha.

Cronbach alpha	No. of Items	Mean	Variance	Standard Deviation
0.708	23	56.78	68.44	8.27

Table 3 shows that the reliability coefficient of the piloted questionnaire items administered was 0.708 for the gathering of data. Therefore the piloted questionnaire is reliable and valid for the use in conducting the main research.

Data Collection Procedure

Data for the study was collected by administering a questionnaire. The respondents were put into two groups. Each group consisted of 35 members. Both first year students and second year students were mixed. Each group also contained both male and female students. The two groups were put into different classrooms each under the supervision of a well-trained assistant supervisor. The researcher acted as the overall supervisor.

The questionnaire was administered on Saturday, 25th of June, 2011. This was possible because all the respondents were residential students in the college. The respondents responded to the items in the questionnaire and these were collected immidiately.

Data Analysis

The data collected were subjected to descriptive statistics of frequency counts and simple percentages. This was possible by adopting the computer software of the SPSS system. The data were presented in tables consisting of a response or item under consideration, frequency and percentage.

For easy identification each table was given a heading based on the item under consideration. The analysis of the data emphasized on numbers, measurement and deductive logic. The results were discussed in relationship to the literature .

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter deals with the presentation and analysis of the data. The study was conducted to determine the influence of traditional and religious beliefs on the learning of science by students of Tamale College of Education. A questionnaire was used to collect the data from 70 students of the college.

In item 4, respondents were asked to choose the age group they belonged to. Their responses are displayed in Table 4.

Table 4: Age Group of Respondents

Age group	Frequency	Percentage
18-23 years	54	77.1
24-29 years	16	22.9
Total	**70**	**100.0**

From Table 4, 54 respondents representing 77.1% of the sample fell within the 18-23 age group whilst 16 respondents representing 22.9% fell within the 24-29 age group. No respondent was aged above 29 years.

Belief systems formed a major component of the study. So respondents were required in item 3 to indicate which belief system they belonged to. Three religious dominations, i.e. Islam, traditional and Christian were used because they are the major religions practised and studied in schools in Ghana.

Table 10 shows the frequency distribution of respondents according to religious denomination.

Table 5: Religious Denomination of Repondents

Religion	Frequency	Percentage
Islam	43	61.4
Traditional	3	4.3
Christianity	24	34.3
Total	**70**	**100.0**

Table 5 reveals that 43 students representing 61.4% practised Islam, 3 students representing 4.3% practised traditional religion and 24 students representing 34.3% of the sample belonged to the Christian religion. The belief system of the students may have an influence in their learning of science because some of the beliefs have scientific basis whilst others have no scientific basis.

Influence of Traditional and Religious Beliefs on Science Learning

The integrated science syllabus for lower primary, upper primary, junior and senior high schools states several aims of learning science. In item 6, the respondents were asked to indicate their main goal of doing science. Their responses are as shown in Table 6.

Table 6: Main Goal of Learning Science

Goal	Frequency	Percentage
To pass examination	20	28.6
To make me scientifically literate	48	68.6
No response	2	2.9
Total	**70**	**100.0 (approx)**

From Table 6, it is observed that 20 students representing 28.6% indicated that their main goal of doing Science was to pass an examination. Even though students are required to pass an examination at the end of every science course, this should not be the main goal of learning science. Forty - eight students indicated that they learned science in order to become scientifically literate. Scientifically literate persons will be able to use scientific concepts to explain their own lives and the world around them without resorting to superstition. Two students representing 2.9% of the sample did not respond to the item.

Item 7 required respondents to indicate whether there is a relationship between science and their belief system. The distribution of responses is shown in Table 7.

From Table 7, it can be seen that 55 respondents representing 78.6% indicated that there is a relationship between science and their belief system. This is true because many of the belief systems stated in Chapter Two, such as taboos connected with conservation of wild life which include the idea that there should be no fishing in certain lagoons at certain times of the year, have meaningful scientific explanations even though our ancestors could not explain them scientifically. Fourteen respondents representing 20.0%

indicated that there is no relationship between science and their belief system. One student representing 1.4% did not respond to the item and this may be due to an oversight or the student not understanding the item.

Table 7: Relationship Between Science and Belief System

Response	Frequency	Percentage
Yes	55	78.6
No	14	20.0
No response	1	1.4
Total	**70**	**100.0**

The 55 respondents who chose a 'yes' in item 7 were asked to respond to item 8 on whether the relationship between Science and their beliefs system promotes their learning of science. The responses are displayed in Table 8.

Table 8: Relationship Between Science and Belief System Promote Learning of Science

Response	Frequency	Percentage
Yes	51	92.7
No response	4	7.3
Total	**55**	**100.0**

From Table 8, it is observed that majority of the students (51) representing 92.7% indicated that the relationship between science and their belief system promoted their learning of science. Also from Table 8, 4 students representing 7.3% did not respond to the item.

The 51 respondents who indicated a 'yes' to item 8 were required to respond to item 9. Their responses are displayed in Table 9.

From Table 9, it can be seen that 33 respondents representing 64.7% indicated that to a large extent the relationship existing between science and their belief system promoted the learning of science. Two respondents representing 3.9% indicated that the relationship between science and their belief system has no effect on their learning of science.

Table 9: Extent to Which Relationship Between Science and Belief System Promote the Learning of Science

Response	Frequency	Percentage
To a large extent	33	64.7
To a small extent	16	31.4
No effect	2	3.9
Total	**51**	**100.0**

Traditional and religious beliefs which have scientific basis are termed positive beliefs. These beliefs have a relationship with science. The 14 respondents who chose "no" in item 7 that there is no relationship between the two disciplines were required to indicate in item 10 how this affects their learning of science. The distribution of their responses is shown in Table 10

Table 10: Effects of Non –Relationship Between Science and Belief System in Learning Science

Response	Frequency	Percentage
Yes	3	21.4
No	9	64.3
No Response	2	14.3
Total	14	100.0

From Table 10, it is observed that 3 respondents representing 21.4% indicate“yes” to the item. The table also reveals that 9 respondents representing 64.3% indicated “no” to the item. Two respondents representing 14.3% did not response to the item.

Item 11 required respondents to indicate whether the learning of science was a threat to their belief system. The distribution of their responses is shown in Table 11.

The theory of evolution of species and natural selection proposed by Charles Darwin contradicts the theory of special creation documented in Holy Scriptures. The proposal by Nicolas Copernicus and Galileo that the earth and other planets travelled around the sun stirred strong opposition among philosophers and other religious leaders of the time. These two theories among many others which contradict certain traditional and religious beliefs may pose a threat to many belief systems.

Table 11: Learning Science a Threat to Belief System

Response	Frequency	Percentage
Yes	19	27.1
No	50	71.4
No response	1	1.4
Total	**70**	**100.0(approx.)**

From Table 11, 19 respondents representing 27.1% indicated that they see the learning of science as a threat to their belief system. This may be due to the fact that some scientific theories contradict certain belief systems. Also from Table 11, 50 respondents representing 71.4% of the sample indicated that

the learning of science poses no threat to their belief system. It may therefore be alluded that both science and religion are part of culture and can co-exist as the same culture. Science can be used to shape religion and vice versa, therefore one may confidently stress that the learning poses no threat to belief systems. One respondent representing 1.4% of the sample did not respond to the item.

Ghana needs to increase science and technology provision in the school curriculum . A sound science education for young citizens will enable them appreciate and understand things going on around them.It will also enable them eradicate ignorance, superstition and other negative cultural practices that impede progress.A blend of science and good cultural practices will not pose a threat to the learning of science.

Respondents who indicated yes to item 11 were to asked indicate in item 12 the extent to which the learning of science was a threat to their belief system. Their responses are shown in Table 12.

From Table 12, 6 respondents representing 31.6% indicated that to a large extent the learning of science is a threat to their belief system.For example, some students declined to mention the names of the human reproductive organs because they belief it is in conflict with their religious beliefs. To such students these concepts are a threat to their beliefs. The table also reveals that 8 respondents representing 42.1% indicated that to a small extent the learning of science was a threat to their belief system.One student representing 5.3% of the respondents indicated that the learning of science has no effect on his/her belief. Four respondents representing 21.1% did not respond to the item.

Table 12: Extent to which Learning of Science Becomes a Threat to Belief System

Response	Frequency	Percentage
To a large extent	6	31.6
To a small extent	8	42.1
No effect	1	5.3
No response	4	21.1
Total	**19**	**100.0 (approx.)**

Item 13 required respondents to indicate whether when they are given the opportunity they will prefer not to learn science in order to protect their belief system. Their responses areshown in Table 13.

Table 13: Protecting Belief System in Preference to Learning Science

Response	Frequency	Percentage
Yes	29	41.4
No	35	50.0
No response	6	8.6
Total	**70**	**100.0**

In most Ghanaian cultures it is a taboo especially for children to mention, for example, the names of the human reproductive organs. During instructional periods many students refused to mention the names of the human reproductive parts (example vagina, penis, clitoris, etc) because tradition and other belief systems do not permit them to do so. From Table 13, 29 respondents representing 41.4% indicated that when given the opportunity they will not learn science in order to protect their belief system. Thirty -five

respondents representing 50.0% indicated a 'no' meaning that no matter their belief system, they will still learn science. Since science is part of culture, the learning of science will facilitate the understanding of certain cultural practices. Therefore, half of the students who indicated 'no' are right. Six respondents representing 8.6% did not respond to the item.

Science does not accept superstition. Respondents were therefore required in item 14 to indicate the extent to which proper science education will help eradicate superstition in them. The responses are displayed in Table 14.

Table 14:Extent to which Proper Science Education will help Eradicate Superstition

Response	Frequency	Percentage
To a large extent	48	68.6
To a small extent	13	18.6
No effect	7	10.0
No response	2	2.8
Total	**70**	**100.0**

To a large extent 48 respondents representing 68.6% of the sample indicated that proper science education will help eradicate superstition in them as learners. In many Ghanaian cultures, phenomena such as eclipses, earthquakes, miscarriage, infertility, convulsion, etc, are attributed to the work of the gods or witches. To a large extent it is only by proper scientific education that such fears and superstitions can be explained and then become irrelevant. Thirteen respondents representing 18.6% indicated that to a small extent proper science education will help eradicate superstition in them as

learners. This means that to these students there will still be some element(s) of superstition embedded in them even after proper science education. Seven respondents representing 10.0% indicated that proper science education will have no effect in eradicating superstition in them as learners while two students representing 2.9% did not respond to the item.

For items 15-23 respondents were required to state the extent to which they agreed to each statement made. Their responses are presented in Tables.

In item 15, respondents were required to give their views on the belief that whatever elders say is indisputably true and should therefore not be questioned or challenged. The distribution of their responses is shown in Table 15.

Table 15 reveals that 9 respondents representing 12.9% of the sample strongly agreed to the statement while 20 respondents representing 28.6% indicated that they agreed to the statement. Scientific knowledge can be subjected to scrutiny, i.e. individuals are allowed to explore deeper to find out things for themselves. They are also allowed to question events, phenomena, etc or challenge findings made by others. No particular individual can claim custody of scientific knowledge, i.e, scientific knowledge is public knowledge and is also tentative. Knowledge from leaders, or senior figures in a given culture tends to be final and therefore often not challenged.

Respondents who agreed to this statement tend to deny themselves of seeking information through questioning of events and other happenings in their locality. They accept whatever elders tell them without verification. It is not everything that elders say which is true. Also from Table 15, 22 respondents representing 31.4% disagree while 18 students representing

25.7% strongly disagreed to the statement. Students who disagreed were right because individuals have the right to raise questions and find out answers to challenges for themselves.

Table 15: Challenging What Elders Say

Response	Frequency	Percentage
Strongly agree	9	12.9
Agree	20	28.6
Disagree	22	31.4
Strongly disagree	18	25.7
No response	1	1.4
Total	**70**	**100.0**

In item 16, respondents were to indicate the extent to which they agreed or disagreed to the belief that one should not sing whilst bathing else one's mother will die. Thei6 responses are displayed in Table 20.

Table 16 reveals that seven respondents representing 10.0% of the sample strongly agreed whilst 13 respondents represe nting 18.6% agreed to the statement. The table also revealed that 23 respondents representing 32.9% disagreed to the statements whilst 24 respondents representing 34.3% strongly disagreed.

Three respondents representing 4.3% of the sample did not respond to the item.This may be due to the fact that these respondents did not see the item,or did not understand it.

Table 16: Singing Whilst Bathing

Response	Frequency	Percentage
Strongly agree	7	10.0
Agree	13	18.6
Disagree	23	32.9
Strongly disagree	24	34.3
No response	3	4.3
Total	**70**	**100.0(approx)**

Traditional beliefs and taboos which have good scientific explanation are termed positive beliefs. Item 17 required respondents to indicate how they agreed or disagreed to the belief that one should not talk whilst eating else one's mother will die. The responses are displayed in Table 17.

Table 17: Talking Whilst Eating

Response	Frequency	Percentage
Strongly agree	1	1.3
Agree	9	12.9
Disagree	21	30.0
Strongly disagree	37	52.9
No response	2	2.9
Total	**70**	**100.0**

From Table 17, 1 respondent representing 1.3% of the sample strongly agreed to the statement whilst 9 respondents representing 12.9% of the sample

population agreed to this belief. However, 21 respondents representing 30.0% disagreed whilst 37 respondents representing 52.9% strongly disagreed. Even though elders of a given culture are aware that one's mother will not die if one talks whilst eating, they still enforce this as a taboo to deter children from talking whilst eating in order not to cause death to their mother whom they love so much. This belief is for the personal safety of the child and must therefore be enforced. This is so because when one is eating whilst talking, sound is produced by expelling air from the lungs and also by inhaling large volume of air. There is the possibility of food passing through the trachea instead of the oesophagus. This is harmful and may even cause death.

In most Ghanaian cultures, misfortunes are attributed to the acts of the gods. Item required respondents to indicate the extent to which they agreed or disagreed to the belief that gods curse people who have sexual intercourse in the bush. Their responses are displayed in Table 18.

Table 18 reveals that 11 respondents representing 15.7% of the sample strongly agreed to the statement whilst 17 respondents representing 24.3% agreed. The table also reveals that 23 respondents representing 32.9% disagreed whilst 18 respondents representing 25.7% of the sample strongly disagreed. One respondent representing 1.4% of the sample did not respond to the item.

Table 18: Sexual Intercourse in the Bush

Response	Frequency	Percentage
Strongly agree	11	15.7
Agree	17	24.3
Disagree	23	32.9
Strongly disagree	18	25.7
No response	1	1.4
Total	**70**	**100.0**

Traditional beliefs which have no sound scientific bases are termed 'negative beliefs'. Item 19 required the respondents to respond to the belief that 'pregnant women who eat eggs or snails will give birth to babies who will become thieves in future.' The distribution of their responses is shown in Table 19.

From Table 19, 4 respondents representing 5.7% of the sample strongly agreed whilst 2 respondents represening 2.9% agreed. It is misleading to agree to this belief because it has no scientific basis. Enforcing this will only deprive pregnant women of valuable proteins which their babies need to develop. Such beliefs are still strictly enforced in primitive cultures. Twenty-five respondents representing 35.7% indicated that they disagree whilst 38 respondents representing 54.3% indicated that they strongly disagree to the statement. The total number of respondents who disagreed far outnumbers those who agreed to this notion. This shows that most individuals are increasingly becoming aware of certain negative cultural practices which have adverse effect on the society.

Table 19: Pregnant Women Eating Eggs or Snails

Response	Frequency	Percentage
Strongly agree	4	5.7
Agree	2	2.9
Disagree	25	35.7
Strongly disagree	38	54.3
No response	1	1.4
Total	**70**	**100.0**

Item 20 required respondents to respond to the belief that if one throws stones at pregnant animals the offender's mother will have a miscarriage. Their responses are displayed in Table 20.

From Table 20, only 1 respondent representing 1.4% strongly agree whilst 11 respondents representing 15.7% agree to the statement. Even though one's mother may not have miscarriage if one throws stones at pregnant animals, those respondents who agreed to this assertion are not far from right because the laws of the country forbid hunting of animals during their breeding seasons. Elders of a given community forbid cruelty to animals, especially, pregnant ones. Also from Table 24, 36 respondents representing 51.4% of the sample disagreed whilst 21 respondents representing 30.0% indicated that they strongly disagreed to this assertion. It is very difficult if not impossible to use the scientific method to determine whether a cause of miscarriage is due to the throwing of stones at pregnant animals. Respondents who disagreed to this assertion are right but it is still good to keep it as a

positive traditional belief in order to prevent cruelty to animals. One respondent representing 1.4% did not respond to the statement.

Table 20: Stoning Pregnant Animals

Response	Frequency	Percentage
Strongly agree	1	1.4
Agree	11	15.7
Disagree	36	51.4
Strongly disagree	21	30.0
No response	1	1.4
Total	**70**	**100.0 (approx.)**

Item 21 required respondents to respond to the belief that traditional and religious beliefs should not be challenged. The responses are displayed in Table 21.

From Table 21, all the respondents responded to the item. The suppression of the work of the Italian astronomer Galileo by leaders of the Christian religion is a clear indication that religious beliefs are most often not challenged. From the table, seven respondents representing 10.0% strongly agreed to the statement whilst 23 respondents representing 32.9% of the sample agreed to it. In all, a total of 30 respondents agreed representing 42.9% of the sample. This may be due to the strict interpretation of scripture(s) which is believed to be divine and so should not be challenged.

Table 21: Challenging Traditional or Religious Beliefs

Response	Frequency	Percentage
Strongly agree	7	10.0
Agree	23	32.9
Disagree	26	37.1
Strongly disagree	14	20.0
Total	**70**	**100.0**

Twenty- six respondents representing 37.1% indicated that they disagreed whilst 14 respondents representing 20.0% indicated that they strongly disagreed to the statement. These respondents may be right in disagreeing because certain beliefs have no scientific basis and should therefore be challenged and made to fade out from society.

Religion is part of culture and most of the cultural practices such as farming, craftsmanship, hunting, etc have sound scientific ideas embedded in them. Item 22 sought to find out from respondents whether science and religion can live together as part of the same culture. The responses are displayed in Table 22.

From Table 22, the number of respondents who strongly agreed to this assertion was 15 representing 21.4% and 27 respondents representing 38.6% of the sample agreed. Both science and any progressive religion aim to instill the spirit of enquiry, probity and honesty: both search for truth, but in their own ways. From this assertion it cannot be over ruled that science and religion can live together as part of the same culture. The table also revealed that 19 respondents representing 27.1% disagree whilst 8 students representing 11.4%

of the sample strongly disagreed to the statement. Those students who either disagreed or strongly disagreed that Science and religion can live together as part of the same culture might have based their argument on the fact that true science is proof without certainty whilst true religion is certainty without proof.

Table 22: Science and Religion living as Part of the Same Culture

Response	Frequency	Percentage
Strongly agree	15	21.4
Agree	27	38.6
Disagree	19	27.1
Strongly disagree	8	11.4
No response	1	1.4
Total	**70**	**100.0 (approx)**

Item 23 required respondents to respond to the assertion that the fear of witchcraft and superstition can be explained and become unimportant through proper science education. Table 23 shows a distribution of their responses.

All the respondents responded to this item as shown in Table 23. Eighteen students representing 25.7% indicated that they strongly agreed whilst 24 students representing 34.3% also indicated that they agreed to this assertion. This shows that a larger proportion of the sample for example, believe that natural events have natural causes and that man can understand and ultimately control these events. For example man can explain the causes of lightning and thunder, causes and effect of infertility in humans, etc, without attributing them to the work of the gods or witchcraft. The table also

reveals that 21 students representing 30.0% of the sample disagreed whilst seven students representing 10.0% strongly disagreed to this assertion. This means that no matter the level of science education there will still be an element of superstition in students who disagree to the assertion.

Table 23:Fear of Witchcraft and Superstition Become Unimportant Throught Proper Science Education

Response	Frequency	Percentage
Strongly agree	18	25.7
Agree	24	34.3
Disagree	21	30.0
Strongly disagree	7	10.0
Total	**70**	**100.0**

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the research findings obtained from the study. It also contains the conclusions drawn, recommendations and suggestions for further studies.

Summary

Science is accepted worldwide as the 'bedrock' of technology and for that matter national development. For a nation to really develop and attain international recognition, it is very important for that nation to establish formidable scientific institutions that will facilitate accurate research findings for improvement and invention of modernized infrastructure.

Ghana, like any other developing country, needs to give particular attention to science in the various learning institutions, and provide for the smooth teaching and learning of the subject. The values of science education would not be achieved if religious beliefs are not integrated with scientific facts.

The study was designed to find out the influence of traditional and religious beliefs on the learning of science by students of Tamale College of Education. The case study design was employed and data for the study was collected by administering a questionnaire. Before administering the questionnaire, it was pilot tested in Bagabaga College of Education, Tamale.

Simple random sampling technique was used to select the respondents from the first and second year groups of students. The data collected was analysed using simple tables consisting of frequencies and percentages. During the study topics or materials related to the problem were reviewed in the form of literature review.

Items in the questionnaire were discussed in relation to the related literature. A summary of the major discussions are as seen below:

1. All the respondents belonged to one of the three main religious denominations, i.e, Islam, traditional and Christianity.
2. The majority (61%) were Muslims. About 79% of the respondents indicated that some relationship exists between science and their belief system.
3. A large majority (93%) of the respondents indicated that the relationship that existed between science and their belief system promoted the learning of science in the college.
4. Majority (71%) of the respondents indicated that the learning of science was not a threat to their belief system. Nineteen respondents representing 27.1% saw the learning of science a threat to their belief system.
5. The respondents were evenly divided about whether they would prefer not to learn science in order to protect their belief system.
6. A fairly large proportion of respondents (69%) indicated that proper science education would help eradicate superstition to some extent.

7. Minority (13%) of the respondents strongly agreed that whatever the elders say is indisputably true and should not be questioned or challenged.
8. A small proportion of the respondents (31%) disagreed to the belief that whatever elders say is indisputably true and should not be questioned or challenged.
9. Majority of the respondents (54%) strongly disagreed to the belief that pregnant women who eat eggs or snails will give birth to babies who would grow to become thieves.
10. Minority of the respondents (39%) agreed to the assertion that science and religion can live together as part of the same culture.

Conclusions

The main aim of learning science as stated by the Ghana Education Service (2007) is to make an individual scientifically literate. Most respondents of the sample supported this aim. A scientifically literate person has the advantage of living a healthy life, using scientific concepts for explaining the world around, etc. This scientific literacy, in effect, had a positive influence on the learning of science in the college. Few respondents indicated that their main aim of studying science was to pass an examination. Passing an examination in science does not necessarily make an individual scientifically literate.

Asare-Arhin (2006) stated that traditional beliefs that have scientific bases are termed positive beliefs. Bishop and Darton (2002) also outlined the relationship between the aims of science and any progressive religion as instilling the spirit of enquiry, probity and honesty. The study revealed that

more than half of the respondents admitted that there was a relationship between science and their belief system. This existing relationship promoted the learning of science as indicated by most respondents in item 8 and therefore this had a positive influence on science learning in the college. A few respondents did not support the idea of an existing relationship between science and their belief system. Their view goes contrary to the views of Asare-Arhin (2006), and Bishop and Darton (2002). The view of these few students might have a negative influence on their learning of science in the college. This is because positive beliefs according to Asare-Arhin (2006) had good foundations in science and facilitated the learning of science.

The theory of evolution proposed by Darwin (Nault, 1999), the sun-centered solar system proposed by Coppernicus (Bennet, 2002) and many other scientific discoveries were contrary to the teachings of the Holy Scriptures. These contradictions might be expected to pose as a threat to certain beliefs of students and impede students' learning of science. However, most students in this study indicated that the learning of science was not a threat to their beliefs. This had a positive influence on science learning in the college because despite the contradictions, the beliefs of these students were not threatened. Only a few students attested that the learning of science was a threat to their belief system.

Asimah and Owusu(2010) do not support the belief that whatever the elders say is indisputably true and should therefore not be questioned. This is because this belief has no scientific basis. Byers (2002) attested that scientists probe, poke, disagree and think up theories. In this study, the belief that whatever the elders say is indisputably true and should not be questioned was

shared by some students. Such a belief would have a negative influence on the learning of science in the college because these students would not want to discard their superstitious beliefs and stick to scientific facts.

To a large extent most students indicated that proper science education would help eradicate superstition in them. These students shared Shayer's view that science does not accept superstition, and this would have a positive influence on science learning in the college. Very few students indicated that proper science education would have no effect in eradicating superstition. For these students, this belief might have a negative influence on their learning of science because phenomena such as eclipses, rainbows etc, could be attributed to the act of the gods. Asimah and Owusu (2010) viewed traditional beliefs and taboos which had no good scientific basis as negative beliefs. Capp (2003) also seemed to share Asimah and Owusu's view when they stressed that traditional beliefs are often based on superstition of phenomenon typically with little or no basis in facts. The belief that pregnant women who eat eggs or snails would give birth to thieves in future was strongly disagreed by more than half of thestudents. This belief as viewed by Asimah and Owusu (2010), and Capp (2002) has no scientific basis. Therefore students who disagreed had good reasons for doing so. Disagreeing with negative beliefs by these students promoted the learning of science and therefore has a positive influence on science learning in the college. These beliefs would not promote the learning of science in the college by a few students. Science and religion may disagree in some areas but both have their limitations (Ferngren, 2002). Scientists probe, agree, disagree, discover, challenge and question (Byers 2002).

It is socially acceptable to dismiss certain type of beliefs such as false scientific beliefs. According to Bishop and Darton (2002), no one can say something to criticize a religion without being a terrible person. Some students felt that traditional and religious beliefs should not be challenged. The suppressing of the work of the Italian Astronomer, Galileo, by the leaders of the Christian religion was a clear indication that religious beliefs should not be challenged. The belief of the few students would have a negative influence on their learning of science in the college. Students who disagreed might have shared the views of Ferngren (2002) and Byers (2002). This belief would have a positive influence on their learning of science in the college. Bishop and Darton (2002) attest that both science and any progressive religion aim to instill the spirit of enquiry, probity, and honesty; both search for truth, but in their own way. According to Atkins (2001), "religion is the anti – thesis of science". Atkins stressed further that despite the difference between science and religion, both can live together as parts of the same culture. Those students who agreed to this assertion had a sound basis because most cultural practices had good scientific ideas imbedded in them. Traditional and religious beliefs could have both positive and negative influence on the learning of science in Tamale College of Education.

Recommendations

It is evident from the findings that the belief systems of some learners play a role in the learning of science. In view of this, it is recommended that:

1. Teachers of Tamale College of Education make use of relevant teaching and learning materials to teach science instead of explaining concepts theoretically. The use of materials to teach science will help to demystify

science. This will also make science real. For example, a ray box, glass prism and a screen can be arranged to produce the colours of the rainbow. This will help students to discard the misconception that the formation of the rainbow is due to the act of the gods. Again, a chart of the respiratory and digestive systems can be used to explain the danger involved in eating whilst talking. Students will become aware that particles of food can accidentally enter the trachea and cause choking.

2. Science teachers in Tamale College of Education should form science clubs. Science fora should be organized by these clubs to educate students of the college about the effects of some cultural practices such as the belief that pregnant women should not eat eggs or snails, and whatever the elders say is indisputably true.

Suggestion for Further Research

Even though some work has been done on this study, there is still more room for improvement. Other researchers could look at the influence of traditional and religious beliefs on both the teaching and learning of science, and cover many colleges of education.

REFERENCES

Abbey,T.K. (1990).*Core Science for Senior Secondary School*.London: MacMillan Education Ltd.

Alton-Brigg, M. S, & Kathleen, G. (2005). *The Dynamics of Life*. Glencoe, New York: McGraw-Hill.

Asare – Arhin, S. (2006). *Methods of Teaching Integrated Science.* Accra: Teacher Education Division, G.E.S.

Asare-Ahene, F.S. (2003). *Professional Studies in the Teaching of Science. A Concise Source Book for Training Colleges.*Suhum: Dan Christ Printing Press.

Asimah, G., & Owusu, B. (2010). *Methods of Teaching Science for Diploma in Basic Education by Distance Learning*. Kumasi: University of Science and Technology Printing Press.

Atkins, P. (1997). *Religion – The Antithesis of Science*. http: // En. Wikilpedia. Org/Wiki/relationship – bn Science and religion.

Barry, J .F (2001*). Altering Socio – Cultural Beliefs Hindering the Learning of Science*. California: Corwin Press, Inc.

Bennet, J. (1998). *On the Cosmic Horizon*. New York, McGraw Hill Companies, Inc.

Bennet, R. (2002). *Exploring Science (4th ed).* London: Laidlaw Brothers Publishers.

Bishop, P., & Darton, M (2002). *An Illustrated Survey of the World Living Religion.* New York: John Killey and Sons Inc.

Brooke, J. (1991). *Science and Religion: Some Historical Perspective*. Cambridge:Cambridge University Press.

Bunnet, C. (2002). *The Book of Popular Science*. New York: The Grolier Society Inc.

Byers, A. (2002). *Understanding science.* New York: McGraw-Hill Co.

Capp, T. (2002). *Science and Indigenous Beliefs*. London: Christopher's Printing Press.

Cohen, L., Manion, K & Morrison, K. (2002*). Research Methods in Education* (5thed.). London and New York: Talyer and Francis Group.

Davis, C. (2001). *Science, Discovery and Progress*. New York: Holt Rinehart and Winston, Inc.

Dusick, L.(2001*). Research Methods in Education*.London: Tayler & Francis Group.

Ellen, M. & Harris, K. (2006). *Science, Technology and Traditional Knowledge*. Hong Kong: SheekWab Printing Press.

Farrant, J.S. (1980). *Principles and Practice of Education*. Victoria City: SheekWab Tong Printing Press Ltd.

Ferngren, G. (2002). *Science and Religion: Some Historical Introduction*. Baltimore: John Hopkins University Press.

Fiador ,E. (1998). *Hands- on science using simple material*. Accra: Tops LearningSystems.

Findley, M. (2001). *The Impact of Religion in the Science Classroom*. A Paper Presented at the Annual Meeting of the Mid- South Educational Research Association. 30th Little Rock, AR. 14-11-2001.

Jenkins, P. & Nelson, D. (2005). *The Science Teacher's Handbook.* London: Heinemann Educational Publishers.

Joof, M. B. (2007). Scienceand Technology Development in the ECOWAS Sub-Region. *Journal of Research in Science and Technology, 67*(5), 23-31.

Jure, G.(2003). *Culture & Scienc Education:A Look from the Developing World*. New York: Macmillan.

Kant, E. (2003). *Comparative Study of Religion*. Chicago: Nelson-Hall Publishers.

Ladyman, J. (2008). *Understanding Philosophy of Science*.San Diego : King Lynn Press Inc.

Lindberg, D. C. (2007*). The Beginning of Western Science* (2nded.). Chicago and London: University of Chicago Press.

Mackean, S. & Clegg, T. (2007). *Advanced Biology, Principles and Applications (2nded.).* London: Sage Publishers.

Ministry of Environment, Science & Technology.(2000).*Policy Document.* Accra.

Nault, W. (1999). *The World Book Encyclopedia*. Chicago: World Book Inc

Nolan, P. (2003). *Fundamentals of College Physics* (6thed.). Dwuque: WmC. Brown Publishers.

Nyavor, C.B., & Seddoh, S. (2000). *Science for Senior Secondary School* (2nded.). London: Macmillan Education Ltd.

Olugbemiro, J. (2005). *Research in Science Teaching*. 46, 057-017.

Pearsal, J. (Ed.) (2000). *Concise Oxford English Dictionary.* New York: Oxford University Press.

Reynolds, D. (2008). *Concepts in Science* (2nded.). Chicago: Aldine-Atherton Press.

Shayer, A. (2001). *The Basic Concepts of Science*. Montreal: Nelson and Sons Publication Ltd.

Smith, R. (2000). *The Religious Experience* (4thed.). London: Macmillan Publishers.

Sonnes, C. & Stevenson, A. (2004). *Concise Oxford English Dictionary* (11thed.). New Yolk: Oxford University Press.

Tjikuua, K. (2001). *Science Education in Namibia.* Windhoek: Windhoek University Press.

Turkson, D. (2001). *Science and Cultural Beliefs.* Unpublished First Degree Project Work, University of Education, Winneba.

Wayne, G. (2001). *Physical Science* (6thed.). London: Christophers Printing Press.

APPENDIX A

UNIVERSITY OF CAPE COAST

QUESTIONNAIRE FOR STUDENTS

This questionnaire has been designed to collect relevant information that will assist in the study of the influence of traditional and religious beliefs on students' learning of science in Tamale College of Education.

Please tick, underline or write your response as appropriate in the space provided.

1. Department …….

2. Sex: Male ☐

Female ☐

3. Number of years in the college ……..

4. Which of these age groups do you belong to?

18 – 12 years ☐

24 – 29 years ☐

30 – above years ☐

5. Which of the following religious denominations do you belong to?

Islam ☐

Traditional ☐

Christian ☐

6. Which of the following is your main goal in doing Science?

To pass examination ☐

To make me scientifically literate ☐

7. Is there a relationship between science and your belief system?

Yes ☐

No ☐

8. If yes to item 7, does this relationship promote your learning of science?

Yes ☐

No ☐

9. If yes to item 8, to what extent, does this relationship promote your learning of science?

To a large extent ☐

To a small extent ☐

No effect ☐

10. If no to item 7, does it affect your learning of science?

Yes ☐

No ☐

11. Do you see the learning of science a threat to your belief system?

Yes ☐

No ☐

12. If yes to item 11, to what extent is the learning of science a threat to your belief system?

To a large extent ☐

To a small extent ☐

No effect ☐

13. When given the opportunity will you not learn science in order to protect your belief system?

Yes ☐

No ☐

14. To what extent will proper science education help eradicate superstition in you as a learner?

To a large extent ☐

To a small extent ☐

No effects ☐

To what extent do you agree to the following statements in items 15-23?

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
15. Whatever elders say is indisputably true and should not be questioned/challenged 16. One should not sing whilst bathing else one's mother will die 17. One should not talk whilst eating else one's mother will die 18. The gods curse people who have sexual intercourse in the bush. 19. Pregnant women who eat eggs or snails will give birth to babies who will become thieves in future. 20. If one throws a stone at pregnant				

animals the offender's mother will have miscarriage. 21. Traditional / religious beliefs should not be challenged. 22. Science and religion can live together as part of the same culture. 23. It is only through proper scientific education that the fear of witchcraft and superstition can be explained and become unimportant				