PRACTICE AND CHALLENGES OF MATHEMATICS LESSON IMPLEMENTATION IN CHIRO COLLEGE OF TEACHERS' EDUCATION, WEST HARARGHE ZONE, OROMIA REGIONAL STATE, ETHIOPIA

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AMAN ADEM

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Practice and Challenges of Mathematics Lesson Implementation in Chiro College of Teachers' Education, West Hararghe Zone, Oromia Regional State, Ethiopia

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Aman Adem

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POSTGRADUATE PROGRAM DIRECTORATE

I hereby certify that I have read and evaluated this Thesis entitled **"Practices and Challenges of Mathematics Lesson Implementation in Chiro College of Teachers' Education, West Hararghe Zone, Oromia Regional State"** prepared under my guidance, by Aman Adem. I recommended that it will be submitted as fulfilling the thesis requirement.

Melisew Tefera (PhD) _____ _____

Major Advisor Signature Date

Yilfashewa Seyuom (PhD) _____ _____

Co- Advisor Signature Date

As a member of the Board of examiners of the MSc Thesis Open Defense Examination, I certify that I have read and evaluated the Thesis prepared by Aman Adem and examined the candidate. I recommended that the thesis be accepted as fulfilling the Thesis requirements for the degree of Masters of Sciences in Mathematics (Mathematical Modeling).

_____ _____ _____

Chairperson Signature Date

_____ _____ _____

Internal Examiner Signature Date

_____ _____ _____

External examiner Signature Date

DEDICATION

I dedicate this thesis work to my beloved wife Ramete Zeleke and to my daughters Sumaya Aman and Raha Aman who provided me with love and support throughout my studies.

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this Thesis is my own work. I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this Thesis. Any scholarly matter that is included in the Thesis has been given recognition through citation.

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Name: Aman Adem Signature: _____

Date: May 2019

Department: Mathematics

BIOGRAPHICAL SKETCH

The author was born in 1983 in Adami Tullu Jiddoo Kombolcha district, East Shoa Zone. He attended his Elementary Education at Weransa School; completed his Secondary Education at Zeway Secondary School in 2001. He joined Jimma College of Teachers Education in 2002 and graduated with Diploma in Mathematics in 2003. Upon his graduation, he was employed and working as mathematics teacher in Hareto Secondary and Preparatory School from 2004 – 2010 in Jimma Geneti Woreda, Horro Guduru Wellega Zone. After teaching for 3 years, he joined Mekele University in Summer (Kiremt) Program and graduated in 2009. Then, he got a Mathematics teaching position at Chiro College of Teachers Education in 2011. In 2015, he joined the Postgraduate Program Directorate at Haramaya University in Summer (Kiremt) Program in College of Natural and Computational Sciences, Mathematics Department, for Master of Science in Mathematics (Mathematical Modeling).

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ACRONYMS AND ABBREVIATIONS

CCTE	Chiro College of Teachers' Education
df	Degree of freedom
DHS	Demographic Health Survey
ETP	Education and Training Policy
F	Frequency
FDRE	Federal Democratic Republic of Ethiopia
INSET	In Service Training
MOE	Ministry of Education
NCTM	National Council of Teachers of Mathematics
PCK	Pedagogical Content Knowledge
SMASEE	Strengthening Mathematics and Science Education in Ethiopia
TGE	Transitional Government in Ethiopia

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figures Pages

Practice and Challenges of Mathematics Lesson Implementation in Chiro College of Teachers' Education, West Hararghe Zone, Oromia Regional State, Ethiopia

ABSTRACT

The purpose of this study was to investigate practice and challenges of mathematics lesson implementation in Chiro College of Teachers Education. Attempts have been made to examine:- mathematics teachers method of teaching in implementation of mathematics lesson, teachers belief about mathematics, availability of teaching and learning resource and dominant factors that challenges mathematics lesson implementation in Chiro College of Teachers Education. To this end, a descriptive survey approach was used as a method of this study. The data was collected from 236 sample students through simple random sampling techniques and all 4 mathematics teachers were selected because they were available. Interview with teachers, observation, and questionnaires were employed to collect data for this study. The data obtained were analyzed using both quantitative and qualitative analysis methods. Accordingly, the result of the study indicated that the major factors that affect mathematics lesson implementation in Chiro College of Teachers' Education were:- attitudes of students' towards mathematics, students' academic background knowledge in mathematics, uncovered contents of mathematics in elementary school and inadequate physical facilities. Lack of training on professional development in mathematics such as mathematics content, mathematics pedagogy/instruction, mathematics curriculum were another findings of the study. But majority of the teachers took only strengthen mathematics and science education in Ethiopia. Furthermore, teachers used a variety of methods to teach mathematics in class. However, teachers rated themselves as using lecture/explanation and demonstration methods prominently. It was found that the implementation of mathematics lesson was constrained by inadequate teaching and learning resources. Teachers have good feeling (belief) about mathematics was also another finding of the study. Hence, to alleviate the problems encountered in the implementation of mathematics lesson:- College administration should provide enough teaching and learning resources needed for implementation of mathematics lesson as soon as possible, Teachers should practice different method of teaching to enhance mathematics lesson, Ministry of Education should design and give additional training for lower grade mathematics teachers to be motivated, College should immediately conduct training program for teachers in mathematics, College should provide appropriate physical facilities and students have to be initiated to develop a positive attitude towards mathematics by using different methods of teaching and learning styles. Finally, the researcher believes this study will have a contribution in the effort of identifying some of the aspects, which hinder mathematics lesson implementation. It could be also used as an initial work for those who are interested to do further studies in this area.

1. INTRODUCTION

1.1. Background of the Study

Education is a means for bringing behavioral changes in the learners in terms of knowledge, skills, and attitudes. (Begum and Farooqui, 2008) explained that education is a vehicle of socio economic progress. They further explained that education is an ongoing process, during this process it is often required to measure the progress of the learners, how far the educational changes occurred among them or how these changes have been organized. Education plays a vital role in the development of human capital and is linked with individuals' wellbeing and opportunities for better living" (Farooq *et al*., 2011; Ababa *et al*., 2012).

According to (Aggarwal, 2002) the teaching learning process is the means through which the teacher, the learner, the curriculum and other variables are organized in a systematic manner to attain those educational aims and objectives. (Amare, 2002) also expressed lesson implementation as a systematic process that involves input, process and output. That is, the teaching and learning as a process implies that all the various elements of the teaching-learning situation have to be brought in to an understandable whole. These elements and activities include the content of the curriculum, the learner and their individual difference, the teachers, the method of teaching, the classroom condition, teaching materials, questioning and answering, assignments, thinking, enjoying creating, practical skills, discussions and many others (Aggarwal,2002; Curzon, 1990).

Mathematics is one of the disciplines that greatly contribute for the achievement of those educational objectives. To look at this fact it is better to see the nature of mathematics and how educational objectives are stated. In (FDRE 1994, p. 8) some of the objectives are stated as:

> Bringing up citizens who differentiate harmful practices from useful ones, who seek and stands for truth, appreciate aesthetics, and show positive attitude towards the development and dissemination of science and technology in the society; cultivate the cognitive, creative, productive and appreciative potential of citizens by appropriately relating education to environment and societal needs.

Mathematics is not only computation of a numbers. It is a science of patterns and relationships, a way of thinking, an art, characterized by order and internal consistency, and it is a language

and a tool using carefully defined terms and symbols (NCTM, 1999; 1995). (NCTM 2008) strengthened these ideas expressing that mathematics is the key to opportunity, and every individual in an economically competitive nation must be mathematically literate. Because one who is mathematically literate can analyze data, reason and solve problems by applying mathematical concepts and skills.

Education systems throughout the world place high importance on the implementation of mathematics lesson, and a lot of resource is put to maintaining and improving efficiency and effectiveness in these activities (Garden, 2009). There are two major reasons that add to the importance of mathematics. One is the relationship between mathematics performance and academic or career opportunities and performance (Mills, Ablard & Stumpf, 2003). The second is the importance of the study of mathematics to the scientific, industrial, technological, and social progress of a society (Burton, 2009). Despite such importance it is unfortunate that many students have mistaken impressions about mathematics and dislike mathematical activities; many seem to fear, even hate, mathematics (Neale, 2005).

Many studies have identified that teaching mathematics in real life contexts enhance students' enjoyment of mathematics lessons (Anthony &Walshaw, 2007; Boaler, 2002; Dickinson & Hough, 2012; Kacerja, 2012). In (Boaler's, 2002) study, students who were taught in a traditional manner viewed mathematics as a collection of procedures. In contrast, those students who were taught in a context viewed mathematics as an active and inquiry-based discipline. Mathematics education is the key learning area of the school curriculum. In line with this, (Caglar 2003) stated that mathematics is a language that we use to identify, describe, and investigate the pattern and challenges of everyday living. Besides, National Council of Teachers of Mathematics (NCTM, 2008) also stated that, mathematics gives people the power and utility to express, understand and solve problems in diverse settings.

The Ethiopia Education and Training Policy have given attention to mathematics instruction at all level of primary, secondary, College and TVET Educations (TGE, 1994). Hence, in our education system the place of mathematics as a subject has been very important. Mathematics uses mathematical theory, computational, techniques, algorisms, and the latest computer technology to solve economics, scientific, engineering, physics and business problem.

In CCTE, achievements and participation of students in mathematics were poor. As an affirmation, as the data from the College's registrar office indicated students' yearly academic achievement in mathematics (2007 – 2010 E.C) were less. In these academic years (2007 – 2010 E.C), from the total candidates who sat for final Examination, out of 1471 students, 6.21% got A grade; 22.34% got B grade; 40.19% got C grade; 25.65% got D grade; 11.82% got F grade in mathematics. Adding D and F 37.47% of the students score grade below "C". (CCTE registrar, 2007 E.C – 2010 E.C)

There are some constraints that affect the achievement and participation of students in mathematics at CCTE. Among the challenges, students' attitude towards mathematics, students' background knowledge, teachers' method of teaching, teaching and learning resources are the most significant one (Maria de Lourdes Mata et al. 2012). The above mentioned can be considered as a serious problem in mathematics lesson implementation.

In the College, the researcher from his real observations and eight years' experience of teaching mathematics have observed that most students were not interested in attending mathematics classes. They did not actively engage and take part in discussions of mathematics lessons. They were not capable of working out activities and exercises in their mathematics text books. They have low participation in most mathematics lessons (Teachers' observation, 2003E.C – 2010E.C)

Most students have difficulties in implementing their previous mathematical skills and knowledge to solve mathematical and related problems (De Coete et al., 1989). However, the researcher observed from his experience in teaching CCTE that the participation and performance of many students in mathematics is low. In order to give solution to this problems, the researcher believes that detailed research should be done on teaching methodologies applied to mathematical concepts, proper use and evaluation of teaching aids, construction and utilization of teaching instruments, examination and exploration of alternative assessment strategies and technologies for use in mathematics classrooms (SU Segal - 2009). Therefore, from this and the aforementioned background the researcher was initiated to examine the students' challenges in mathematics lesson implementation.

1.2. Statement of the Problem

Problems related to learning Mathematics are common phenomenon among students around the world (Fennema & Shermann, 2006). This holds true in the Ethiopian context too, particularly CCTE. There are some constraints that affect the achievement and participation of students in mathematics at CCTE. Among the challenges, students' negative attitude towards mathematics, students' background knowledge, teachers' method of teaching, teaching and learning resources are the most significant one. Mathematics is considered as a male domain in various countries (Burton, 2009; Fennema, 2004; Fennema & Shermann, 2006). Particularly in the Ethiopian, specifically in CCTE, community's girls are engaged in household duties in order to support their family. They involve in taking care of young children, cooking and in carrying out other duties (Belay, 2004). This does not allow girls to spend much time in their education in general and Mathematics in particular.

The most important aspect to the mathematics lesson implementation is understanding. Applying thinking skills and creative thought lead to better understanding of mathematics lesson (Braun et al., 2011). However, over the years, poor performance and low participations in mathematics in CCTE has become a significant problem. It is observed that in CCTE the result of mathematics examination of many students is not satisfactory. Throughout the researcher's teaching experience, it is observed that the way the teachers teach, the nature of lesson in given topic, the nature of learning, etc. in one way or the other, acts as an obstacle to the implementation of mathematics lesson.

In Ethiopia, Educational researches made in governmental schools by graduate student researchers of AAU: (Kinfu, 2008) in the study of evaluation of the implementation of preparatory mathematics syllabus in Assela TVET Institution; (Girma, 2007) in the study of the implementation science curriculum in Missionary Owned Secondary Schools; (Alemayehu, 2005) in the study of evaluation of teachers' performance in implementing in geography curriculum in Gore General Secondary School; (Solomon, 2000) in the study of an

evaluation of implementation of grade 8 mathematics syllabus in Sidoma Zone, have all reported in their finding, the existence of prevalent gap between design 'intents' and what is actually in practice at the classroom level. In most of the above studies, many teachers were using the tradition methods of teaching-talk, chalk and rote memorization of facts, ideas, and principles instead of using techniques and strategies suggest in the syllabus.

(Tamene Olana 2007) stated that class room conditions, attitude of teachers toward classroom assessment, lack of professional skill in line with the new approach, lack of instructional materials, school facilities, seem to hinder the effectiveness of the implementation of mathematics. The following conditions are the reasons which initiated the researcher to undertake this study on this area and subject specifically. Firstly, from general education quality improvement program (MoE, 2008, p: 6), school facility is one of the important things that require great consideration by all stakeholders in order to solve the problems seen to improve quality education. But there are standard and situation variety among Colleges of Oromia. These standard varieties are class size, resource availability, teachers load, instructional materials and the commitment of teachers and other stakeholders. Secondly, since the researcher teaches mathematics he observed from his experience that some of our College teachers have the problems related to professional skills. These professional skills include considering continuous assessment as only continuous testing, poor test construction and failure to apply the law of measurement and evaluation, and poor coverage of instructional content. Thirdly, there are also attitudinal varieties between students on accepting mathematics lesson in teaching and learning mathematics (Marjorie Henningsen and Mary Kay Stein, 2018). There is fear to be successful among some of the students during mathematics lesson implementation.

In Chiro College of Teachers Education , the researcher from his real observations and eight years' experience of teaching mathematics have observed that most students were not interested in attending mathematics classes. They did not actively engage and take part in discussions of mathematics lessons. They were not capable of working out activities and exercises in their mathematics text books. They have low participation in most mathematics lessons. Most students, in natural and social science streams, have difficulties in implementing

their previous mathematical skills and knowledge to solve mathematical and related problems (Kaniz Fatema Pia, 2015).

Studies carried out attribute poor performance in mathematics to factors such as poor teaching methods, lack of teaching resources, students‟ attitudes towards the subject, weak link between primary, secondary and college (syllabuses) content levels among others (SMASEE, 2008). In response to these problems, the Ministry of Education (MOE) initiated corrective measures through SMASEE by in-servicing teachers on appropriate teaching techniques that enhance performance. This implies that there are other challenges relating to mathematics lesson implementation that have not been addressed in CCTE context.

Even if there are many studies conducted in mathematics in different country, universities, and colleges in Ethiopia, this study is different in that there is no specific study related with this topic in place where the researcher is working. It is in view of this gap, that the researcher felt mathematics lesson implementation in CCTE might significantly contribute to understanding the causes of poor performance and low participation of students in mathematics lesson implementation. Knowing of the above fact, the researcher is motivated to conduct this research in Chiro College of Teachers Education in Oromia region with particular reference to West Hararghe zone which only focuses on practices and challenges of mathematics lesson implementation.

1.3. Research Questions

This study was attempted to answer to the following research questions.

1. What kinds of teaching methods are used in mathematics lesson implementation in Chiro College of Teachers' Education?
2. What are teachers' beliefs about mathematics lesson in Chiro College of Teachers' Education?
3. How adequate are teaching and learning resources needed for facilitating the implementation of mathematics lesson in Chiro College of Teachers' Education?
4. What are the Dominant factors challenging mathematics lesson implementation in Chiro College of Teachers' Education?

1.4. Objectives of the Study

1.4.1. General objective of the study

The main purpose of this research is to investigate the practices and challenges of mathematics lesson implementation in Chiro College of Teachers Education.

1.4.2. Specific objectives of the study

Specifically, this study is targeted to:

- Specify the teaching and learning methods used in mathematics lesson implementation in Chiro College of Teachers' Education?
- Identify Teachers' belief about mathematics lesson in Chiro College of Teachers' Education.
- Analyze the adequacy of teaching-learning resources in the implementation of mathematics lesson in Chiro College of Teachers' Education.
- Identify the dominant factors that challenge mathematics lesson implementation in Chiro College of Teachers' Education.

1.5. Significance of the Study

Assessing the present implemented syllabus and identifying the nature and practices of teaching and learning the subjects is a very important part of educational process. In addition, this study is concerned in assessing the practices and challenges underlying with the content to reach on improvement. The results of this study therefore, useful in many ways. To begin with, it has benefits to the academicians, researchers, policy makers and reference books writers. Besides the study has some benefits to teachers in how they can facilitate the teaching and learning process of mathematics and for students in how to conceive concepts in learning mathematics and for their future application and also reinforces the need for developing good attitude towards mathematics. It may serve for educational researchers as initiation for further studies. Furthermore, the finding of the study and its implication is expected to serve as springboard for a further study in other subjects.

1.6. Scopes of the Study

This study is delimited in searching for the practice and challenges of mathematics lesson implementation in CCTE. The study emphasized on all first year students, second year mathematics and third year mathematics students. Since the study was conducted at CCTE and limited to the size of population in CCTE, the conclusions deduced from such a narrow context and the recommendations provided may not serve the case of all colleges and universities of the country. The researcher had attempted to make the study as complete as possible and open for further study.

1.7. Definition of Key Terms

- **Beliefs:** are convictions about the world and how it works.
- **Challenge:** obstacle that threaten success
- **College of Teachers' Education:** in Ethiopian context, learning gap between secondary school and university.
- **Implementation:** refers how teaching and learning activity put into practice in/outside classroom by mathematics teachers and students in the College.
- **Mathematics lesson implementation:** is the process of making mathematics lesson active or effective.
- **Performance:-** Achievement of CCTE students in mathematics: in terms of qualitative or quantitative works during their study
- **Practices**: current decisions and activities.

1.8. Organization of the Study

The study has five chapters. The first chapter focuses on the background of the study, statement of the problem, objectives of the study, research questions, and significance of the study. The second chapter comprises review of related literatures. Chapter three constitutes the design of the study, instruments of the study area, administration of pilot-test, population of the study, samples and sampling techniques, administration and procedures of data collection, and ethical considerations. Chapter 4 deals with the Presentation and Analysis of Results. Finally, chapter 5 presents the Summary of Findings, Recommendations and Conclusion of the study.

2. REVIEW OF RELATED LITERATURE

2.1. The Nature of Mathematics and Mathematics Education

There are a number of philosophical views, beliefs and conceptions on the nature and learning of mathematics. (Schoenfeld, 2016) states these philosophical views, beliefs and conceptions have paved the way for different teaching-learning methodologies of mathematics since teaching–learning process is a means through which teachers, learners, curriculum and other variables are organized in a systematic manner to address the needs and benefits of mankind. Supporting this, (Cangelosi, 2006) says that from the pedagogical point of view, there is no definite and better way of teaching mathematics. Cangelosi stipulated the cooperative method, the project method, the mastery learning method, and the problem solving methods as some of the basic learning strategies to be employed in the learning and teaching of mathematics. However, there are various challenges in employing the above-mentioned learning strategies which seem to emanate from the preparation of mathematics teaching materials, the training of mathematics teachers, and the existing beliefs and conceptions on the nature of mathematics itself. The study conducted by the Ministry of Education of Ethiopia (MoE, 2003) indicated that, mathematics teachers are not necessarily good at teaching in the schools by using active learning methods for exploiting the advantages coming through promoting learners' learning styles and strategies.

Principally, the National Council of Teachers of Mathematics (NCTM, 2015) described that mathematics education requires qualified teachers that guide students to meet the educational goals and objectives and support students, among other goals, to employ their own preferred learning styles and strategies. In addition to this argument, students need to be able to deploy meaningful learning strategies and use an insightful approach to mathematics learning since mathematics is one of the basics for the development of science and technology. Thus, one can easily see that the advancement of science and technology is realized by the proper application and utilization of mathematical knowledge, which in turn helps to curb societal problems.

(Cangelosi, 2006) noted that the use of calculators and computers has avoided the long and tiresome calculations being previously made by human mind. They helped to avail all information in the world on a table within a fraction of seconds using computers. Similarly, (Schoenfeld, 2016) illustrated that mathematical knowledge is associated with the socio-economic situation of the community and it helps to enhance the development of the citizens. Likewise, (Pewewardy, 2002) stated that mathematics connects one to his or her universe in many ways by incorporating language, culture and daily living practices. Mathematics education deals with the nature of mathematics, teachings and learning of mathematics.

(The NCTM, 2011) indicated that the basic elements in mathematics education process include teachers, learners, curriculum and pedagogy of instruction. The integration of these elements is mandatory to create a full-fledged operational result. (Austin and Howson, 2009) further elaborated that mathematics education can be viewed as both a process of individual construction and as a process of acculturation into the mathematical meanings and practices of wider society. One can learn from this point that the role of the learners is of paramount importance in the learning of mathematics. As noted in the standards (NCTM, 1999), traditionally people view learners as objects, which are to be filled with knowledge from a knowledgeable person, the teacher. Learners are expected to memorize the rules and procedures, formulas and follow the only steps given by their teacher in order to solve other mathematical problems and there is no way to construct their own mathematical knowledge. Moreover, traditional viewers consider the basic features of mathematics are expected to be crammed and given back as received by the learners. On the other hand, constructivists view learners as the architects to construct their own knowledge, to discover the relationships, and to form their own concepts. (Cangelosi, 2006) supported this view by stating that,

> Mathematics will not be meaningful to students unless they develop certain key concepts in their own minds and discover key relationships for themselves. The learners are not considered as white slates on which something is to be written by a knowledgeable person. Learners should be given the opportunity to exercise different learning styles and use different learning strategies.

(Graven 2002) further noted that, by its very nature, mathematics education needs conceptual understanding and intense effort in the construction and reconstruction of knowledge. Similarly, (Flavell, 2010) also showed that learning should focus on students' empowerment,

which is developed by involving students in activities that allow them to construct well-organized bodies of knowledge. Since mathematics education deals with the learning and teaching of mathematics, I needed to investigate the learning status of mathematics at College education level. The purpose of College education in the view of (Cano, 2005) is to develop critical thought, problem solving skills and learning to learn. To this, (Cangelosi, 2006) stated,

> The attainment of mathematical problem solving ability is dependent on five interrelated components. These interrelated components are concepts, skills, processes, attitudes and meta-cognition. The cognitive and meta-cognitive developments of the learner have greater impact on the learning and teaching of mathematics.

Since concepts refer to the basic mathematical knowledge needed to solve mathematical problems, the number of concepts possessed and the efficiency with which cognitive relationships are organized measure intelligence. The more concepts one has stored in one's mind, the more one is able to learn because there are more categories to which to anchor incoming information. Concepts are abstract ideas and definitions. If the student doesn't know the concept, a teacher has to create a comparative advance organizer, relating the new concept to something already known, and to create an expository advance organizer of a verbal explanation of the main features of the concept in order to establish it as a category in the students' cognitive structure. In addition to having conceptual knowledge, mathematical skills are also crucial to solve mathematical problems.

2.2. Challenges in Mathematics Lesson Implementation.

Challenges in mathematics lesson implementation are observed at secondary school level as well as at higher education level. The over all, unsatisfactory performance in school certificate is attributable in large measure to poor performance in mathematics and science (MOE, 2010). There are many students who fail to gain entry into a college institution immediately after leaving high school because of the poor grade they obtained in mathematics after twelve years in school. A good pass in mathematics is a requirement for entry into a college institution. The National Policy on Education of 2010 attributes this poor performance to challenges at the College level. The document states that the challenges "may be in the facilities, the resources or the teaching. It may be in the balance of the curriculum. It may be in the expectations that

pupils set for themselves since these are known to have a major impact on students' performance" (MOE, 2010).

During the National Implementation Framework (NIF) period, three institutions have been earmarked for conversion to colleges. Challenges in mathematics lesson implementation have also been noted by many other researchers. D'Souza and Wood (2008) observed that the learning of mathematics is often viewed as an isolated, individualistic matter where one sits alone with pen and paper and struggles to understand the materials and concepts at hand. This process can often be quite lonely and frustrating. Some college students believe that only a few talented individuals can successfully compete in the mathematics realm.

College students' experiences during their first year of study appear to be crucial to their personal adjustment and academic performance. First year at college for many students entails a considerable time of transition and change, particularly for those entering college teachers education directly after the end of their high school education. The transition from school to college involves adjusting to different learning environments and assessment systems, different perspectives on discipline-based knowledge and different teaching practices (Pargettal, 2008). The attitude a learner has towards mathematics is of critical importance because it determines the learners behavior towards mathematics and the effort the learner will put into the learning of mathematics. Researchers such as (Okello, 2010) and (Ekol, 2010) in their studies have attributed challenges faced by students as they learn mathematics to the wrong attitudes they hold about mathematics. Kyambogo University in April 2008 found out that a major challenge in mathematics lesson implementation is the attitude of students towards the subject. Discussions with the mathematics faculty in NTCs invariably echoed the negative attitude and poor mathematics background by students as being the major setback to their mathematics attainment. The John Templeton Foundation Report (2009) revealed that while African countries differ from one another in many features, they are broadly similar in the issues that hinder mathematical development.

(Tuan, 2011) observes that mathematics is one of the core subjects in any engineering field, including engineering technology and science fields. It is also known as the backbone of

success in these fields. A student who masters the subject of mathematics is perceived to be bright and is assured of graduating from the college. However, students entering higher education, particularly in the field of mathematics were found to have insufficient basic mathematics skills and knowledge. This scenario is not only becoming an issue in Malaysia (Ahmad, 2010) but it is also becoming a worldwide phenomenon in adding up burden to mathematics educators. (Okello, 2010) in her study in Uganda found the same situation. One of the biggest challenges in teaching mathematics skills based at the college level is the under preparedness of students enrolling in the mathematics related fields (Varsavsky, 2010). What will happen next are very predictable low levels of success and engagement with college level mathematics. The increasingly weaker mathematics background of college students and its consequences have been reported around the world (Varsavsky, 2010).

(Bell, 2009) concluded that every year in the United States, nearly 60% of first year college students discover that, despite being fully eligible to attend college, they are not academically ready for college mathematics. This gap between college eligibility and readiness to study college mathematics has attracted much attention in the last decade, yet it persists unabated. The National Centre for Policy and Higher Education report (2009) revealed that earning a high school diploma does not mean that graduates are ready for college. (Taylor, 1999), reports that the changing nature of Australian Universities has resulted in a student intake with a broad range of abilities, attitudes, personal and educational experiences. The study revealed that uneven preparedness was a problem for many college institutions with mathematics in particular cited as a barrier for success of many students. Therefore, students have very little time to study mathematics because they have to concentrate on the core technical subjects.
(Tuan, 2011) concludes by stating that an innovation in lesson implementation of mathematics should be considered to bridge the gap of knowledge in mathematics to ensure the quality of future engineers and scientists in the 21stcentury. Much of the recent studies show that college institutions in many countries around the world are facing various challenges in the lesson implementation of mathematics (Rylands and Coady, 2009). There is not much research that has been done in the area of mathematics in Chiro College of teachers' education. This study will therefore look at the challenges that lecturers and students face in the lesson implementation of mathematics at CCTE.

2.3. Students Opportunity to Learn Mathematics

According to Askew, Brown, Rhodes, Johnson & William (2007) and Martin, Mullis, Gregory, Hoyle & Shen (2000) opportunity to learn mathematics effectively is dependent upon a wide range of factors, but among the most important are those which are related to activities and practices within the classroom. The above studies focused strongly on the classroom and what happens there. They suggested that within the classroom, it is possible to discern a number of key elements. These include: teaching practices; the nature of student learning activities; the amount and nature of engaged learning time experienced by students; the learning environment and the scope and nature of the feedback given to students.

(Peterson, 2008) also listed effective teaching practices as: (a) a focus on the meaning and understanding mathematics and on the learning task; (b) encouragement of student autonomy, independence, self-direction and persistence in learning; and (c) teaching of higher-level cognitive processes and strategies. This indicates that teaching practices are central to understanding what makes effective teaching.

(Hanna, 2002), Brophy and Good (2016) identified successful teaching strategies as requiring an organized approach to teaching where, material was taught until it was mastered. They also argued that in the classroom instruction, three modes exist: (i) giving information; (ii) soliciting information; and (iii) providing feedback. This implies that both the teacher and students should participate in the teaching and learning process. Again, in providing information, an approach which structures the information so that the lesson forms a coherent whole that relates previous work to new material should be adopted. This call for clarity of presentation and good sequencing of information by mathematics teachers to enable learners adapt to learning of the subject.

Therefore, plans for effective teaching of mathematics to support student's conceptual understanding need to emphasize the need for mathematically challenging and significant tasks (Askew, Brown, Denvir & Rhodes, 2000; Fraivilling, 2005). This view is also supported by (Nickerson, 2012) and (Stigler & Perry, 2008) noted that students' involvement in

classroom activities is a major factor affecting student achievement. However, (Gore, 2000) argues that the classroom environment needs to be supportive of learning as well as setting high expectations, encouraging students to be self-regulating and articulating the criteria for quality of students‟ work. This shows that mathematics learning mainly constitutes students‟ engagement in the classroom activities. This study attempted to explore the kind of engagement learners are given by their teachers in an attempt to unearth challenges facing students in adapting to mathematics learning.

2.4. Attitude towards Mathematics Learning

(Le Roux, 2014) defines attitude as a positive or negative emotional relationship with or predisposition towards an object, institution or person. This points to another definition by (Becker and Wiggins, 2001) who defines attitude as enduring non-verbal features of social and physical world, and they are acquired through experience and exert a directive influence on behavior. These two definitions reveal that an attitude can be understood as an emotion that has an influence on the behavior of human being. Attitude may be expressed verbally for instance “I like mathematics”. Sometimes, it is expressed in varieties of actions like refusing to do homework or not participating in class during lessons.

2.4.1 Students’ attitude towards mathematics and their teachers

Students‟ attitudes towards mathematics and their teachers determine results. If the attitude is negative, students are likely to perform poorly and vice versa. Students need to develop a positive attitude towards each other, mathematics as a subject and their teachers in order to enhance the development of a strong foundation for learning of mathematics. (Orton, 2007) pointed out that some students are blamed for having negative attitude towards mathematics yet most of them are not motivated to change that attitude. Students would therefore have some measures of success in mathematics lessons if they are motivated to develop positive attitude towards it.

(Watson, 2010) argued that students develop negative attitudes towards mathematics as they move from lower classes to upper classes. He notes that pupils’ attitudes towards mathematics

are usually positive in early years of primary schooling but these decreases as they progress to upper classes. This view is supported by (Taiwo, 2004) who suggests that student‟ attitudes towards mathematics decreases as they climb higher because most of them have a general belief that mathematics is a very difficult subject that can only be understood by bright and hardworking students.

(Rukangu , 2000) also supports this view by pointing out that poor performance in mathematics in national examinations could be due to the unproven belief that the subject is difficult. Although Watson, Taiwo and Rukangu seem to give a pointer that student's performance mathematics changes with their attitude formation. However, these authors do not focus on mathematics learning in secondary which could be affected by attitude formation. This study was set out to investigate learners' attitude towards mathematics and their teachers in relation to adaptation to mathematics learners. (Giles, 2001) also pointed out that the image of mathematics has been that of "adult subject" such that it becomes very easy for a child to be discouraged right from the start. This implies that if s/he misses the first essential steps, s/he will have great difficulties in catching up, even if this interest is awakened at a later stage. This clearly demonstrates that student's feelings and perception about mathematics is a major factor affecting his or her attainment and realization of full potential. Once students are motivated, they develop positive attitudes towards both the subject and the teachers and this will lead to the understanding of what they are taught from the lower levels in secondary schools.

Psychologists (Skemp, 2001 and Bruner, 2009) and most educators (Cockcroft Report, 2010 and Taiwo, 1999) are in agreement with Donavan (2007) in that attitudes play important role in the learning process. Teachers and all those involved in the education of students therefore have a responsibility of helping students to develop positive attitude towards mathematics. If students attained attitudes of appreciation of mathematics at different levels in secondary schools, they will enjoy the subject, get satisfaction in understanding it and feel rewarded when they attain mathematical competence. This study, therefore, sought to assess how the students' attitude towards mathematics and their teachers enhanced to mathematics lesson implementation in the colleges.

2.4.2. Mathematics teachers' attitudes towards learners

Attitude focuses as individual's prevailing tendency to respond favorably or unfavorably to an object, person or group of people, institutions or events. Mathematics teachers have the challenge of promoting practices in which teachers are encouraged to give up a degree of their control over mathematical activity. This allows students to initiate their own techniques to solve problems and grapple with contradictions (National Council of Teachers of Mathematics, 2000). Answering to mathematics reform some scholars (Peressini, Borko, Romagnano, Knuth & Willis, 2004) suggested that teachers have to engage students in rich, meaningful tasks when teaching. This means students' thinking whether shared orally or in writing, must be used by teachers to guide the classroom in exploration of important mathematical ideas. However, there are other factors such as the decisions that teachers make, the methods they use, and the attitudes displayed, that are relevant to performance on mathematical tasks that influence the direction and outcome of student performance (Mapolelo, 2007; McLeod, 2008; Schoenfeld, 2005).

It is often declared that the attitude of a teacher could influence their actions in the classroom, which becomes critical to student learning. In other words, a teacher’s attitude regarding mathematics and students is relative to attitudes towards the teaching of mathematics, which in turn, has a powerful impact on mathematics learning (Ernest, 2009; Van der Sandt, 2007). According to (Ernest, 2009), there should be a shift to a problem solving approach that requires a deeper change that greatly depends on the teacher's beliefs. He further expressed that the practice of teaching mathematics depends on the attitudes and practices that mainly affected by beliefs, emotions, social context and content knowledge. The study focused on determining mathematics teachers‟ attitudes and practices with a focus on mathematics lesson implementation in the colleges.

2.5. The Learning Environment

According to(Smith and Regan, 2015), learning environment comprises the teacher, the existing curriculum, the instructional and equipment, the institutional and larger learner community. In this regard (Shields, 2001) stated that the school environment is the broader climate or context of the school that either facilitates or constraints the classroom instruction and learning.

According to (Hughes, 2009), the most important factors related to achievement in schools are that (1) teachers are the critical sources; (2) the composition of the student body matters; (3) schools make a difference; and (4) physical facilities such as class size, curriculum, instructional strategies and other resources influence student learning indirectly through their effect on the behaviour of teachers and students.

2.5.1. The school and class size

School and class sizes have been shown to have an impact on the teaching and learning of mathematics. In contrast, Ratter (2003) found that effective schools can be very small, very large or somewhat in-between. Class sizes of below 20 learners have been found to be advantageous for disadvantaged learners. In this respect, Ratter (2003) argued that small class size facilitates social interaction and inhabits teacher specialization.

2.5.2. Teaching and learning resources

The use of resources gives rise to certain teaching and learning techniques that enhance students' learning of mathematics. (UNESCO, 2005) note that the availability of a range of teaching and learning related equipment suppliers, furniture and various forms of printed media for teachers and learners is critical facilitating the processes of teaching worldwide. Teaching and learning materials incorporate a broad category of education related resources. These include textbooks, instructional guides, workbooks, practice exercises, activities, tests, calculators, audio-visual materials, and supplementary readers in libraries, classrooms or home, person, tool or piece of equipment that has the potential of aiding teaching and learning process. According to (Gross *et al*. 2011), instructional resources need to be relevant in order

to complete and enrich the teaching and learning process. This is because instructional aides may be inadequate or unsuitable in engaging the learners in teaching and learning process.

Some studies (Riungu, 1998 and Kirembu, 2005) have revealed that in cases where instructional resources such as textbooks were adequate and combined with other teaching aids, students interacted better in the teaching and learning process and hence performed better in mathematics. In addressing the role of technology in the teaching and learning of mathematics, the (NCTM, 2008) states: "Technology is an essential tool for learning mathematics in the twenty-first century. However, having access is only one of the necessary ingredients to support integration of technology in the mathematics lesson. This means the subject can be" softened" when appropriate instructional resources are used during the lesson.

2.5.3. Enjoyment and ability

(Henderson, S., &Hudson, B.2011) observed that learners who have more enjoyable experiences while learning mathematics achieve higher scores. In a study of mathematics classes, (Schoenfeld, 2009) explores aspects of the relationship between learners' beliefs about mathematics, their sense of mathematics as a discipline, and found that students tend to think of classroom mathematics as requiring memorization of equations and formulas and knowing the rules.

2.6. Teacher-related Variables

(Meyer and Koehler, 2010) state that one of the most important factors in developing learners' mathematics ability is the attitude of their teachers in mathematics. According to (Meyer and Koehler, 2010) knowledge of the learners' thinking is important while teachers' knowledge of mathematics content and pedagogy is also critical to the culture of the learning environment. According to (Lubinski, 2014) knowledge of the content and pedagogy in conjunction with learners' thinking, allows a teacher to design blueprints for worthwhile mathematics tasks. In this respect it is reasonable to expect that teachers will feel successful when their learners perform well in mathematics, irrespective of whether or not they come from a historically disadvantaged school situation. It should also be expected that teachers would feel frustrated

and unsuccessful when the learners perform badly. What is not clear, is who should be blamed, the teachers or the learners? (Fennema and Franke,2012) observe that:

> If teachers attribute success or failures of students to themselves, then they will do something to alleviate the problem. If, on the other hand, the reason that learners succeed or fail lies within learners, then the teachers do not feel as much responsible for the failure.

2.6.1 Teachers attitudes and beliefs

In mathematics research, one area of focus has been on teachers' beliefs and attitudes towards mathematics. (Ernest, 2009) observes that the practice of teaching mathematics depends on a number of key elements, such as the teachers' mental contents and schemes, particularly the system of beliefs concerning mathematics and its teaching and learning; the social context of the teaching situation, particularly the constraints and opportunities it provides and the teachers' level of thought processes and reflection. (Fennema and Romberg, 2009) have made similar observations that teachers' beliefs influence the way teachers teach and talk about mathematics to their learners. She observes that:

> If teachers believe that mathematics is useful, it seems reasonable to assume that they will work harder to ensure that their learners learn mathematics.

(Mudeliar , 2014) also asserts that teachers' attitudes towards mathematics have a strong bearing on learners' attitudes and achievement in mathematics. In a review of related literature on learners' attitudes towards mathematics, (Dungan and Thurlow, 2009) conclude that learners' attitudes towards mathematics are derived from teachers' attitudes towards the subject. These attitudes in turn affect learners' mathematics achievement. (O'Laughlin, 2010) found that novice teachers maintain definite beliefs regarding knowing, learning and teaching, which usually lead them to endorse didactic approaches with the teacher acting as the primary conveyer of knowledge. A teacher's beliefs about learners' abilities greatly influence the decisions the teacher makes about the learning environment (Lubinski, 2004). (Lubinski, 2004) also feels that teachers, who believe that the content of the mathematics in their classroom is guided by the textbook, make decisions that differ from those of teachers who believe that learner' interest and ability guide the content of the mathematics. In this regard Leder and Gunstone (cited in Ethington, 2010) referred to Colburn who recommends that the

textbook should not be followed slavishly, but should be adapted to suit the needs of both the teacher and learners. Research suggests that teachers' beliefs and teachers' knowledge are related to the instructional decision-making process (Fennema & Franke, 2012; Thompson, 2012). Consequently what a teacher believes about the content, methods, and materials available to teach mathematics influences the teacher's instructional decisions. (Schmidt, 2009) also observes that:

> What teachers teach and how they teach it are affected by their subject matter belief and preferred pedagogical approaches, things that are consequences of their training and experiences.

(Fennema and Franke, 2012) further indicate that the way teachers teach is not only affected by their own beliefs and by the ir conception of subject matter discipline in mathematics, but also by their beliefs about their learners and by their understanding of appropriate pedagogy. In their survey of teachers' beliefs (Schmidt, 2009) classifies teachers' beliefs into four categories:

Discipline-oriented teachers: These teachers indicate that it was important to remember formulas, and that mathematics was essentially abstract, and that mastering algorithms and basic computation was more important. They also indicate that the **real-world use** of mathematics was less important. They more often indicate that success in mathematics learning was more a matter of natural talent than other factors.

Process-oriented teachers: Teachers in this group indicate that it was relatively important to remember formulas, to focus on algorithms, or to emphasize basic computation. They hold that mathematics was not abstract, and that its real world use was important. They also tend to emphasize creativity and thinking about mathematics conceptually.

Procedure-oriented teachers: This group though having more common beliefs with the first group is more concerned with emphasizing the real-world use of mathematics. They regard algorithms as only modestly important and indicate that subject matter should be present conceptually. To them mastering mathematics is just a talent.

Eclectic-teachers: these teachers essentially emphasize nothing and do not possess a distinctive character. They are both somewhat discipline-oriented and somewhat real world oriented.

2.6.2. Teachers' quality and pedagogical content knowledge

According to (Meyer and Koehler, 2000), the knowledge of students' thinking is important while teachers' knowledge of mathematics content and pedagogy is also critical to the culture of the learning environment. According to (Lubinski, 2014), knowledge of the content and the content and pedagogy in conjunction with learners' thinking, allows a teacher to design blueprints for worthwhile mathematics tasks. In this respect, it is reasonable to expect that teachers will feel successful when their students perform well in mathematics, and will feel frustrated and unsuccessful when the students perform badly. Who shall be blamed, the teacher or the students? (Fennema and Franke, 2009) observe that:

> If teachers attribute success or failures of students to themselves, then they will do something to alleviate the problem. If, on the other hand, the reason that learners succeed or fail lies within learners, then the teachers do not feel as much responsible for the failure.

(Sarason, 2003) maintains that if one wants to change the education of learners, one shall first change the education of the teachers. According to (Sarason, 2003), it is necessary to prepare educators for what life is like in classrooms, schools, school systems and society. The pre service and continuing education of teachers of mathematics shall provide them with the opportunity to examine and revise their assumptions about how mathematics shall be taught, and how learners learn mathematics (National Council of Teachers of mathematics, 2004). Learners' attitude toward mathematics is also likely to be affected by the teacher's pedagogical content knowledge (Vatter, 2002).

According to (Shulman, 2007), pedagogical content knowledge is the capacity of a teacher to transform the subject knowledge that he or she possesses into forms that are pedagogically powerful and yet adaptable to the variations in ability and background presented by the learners. (Shulman, 2007) further argues that;

> A teacher must understand the structure of the subject matter, the principles of conceptual organisation, and the principles of inquiry that help answer two kinds of questions in each field: what are the important ideas and skills in this domain? How are new ideas added and deficient ones dropped by those who produce knowledge in this area? That is, what are the rules and procedures of good scholarship or inquiry?

2.7. Methods and Strategies of Teaching Mathematics

(Robitaille and Garden, 2009) point out some factors that influence effectiveness of teachers, namely their teaching strategies, beliefs about teaching, and the general classroom processes that provide an immediate learning environment for mathematics.

Teaching strategies can be classified as *teacher-centered* or *student-centered.* Teacher-centered strategies are those in which the teacher has direct control. Student-centered strategies are those strategies that allow students to play a more active role. In this regard, Stein, Leinhardt and Bikel (1999) suggest the following factors in providing effective instruction for students.

> The teacher is the most important factor; students must be engaged in appropriate instruction for sufficient time to master the academic skills; successful presentation of lessons includes appropriate expectations, frequent monitoring and helpful feedbacks.

The method or methods used in any particular context are largely determined by the objectives that the relevant educational system is trying to achieve. Methods of teaching mathematics include the following:

Conventional approach - the gradual and systematic guiding through the hierarchy of mathematics notions, ideas and techniques. It starts with arithmetic and is followed by Euclidean Geometry and Elementary Algebra taught concurrently. Other methods emerge by emphasizing some aspects of this approach.

Rote learning - the teaching of mathematics results, definitions and concepts by repetition and memorization typically without meaning or supported by mathematics reasoning. Within the conventional approach, rote learning is used to teach multiplication tables.

Exercises - the reinforcement of mathematics skills by completing large numbers of exercises of a similar type, such as adding fractions or solving quadratic equations.

Problem Solving: - the cultivation of mathematics ingenuity, creativity and heuristic thinking by setting students open-ended, unusual, and sometimes unsolved problems. The problems can range from simple to difficult problems. Problem solving is used as a means to build new mathematics knowledge, typically by building on students' prior understandings. According to (Polya,2011), problem-solving is

> The ability to apply mathematics to the variety of situations after the problem is translated into the appropriate mathematicsterms.

Bell (In Maree, 2007) stresses the importance of problem-solving in mathematics as follows:

> Problem-Solving is an appropriate and important activity in school mathematics because the learning objectives which are met by solving problems and learning general problem-solving procedures are of significant importance in our society.

Historical method - teaching the development of mathematics within an historical, social and cultural context. It provides more human interest than the conventional approach. Therefore, problem solving method of learning is preferable for learning mathematics.

2.8. Related Literatures in Ethiopian Context

2.8.1. Factors associated with learning of mathematics

In the Ethiopian context, Ethiopian Third National Learning Assessment of Grade 8 students (MoE, 2008) indicated that students' achievement in grade 8 had related with six blocks of variables such as school structure and curriculum materials, teacher variables, school management, students home background and behavior, woreda education office instructional support and languages of instruction. School structure and curriculum materials, school management and instruction and student understanding were significantly associated with students' achievement. From the regression analysis, school structure and curriculum materials explained 20.5%, teachers' attitude explained 32.5%, and school management as a block contributed 11.1%, student background variables as independent group explained 36.6% of the variation in learners' achievement.

In the Ethiopian First National Learning Assessment of Grades 10 and 12 students (NEAEA, 2010) indicated that the mean score for grade 10 students in mathematics (34.7%) was the second from the least; and only 14.7% of grade 10 students scored 50% and above (pass mark) in mathematics that is 85.3% of the students failed in mathematics. For grade 10, boys achieved (37.4%) significantly higher mean scores than girls (30.9%). Similarly, the mean score for grade 12 students in mathematics was 54.3%; and only 57.7% of grade 12 students scored 50% and above (pass mark) in mathematics that is 42.3% of the students failed in mathematics. For grade 12, boys achieved (56.1%) significantly higher mean scores than girls

(47.6%). The students' academic achievement is associated with teachers' attitude in teaching mathematics (NEAEA, 2010).

Gangolsi cited in Igwe (2002) stipulates that for teaching and learning of science to be interesting, there has to be motivation on the part of both the teacher and the learner so as to enhance positive attitude and subsequently maximum academic achievement. Therefore, factor that challenge mathematics lesson implementation in CCTE were; teaching and learning method, teaching learning resources, students academic background knowledge, uncovered content in elementary school, students' attitude towards mathematics, and physical facilities are the most that affect mathematics lesson implementation.

3. RESEARCH DESIGN AND METHODOLOGY

This chapter presents the research design employed, the sampling procedures used, the source of data, data collection instruments, methods of data analysis and ethical considerations.

3.1. Description of the Study Area

The aim of this research is to investigate practice and challenges of mathematics lesson implementation. The study was conducted on Chiro College of teachers' education of west Hararghe zone of Oromia regional state. Chiro (Asebeteferi) is the administrative city for west Hararghe Zone which is in the East of Ethiopia, 326kms from Addis Ababa. Chiro also colled Ciroo Gola or Asebeteferi is a town and separate Woreda in Eastern Ethiopia, and located in the Amhara Mountains, it has a latitude and longitude of $9^0 05^{'}$N $40^0 52'$E/9.083^0N 40.867^0E and altitude0f 1826m above sea level. Chiro College of Teachers' Education is one of the Colleges of Oromia which is found in Chiro Town. CCTE founded in 2003 E.C with 300 students 4 class natural Science 1 class Social Science, 1 class language stream, 19 lectures and 10 supportive staffs. CCTE is about 3km far from the center of the town. CCTE took Candidates who completed grade 10 and 12 and train them for three years by awarding diploma for grade 1 – 8. Starting from second year, Students select their field of specialization. The medium of instruction is Afan Oromo for all departments except English department. Nowadays there are 1238 total number of students, 38 teachers and 82 supportive staffs.

3.2. Research Design

The main objective of this study is to investigate the practice and challenges of mathematics lesson implementation at CCTE. In order to achieve the intended objectives the descriptive research method was used. Descriptive research studies are designed to obtain pertinent and precise information concerning the current status of phenomena and, whenever possible, to draw valid general conclusions from the facts discovered. The survey gathers data at a particular point in time with the intention of describing the nature of existing conditions or identifying standards against which existing conditions can be compared, or determining the relationships that exist between specific events (Cohen, *et al*., 2000; cited in Temecheng, 2008). Both qualitative and quantitative approaches were employed in the study to collect data.

3.3. Sources of Data

Both primary and secondary data were used in the study. The primary source of data for the study was students and mathematics teachers in the Chiro College of teachers' education. Secondary data collection was from College registrar, students' modules and college libraries.

3.4. Target Population

The target population for this study was selected from Chiro College of teachers' education. (Borg and Gall, 2006), define target population as all members of a real or hypothetical set of people, events or objects from which researchers generate data for a study. The target population in this study was 788 of all first year, second year mathematics and third year mathematics students who took mathematics course and 4 mathematics teachers of CCTE. The total population for the study, therefore, consisted of 792 respondents.

3.5. Sample and Sampling Techniques

The researcher selects sample population from first, second year mathematics and third year mathematics students to carry out the study. There are numerous suggestions about the necessary size of sample. One is that a sample size should be a regular proportion (often put at 5%) of the population. Another is that any increase in the sample size will increase the precision of the sample result (Nachmias, 1987: 1995-1996). It is also suggested that sampling size depends up on the nature of the population of interest of the data to be gathered and analyzed (Best *et.al.,* 1983).

However (Cohen and Manion, 2002) research method in education, note that a sample size of 25-30 percent from the population is appropriate if the number of population is known. For this reason these sample students were believed to be adequate and representative of the target population. Accordingly, the researcher was used 30% of total population for his study. Therefore from the total number of 788 students, 236 (30% of 788) of the students were selected randomly to constitute the sample size for this study as indicated in table below by using simple random sampling method. The researcher used all 4 mathematics teachers because they are available.

Sample Student Respondents selected from each year

Year	Total Size	Sample Size
First year students	571	571*0.3 = 171
Second year students	142	142*0.3 = 42
Third year students	75	75*0.3 = 23
Total	788	788*0.3 = 236
Teachers	4	They are available

3.6. Data Collection Instruments

The instruments that were used in data collection included questionnaires, Classroom observation and interview. The questionnaire was used as it enables the researcher to reach a large sample within a short time (Creswell, 2003). The researcher was administered the questionnaire to students and teachers in the college with the help of research Assistants. The students' questionnaire was used to collect data concerning their attitudes, teaching methods, problems encountered and strategies proposed to improve the teaching and learning of mathematics in College. Therefore two kinds of questionnaire (open- ended and closed-ended) were prepared in Afan Oromo for the students and in English for the teachers to gather data. Open-ended questions ask respondents to reply in their own words, whereas closed-ended ask the respondent to choose between two or more answers (MC Daniel and Gates, 2001)

3.6.1. Classroom observation

The overall teaching – learning process was observed to know the situation of both the students and mathematics teachers and also to prepare some frames of reference for gathering further information. Observational methods was occupied an important place in descriptive educational research (Gehl & Svarre, 2013). With the help of observation check list, the classroom teaching learning process was observed. It was conducted with primary permission of the College dean and the classroom advisor. The researcher was taken detailed notes written on the board and the discussions made by the students and the classroom teacher during the observation including describing what the teacher and the students are doing throughout the lesson, and recording the time for the various activities began and ended. The selected focus

areas included: the extent of the intellectual engagement on the part of the students; the nature of the teacher questions and student responses; whether the lesson included is appropriate sense-making or closure; and the extent to which the classroom culture encourages all students to participate in the lesson. All four mathematics teachers were selected because they are available. Each of them was observed three times and hence a total of twelve mathematics lessons were observed. During the observation, the researcher had taken his own note on the actual teaching-learning process.

3.6.2. Questionnaire for mathematics teachers and for students

Teachers' questionnaire was provided data in terms of personal information, the overall teaching and learning of mathematics, to find out information about availability and utility of instructional materials, interactions among themselves and with the students, their teaching method, teachers' belief, and professional developments. The prepared questionnaire was administered to 4 mathematics teachers and then analyzed item by item.

Students' questionnaire was provided data in terms of personal information, teachers' method of teaching, availability of teaching resources, students' commitment and their attitude toward mathematics, their learning styles, and the efforts they put to do mathematics exercises. The attitude questions are set in a 5-point Attitude Likert Scale. The prepared questionnaire was administered to students and then analyzed item by item.

3.6.3. Pilot study: Reliability and Validity

Reliability refers to the degree of consistency of the data gathering instrument in measuring that which it is supposed to measure (Kimberlin and Winterstein, 2008). This degree of consistency was measured using Cronbach's alpha coefficient. Validity on the other hand, is a measure of internal consistency that shows the degree to which all the items in a test measure the same attribute (Masitsa, 2011). A pilot study was conducted to a class of 20 students these students were not included in the main study. The pilot study was conducted for two main reasons: (i) to ensure that students understood the questions in each item (i.e., to maximize face validity); and (ii) to ascertain whether students were able to completed the test in a reasonable time. The test took, 20 – 40 minutes to complete. In this study, the Cronbach alpha was calculated for the 16-item test and found to be 0.721 which is acceptable value since it

lies between 0.70 and 0.90(Pallant, 2011). To observe content validity, the test was constructed and structured so that the questions posed were clearly articulated and directed. All statements were formulated to eliminate the possibility of misinterpretations. This was followed by a pre-tested administered to 20 students who were excluded from the participants in the main study. The identified improvements were made to ensure the simplicity and clarity of some questions, making it fully understandable to the participants. Four questions were removed from the main study and the Cronbach alpha was calculated for the 12-questions and found 0.792, which was a very good level of internal consistency reliability (Pallant, 2011).

3.6.4. Interview Guides

The interview is a process of communication or intersection in which the subject or interviewee gives the needed information verbally in a face-to-face situation. (Best & Khan, 1993:199) also stated that "the purpose of interviewing people is to find out what is in their mind – what they think or how they feel about something." In addition to this there are many things which we cannot directly find out through observation and through any other means unless we interviewee people. Detailed interview was conducted with 4 mathematics teachers. With the consent of the informants the interview was audio recorded. This helps the researcher to minimize loses of information during interview process.

Following the observations, at a time convenient to the teacher, the researcher was interviewed the respondent teachers about the lesson. Teachers were asked about the learning goals of the lesson; the characteristics of the students in the class; and the instructional materials that are used to structure the lesson.

3.7. Data Collection Procedures

Initially the researcher was gotten permission and further recommendation from the College. After the researcher selects specific design for the study, the next step was to collect the research data. In collecting the data it is important to use procedures that generate quality data. In collecting data for this study all ethical consideration was followed. The selections of student samples was carried out using lists of the students collected from registrar office giving equal chances for each participant. The researcher was obtained staff members from

college as a coordinator or assistant. Then with the help of these assistants, the researcher was contacted the students. Then after the researcher explained the objectives of the study to selected samples of students and politely asks them to participate in the study. Then after, the researcher administered the questionnaire.

3.8. Methods of Data Analysis

The purpose of data analysis is to describe, explain and to give predictions what happen in the collected data, in relation to research questions. So in this research quantitative data was analyzed using frequencies, percentages, arithmetic mean, median, and chi-square(χ^2), whereas, qualitative data was narrated in words. Triangulation of data, including both quantitative and qualitative was used for analysis. The triangulation data from students' questionnaire, teachers' questionnaire and classroom observations were used. Depending on the nature of the research questions and the data collected, different statistical techniques were employed. These where arithmetic mean, median, and chi-square (χ^2).The teaching-learning process of mathematics was observed. The collected data from each group was analyzed using the procedures of descriptive and inferential statistics based on the research questions posed and then follows interpretations and discussions to give the expected answers to the research questions.

3.9. Ethical Considerations

As indicated above, permission was obtained by the researcher from the college Deans to distribute and conduct the research and further cooperation. The researcher was explained the purpose of this research to the College administrators, other concerned authorities and respondents. The participants are not required to put their name on the study to assure their anonymity. The classroom observations were made after discussing with the classroom teachers about the objective of the observation and by having an appointment when to attend the classes. The participants were certain that the purpose of this study is to investigate practice and challenges of teaching- learning mathematics. So they will assure that any data collected from them are for research purposes only and would be kept in the strictest confidence. In this research all participants was participated voluntarily. The participant who has no interest to participate, have right to dropout him/herself from the study at any time.

4. RESULTS AND DISCUSSION

In this section, the data collected by using different data collecting instruments are tabulated, presented and analyzed by dividing them in to sections based on the specific objectives of the study. An attempt was made to integrate the data obtained through different methods under each section.

4.1. Gender of the Respondents

The researcher administered the questionnaires to both male and female students. Therefore, the study sought to find out the gender of the respondents. This was important in specifying the exact number of male and female respondents. The data are presented in table 1

T**able 1: Distribution of Respondents by Gender**

Gender	**Teachers**	**Students**	
	frequency	**frequency**	**percent**
Male	4	125	52.97
Female	-	111	47.03
Total	4	236	100

4.2. Age of the Respondents

The study was conducted to a cross section of respondents with an arrangement of different ages. Table 2 presents the age of the respondents.

Table 2: Age of the Respondents

Age in years	**Teachers**	**Students**	
	frequency	**frequency**	**percent**
15 - 20	0	68	28.81
21 -25	0	148	62.71
26 - 30	0	20	8.48
31 - 40	1	0	0
41 - 50	2	0	0
Above 50	1	25	0

From Table 2 we can conclude that teachers of different ages correspondent with their different skills and experiences in implementing mathematics lesson and use different methods of teaching. While more or less the students were from the same age group which is conducive for mathematics lesson implementation.

4.3. Academic Qualification of Mathematics Teachers

High quality teaching is the power point for improving how student can effectively learn mathematics. According to (Kelwon, 2011) and (Liu and Linggi, 2009) successful implementation of innovation is possible when there are combined teacher specific training activities, ongoing continuous assistance and support during the process of implementation.
(Betts, Zau and Rice, 2003) found that teachers' qualification corresponds positively with students' achievement in mathematics.

Therefore, for questionnaire **what is your academic qualification?**
2 of the teachers are MEd degree holders and the remaining 2 are MSc degree holder. From this all of the teachers were qualified to teach mathematics courses. (Wilson and Floden, 2003) shown that students of teachers with mathematics degree or mathematics education degree demonstrated higher academic achievement in mathematics.

4.4. Experience of the Teachers

It was important to determine the experience of the teachers in the implementation of mathematics. Teachers were therefore asked to indicate their work experience in the College were shown in Table 3.

Table 3 Distribution of Teachers by experience

Item	1 – 5 years	6 – 10 years	11-15 years	16 – 20 years	More than 20 years
How long have you taught mathematics?	0	0	0	1	3

From table 3, Majority of the teachers had taught for a long time, so they had enough experience on the implementation of mathematics lesson.

4.5. Teaching and Learning Methods Used in Mathematics Lesson Implementation

The instructional methods or techniques used by a mathematics teacher in class to give instructions promotes or hinders student's achievement in mathematics (Peterson, 2008). Therefore, the study sought to find out the extent to which teaching methods were used by mathematics teacher to teach learners mathematics lessons. Teachers were asked to state the extent of various methods used to give mathematics instructions in class. This is illustrated in Table 4.

Table 4: Teaching and learning methods used by mathematics teachers to give instructions to learners

No	Teaching method	Very large extent	large extent	moderate extent	small extent	No extent	mean
1	Questioning	0	1	1	2	0	2.75
2	Explanation	1	2	1	0	0	4
3	Demonstration	1	2	1	0	0	4
4	Discussion groups	0	1	2	1	0	3
5	Guided discussions	0	1	2	1	0	3
6	Brainstorming	0	0	1	2	1	2
7	Other (specify) These are jigsaw, and lecture gap						

From table 4, one can conclude that most mathematics teachers used a variety of methods such as questioning, discussion groups, guided discussions and brainstorming to teach mathematics, however, explanation and demonstration as methods of teaching were preferred by most of the teachers. It was observed that teachers preferred these methods since the whole class was involved in the discussion and to cover the syllabus on time.

It was further noted that although discussion group is one of the teaching methods that enhance performance in mathematics, teachers used it moderately. This is because it is perceived as time consuming method to use. Although this method involves learners in the learning process, most students who felt they were poor in mathematics tended to be passive. This finding concurs with that of (Reynolds and Muijis, 1999). According to (Reynold and Muijis , 1999), students that

perceived themselves to be poor in mathematics did not participate fully in the process of learning mathematics in group discussions where other students seem to understand mathematics better. These students ended up being passive during the process of learning which contributed to poor performance in mathematics.

4.5.1. Teachers' opinion on the effectiveness teaching methods used in class

It was important to know whether teachers were experiencing difficulty when deciding on which method to use when giving mathematics instructions to learners. Therefore, teachers were asked to indicate whether or not the methods they used were effective. Figure 1 shows teachers opinion on whether the method was effective in teaching mathematics.

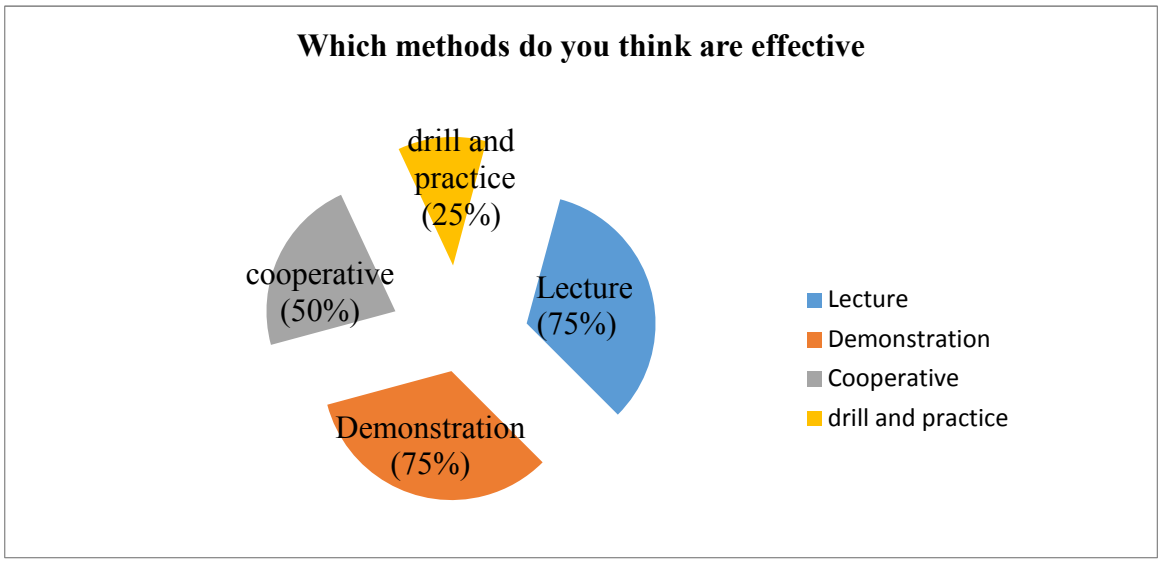

Figure 1: Effective Teaching methods used in a class

From figure 1, one can observe that majority of the teachers suggested that lecture and Demonstration method was effective. According to (Thijs, 1999), poor teaching method such as lecture method were common in classroom because, teachers lacked confidence, mastery of subject matter content and basic teaching skills.

4.6. Mathematics Teacher in-service Training practice

Teacher in-service refers to the opportunity offered practicing teachers to develop new knowledge, skills, approaches and disposition to improve their effectiveness in classroom. The study sought to find out whether mathematics teachers had in-service training on mathematics lesson.

Table 5: In-service training of mathematics teachers

Items	Alternatives	Respondents (4)
		f
Mathematics Content	yes	0
	no	4
	Total	**4**
Mathematics Pedagogy/Instruction	yes	0
	no	4
	Total	**4**
Mathematics Curriculum	yes	0
	no	4
	Total	**4**
Other (specify) This is SMASEE INSET	yes	3
	no	1
	Total	**4**

From table 5, none of mathematics teachers took in service training on mathematics; content, pedagogy/instruction, and curriculum. But majority of the teachers took Strengthening of Mathematics and Science Education in Ethiopia (SMASEE) In-service Education and Training (INSET). According to (Kelwo, 2011) and Liu and Linggi (2009), successful implementation of innovation is possible when there are combined concrete teacher-specific training activities, on-going continuous assistance and support during the process of implementation. Inadequate teaching and learning resources for the implementation of the new education program, means there is a gap in actual classroom practice.

4.7. Teachers' Opinion on the Adequacy of Learning and Teaching Resources

In-adequate materials and equipment are the main problem to implementation of any lesson in schools and greatly affect performance in mathematics lessons. Teachers were therefore, asked to respond to a number of questions in order to establish whether Chiro College of Teachers' Education were experiencing problems during the implementation of mathematics due to lack of essential teaching and learning resource. The response is illustrated in Table 6

Table 6: Adequacy of teaching and learning resources

No	Resources	Yes	No
1	Teaching - learning aids in Mathematics e.g. models	1	3
2	Mathematics modules	4	0
3	Mathematics reference books in Afan Oromo	1	3
4	Library	4	0
5	Computers	4	0
6	Geometrical sets	0	4

According to the information obtained through the use of checklist, Chiro College of Teachers' Education did not have teaching and learning resources such as; teaching aids, reference book in Afan Oromo and geometrical sets to implement mathematics lesson. However, there is computer in College but since IT course cancelled from college curriculum there are seating without function. This concurs with the teachers' observation about the availability of teaching and learning material to implement mathematics lesson. The only teaching and learning resources available and adequately provided for teaching were modules.

4.8. Teacher Beliefs Survey

Beliefs are judgments and evaluations that we make about ourselves, about others, and about the world around us. They are personal convictions based on observation or logical reasoning. (Ford , 1994) defined the beliefs as a group of norms or opinions which were formed in the individual through his experiences and the overlapping of thoughts during the learning processes. The attitudes and values about teaching students, and the education process those teachers bring to classrooms. They are the thoughts held by the teacher about the teaching and learning process, which influence his/her classroom practices.

Table 7:- Analysis of teachers' belief about mathematics lesson.

No	Statements	SD	D	U	A	SA	mean
1	Ignoring the mathematical ideas that students generate themselves can seriously limit their learning.	1	1	0	2	0	2.75
2	It is important for students to be given opportunities to reflect on and evaluate their own mathematical understanding	0	1	0	1	2	4
3	Effective mathematics teachers enjoy learning and 'doing' mathematics themselves.	2	1	0	1	0	2
4	Allowing a child to struggle with a mathematical problem, even a little tension, can be necessary for learning to occur.	1	1	0	0	2	3.25
5	Students always benefit by discussing their solutions to mathematical problems with each other.	2	1	1	0	0	1.75
6	Telling the students the answer is an efficient way of facilitating their mathematics learning.	1	0	0	2	1	3.5
7	It is not necessary for teachers to understand the source of children's errors; follow-up instruction will correct their difficulties.	0	1	1	1	1	3.5
8	It is important to cover all the topics in the mathematics curriculum in the textbook sequence.	0	0	0	1	3	4.75

SA -Strongly Agree, A- Agree, U-Undecided, D-Disagree, SD-Strongly Disagree

From Table 7, we conclude that, most of the sample teachers of the study have good feeling of mathematics and even the challenges in the subject attract them to have a positive belief that would result in positive attitude towards mathematics.

Table 8: Teachers' responses of factors that affect the teaching of mathematics

No	Factors	A lot	Some	A little	Not at all
		F	F	F	F
1	Students background Knowledge	4	0	0	0
2	Inadequate physical facilities	2	1	1	0
3	High student-teacher ratio	1	0	2	1
4	**Other (Specify)**				
	These are: Students with different academic abilities, students' attitude, students chair, and library supported by computers etc.				

F – Frequency

As shown in table 8, all teachers put students' academic background Knowledge as a major factor that limits their teaching of mathematics. With regard to the problem of physical facilities such as class room buildings, student chairs and tables, libraries supported by modern technologies like computers limits their teaching of mathematics a lot. Thus CCTE must solve these and other physical facilities as soon as possible. Concerning the problem of student/teacher ratio, there was no problem for most of the teachers. But there is a little problem on first year students due to lack of class rooms as information obtained from the further discussion of teachers of the CCTE. Therefore for first year Students CCTE should immediately solve the problem of class rooms or limit the number of student admissions.

Table 9: Students' response for adequacy of teaching and learning resources

No	Resources	Yes	percent	No	percent
1	Mathematics modules	236	100	0	0
2	Mathematics reference books in Afan Oromo	46	19.49	190	80.51
3	Library	236	100	0	0
4	Geometrical sets	0	0	236	100

From table 9, all students have modules, majority of the respondents responded that there is no mathematics reference books in Afan Oromo, but there is library in CCTE and all of the respondents responded that there is no geometrical sets. According to the information obtained through the use of checklist, CCTE did not have almost all enough mathematics reference

books in Afaan Oromo and Geometrical sets to implement mathematics lesson. The only teaching and learning resources available and adequately provided for teaching were modules.

Table 10: Students' responses of a better way for mathematics learning

No	Question	Problem Solving		Co-operative learning		Lecture method		Discovery learning	
		f	%	*f*	%	*f*	%	*f*	%
1	Which mode of instruction is a better way for you to learn mathematics?	95	40.25	65	27.54	30	12.71	46	19.49

From the above table it can be seen that the majority of students reported that problem solving method is better way to learn mathematics. Problem solving method of teaching is appropriate for students while mathematics lesson implementation. Because problem solving is a situation in which an individual must find situations that are not immediately obvious. According to (Blum and Niss, 2010) problem solving is a situation which has certain open questions that "challenge somebody intellectually who is not in immediate possession of direct methods, procedures, algorithms etc.

4.9. Students' Attitude towards Mathematics

Mathematics is considered by many individuals as a difficult subject to learn (Fennema & Shermann, 2006). This kind of outlook has a direct relation with achievement. A number of factors do influence students' achievement positively or negatively. The direct relationship between mathematics achievements and attitudes as well as their reciprocal influence are well documented (Aiken 1970; Johnson 1984; Sherman 1980; Tsai and Walberg 1983). If students have positive attitude towards mathematics, it is likely that they will allot a considerable portion of their study time to the subject and strive to master the knowledge and necessary skills.

Table 11: Percentages of students' attitude scores for each statement calculated by the given Likert scale values.

No	Attitude Statements	SA(5)		A (4)		U(3)		DA (2)		SD (1)		Total	$\sum Evx F$	$\frac{\sum Evx F}{N}$
		F	%	F	%	F	%	F	%	F	%	F	Total value	Mean value
1	I often worry that it will be difficult for me in math classes.	78	33.05	81	34.32	43	18.22	19	8.05	15	6.36	236	896	3.8
2	I keep trying to do well in math.	36	15.25	68	28.81	82	34.74	27	11.44	23	9.74	236	775	3.28
3	I feel bad to my math classes.	89	37.71	84	35.59	11	3.66	25	10.59	30	12.71	236	894	3.79
4	I am able to solve math problems without too much difficulty.	27	14.44	78	33.05	63	26.69	24	10.17	44	18.64	236	728	3.08
5	I get very nervous when doing math problems.	80	33.9	24	10.17	66	27.97	34	14.41	32	13.56	236	794	3.36
6	I get good grades/marks in math.	24	10.17	30	14.44	34	14.41	74	31.36	74	31.36	236	564	2.39
7	I worry that I will get poor grades in math.	66	27.97	18	7.63	76	32.2	51	21.61	25	10.59	236	757	3.21
8	I enjoy studying and solving mathematical problems.	27	11.44	28	11.86	81	34.32	33	13.98	67	28.39	236	623	2.64
9	I am happier in a math class than in any other class.	26	11.02	35	14.83	52	22.04	82	34.75	41	17.37	236	631	2.67
10	I often try to think of different way to solve math problems.	14	5.93	34	14.41	53	22.46	58	24.58	77	32.63	236	558	2.36
11	I try to relate the math I learn to work in other subjects.	39	16.53	36	15.25	41	17.37	41	17.37	79	33.47	236	623	2.64
12	I do not feel confident about my knowledge in Math related issues.	50	21.19	49	20.76	85	36.02	29	12.29	23	9.76	236	782	3.31
	Total	556	238.6	565	241.12	687	290.1	497	210.6	530	224.58	2832	8625	3.05

SA-Strongly Agree, A- Agree, U-Undecided, D-Disagree, SD-Strongly Disagree, Ev – evaluated value, F-frequency

Each percents of the attitude questionnaire listed in above table was also analyzed by charts as follows

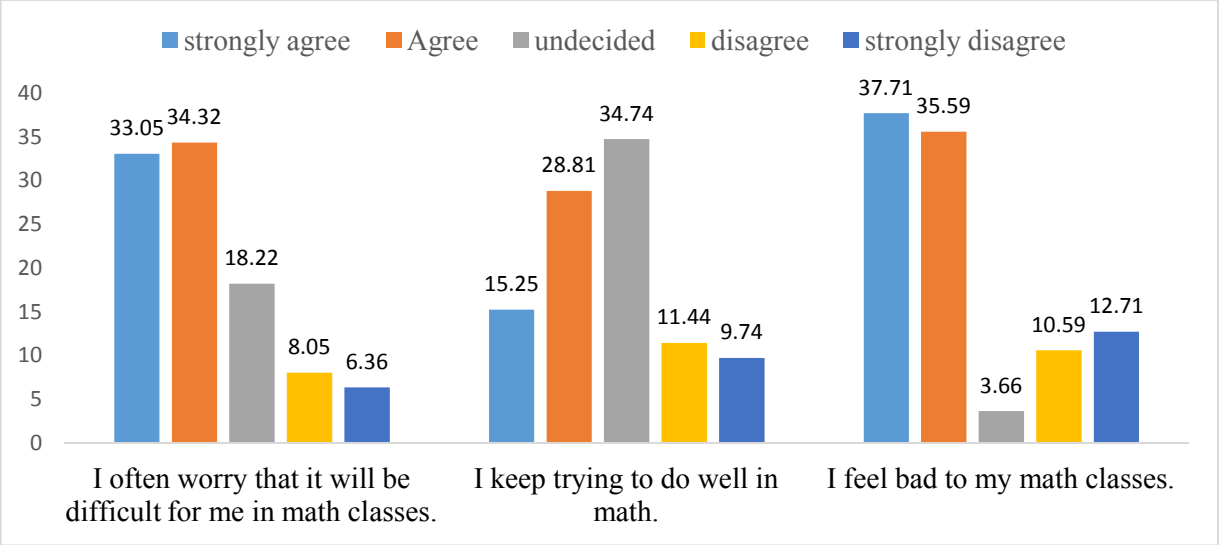

Figure 2: The analysis of attitude questionnaire 1 - 3.

From Figure 2, we can conclude that most of the students have difficulty in mathematics. So Mathematics has some inherent difficulties due to its abstract and cumulative nature. For many students expectancy about the difficulty of math is high, and personal value attached with math is low. This leads to negative attitude towards mathematics. This may challenges mathematics lesson implementation. From the same figure we can conclude that most of the students do well in mathematics but some of the students did not do well in mathematics. Again from the same figure students did not feel good in mathematics classes, but some of the students feel good in mathematics class. This implies that above half of the students did not feel good in mathematics class. This directs students to negative attitude towards mathematics. As a result students hate this subject. This intern challenges mathematics lesson implementation.

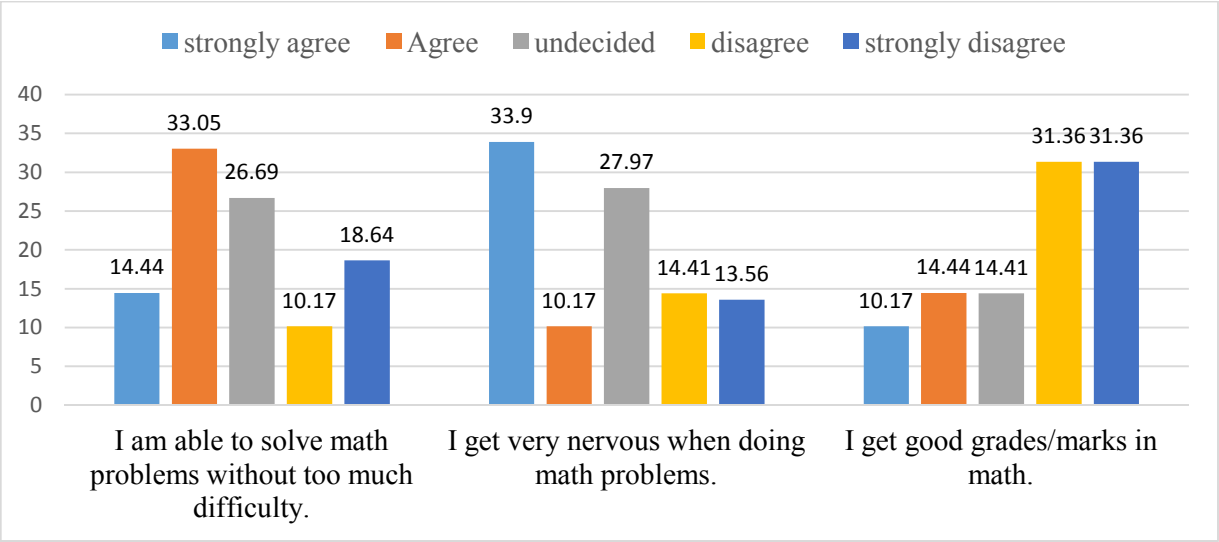

Figure 3: The analysis of attitude questionnaire 4 - 6.

From Figure 3, one can see that, above half of the students did not solve mathematics problems without too much difficulty. This means they have difficulty while they solve mathematics problems. When students do not understand a problem; they are like to make a guess without having any mathematical thinking process. This also supports (Suydam & Weaver, 1977) who say the reason why students do mathematical problems wrong is because they lack knowledge about principles, rules, and processes.

Again from Figure 3, we can conclude that, most of the students did not feel good in doing mathematics problems. This may be, when pupil feel anxious, the math anxiety that they feel is using up some of their working memory, so they do not have enough working memory left to solve math problem. This idea that math anxiety uses working memory has been supported by research studies (Helen Mariah Sokolowski, Oct 17, 2017)

Again from the same figure, we can conclude that, above half of the students did not get good grade in mathematics. This may relate with teachers method of teaching, students feeling to follow this subject during instruction, students' readiness to the exam, etc. But below half of the students get good grade in mathematics. Getting low grade in mathematics may lead to negative attitude towards this subject which intern challenges mathematics lesson implementation.

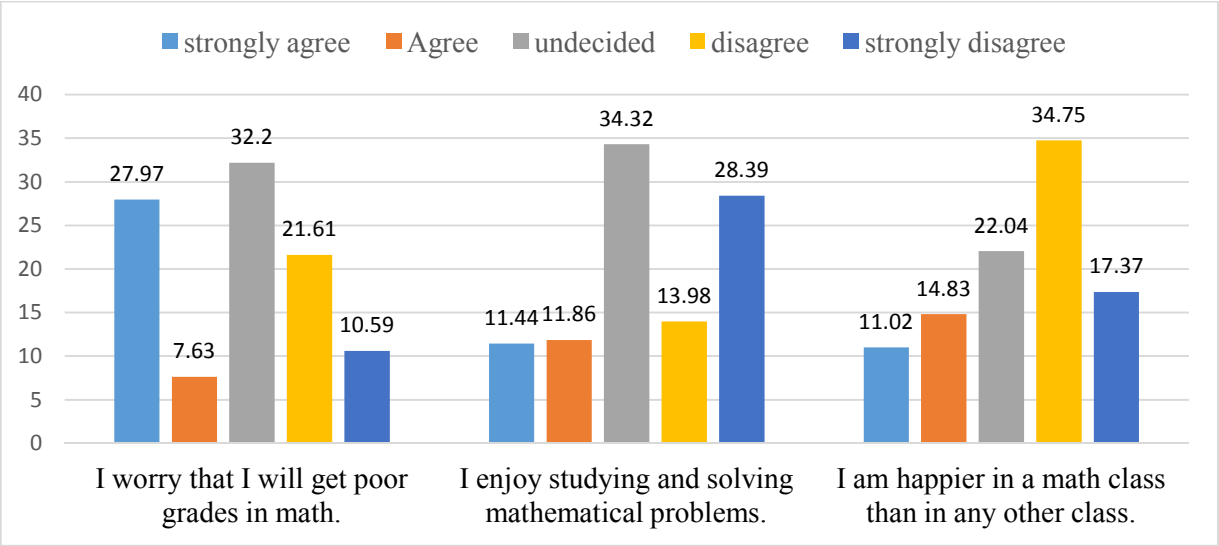

Figure 4: The analysis of attitude questionnaire 7 - 9.

From Figure 4, 35.6% of the respondents responded that they agreed on the idea I worry that I will get poor grades in mathematics, but 22.2% of respondents not agreed on the idea I worry that I will get poor grades in mathematics. This implies that some of the students worried to get poor grade in mathematics. This may lead them not to follow mathematics lesson. Because of that those students are worrying about their grade not for their knowledge. This also directs students to have negative attitude towards mathematics.

From the same table, we can see that, most of the students were not enjoyed studying and solving mathematical problems. In order to solve mathematics problems we have to: master the Key Concepts, understand our doubts because math requires time and patience to master, create a distraction free study environment, create a Mathematical Dictionary, apply Math to real world Problems, and we do not try to memorize the processes (Larry Davis 2015). If the students make this they will be good mathematics problem solver.

Again from the same Figure, Majority of the students were not happier in a math class than in any other class. Because from very beginning students consider mathematics as difficult subject and as nobody can solve it. So they already convinced their mind as mathematics is difficult subject. Therefore most of the students of CCTE are not interested in mathematics class than any other class.

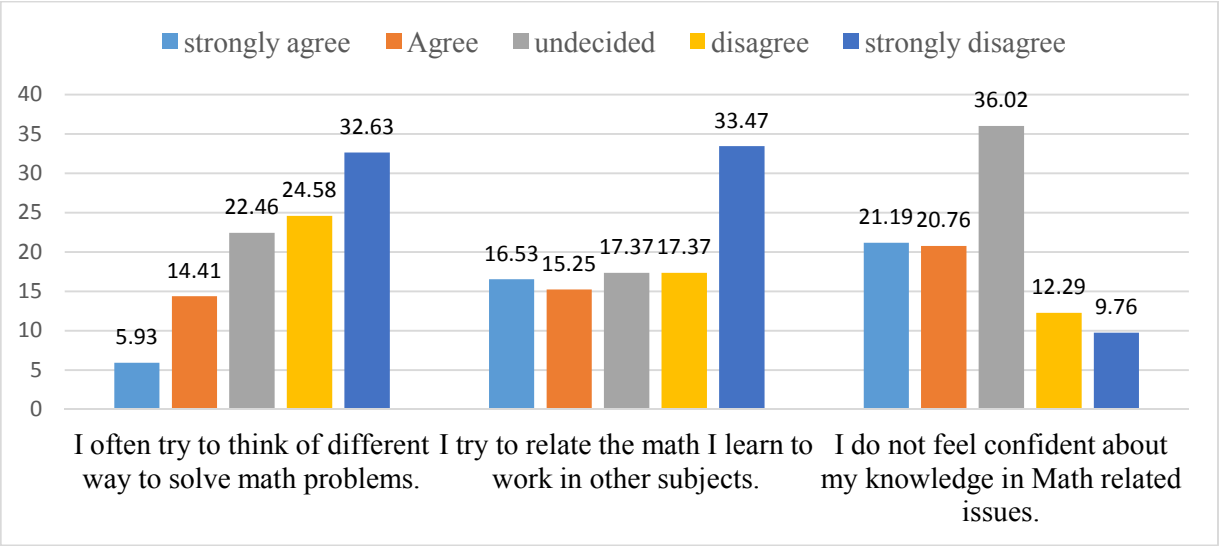

Figure 5: The analysis of attitude questionnaire 10 - 12.

From Figure 5, we can see that, most of the students were not often tried to think of different way to solve math problems. This implies that students' background knowledge did not allow most of students to solve mathematics in different ways. But some of the students were often tried to think of different way to solve math problems. This means there are some talented students who solve mathematics using different ways.

From Figure 5, again we can conclude that half of the students were not tried to relate the math they learn to work in other subjects. This means most students do not understand as mathematics has horizontal relation with other subjects. So Math is an integrated part of something. Again From the same figure, some of the respondents responded that they agreed on the idea I do not feel confident about my knowledge in Math related issues, but above half of respondents did not agreed on the idea I do not feel confident about my knowledge in Math related issues. This implies most students have confidence in mathematics.

Table 12:- Students' Attitude towards Mathematics with respect to class year.

	Student respondents (N = 236)			
Category	**First year**	**Second year**	**Third year**	**Total**
Above Median	79(46.2%)	15(35.71%)	10(43.48%)	104(44%)
Below Median	92(53.8%)	27(64.29%)	13(56.52%)	132(56%)
Total	171	42	23	236

$\chi^2_{cal} = 1.6642$, df = 2, $p \leq 0.05$ $\chi^2_{cri} = 5.991$

Where χ^2_{cal}– is Calculated Chi – square, **df** – is degree of freedom, χ^2_{cri} – is critical Chi – square

Where

$$\chi^2 = \frac{\sum (f_o - f_e)^2}{f_e} \text{ and } f_e = \frac{RT \times CT}{N} \text{ where } f_o - \text{observed frequency and } f_e - \text{expected frequency}$$

The median for the students' respondents that is the grand median is 40.5 (See appendix 6). Then as shown in table 11, students who got a score above a grand median and those who scored below are differentiated in terms of their class year in forming a two by three contingency table. Based on the data presented in the table13, a chi-square (χ^2) median test statistics was computed (see appendix 6 for the calculations). The result shows that the computed chi-square value (χ^2 =1.6642) is less than the critical chi-square value (χ^2_{cri} = 5.991, df = 2, $p \leq 0.05$). Hence this implies that there is no statistically significant difference in the level of agreement on attitude towards mathematics among the students at $p \leq 0.05$ levels of significance. In other words, students who belong to the above grand median (showing positive attitude) and who belong to the below grand median (showing negative attitude) categories have no significant difference among the selected students under the study area at $p \leq 0.05$ levels of significance.

Thus from table 12, students' have negative attitude toward learning mathematics in this study area.

4.10. Students' Response for Open Ended Items.

Questionnaire: Mention some of the problems that you face while mathematics lesson implementation and what should be done to alleviate them.

Students' response:

The problem they faced during mathematics lesson implementations are:

Hating the subject, no background knowledge on this subject, considering mathematics as difficult subject, giving no attention to mathematics while lesson implementation, insufficient teaching aids, the method that applied by mathematics teachers, fearing to ask unclear things, unavailability of reference books in Afan Oromo, to do one question it takes long time so that for this reason it is boring to learn mathematics, selecting this department without interest are challenges that they faced during mathematics instruction.

Suggested Solution for this problem:

Sufficient tutorial should be given, there must be reference books in Afan Oromo, exercising different exercises at home, College should fill teaching aids, teachers' should apply student centered method of teaching, teachers' should make students to practice activities in the class.

4.11. Suggestions on How to Improve Mathematics Lesson Implementation in the Future

Respondents were asked to make suggestions on how to improve the implementation. Most the respondents saw the need to create awareness and orientation among members of the society and implementers to discourage the stigma that associates the mathematics lesson implementation with lower intelligence. Respondents suggested that before the implementation of any mathematics lesson there should be wide consultation with stakeholders. This is the only way that would ensure that the content of the curriculum responds to the needs of learners and society in general.

4.12. Best Practices

(Sabean and Bavaria, 2005) have synthesized a list of the most significant principles related to mathematics teaching and learning. This list includes the expectations that teachers know what students need to learn based on what they know, teachers ask questions focused on developing conceptual understanding, experiences and prior knowledge provide the basis for learning mathematics with understanding, students provide written justification for problem solving strategies, problem based activities focus on concepts and skills, and that the mathematics curriculum emphasizes conceptual understanding.

Teachers' responses for question what should you practice to enhance effective mathematics lesson?

The following best practices for implementing effective mathematics lessons should be followed: Teachers should practice different method of teaching mathematics, tasks should build on students' prior knowledge, students should be responsible for self-monitor their progress, the lesson must be balanced between the practice of skills and methods previously learned and new concept discovery, teachers should use manipulative to increase mathematics achievement and improve student attitudes toward mathematics, effective assessment of mathematics learning must be performance-based, use multiple strategies and employ more open-ended assessment tasks than have been used in the past. Don't attempt to work through a complicated example or proof without having gone through the details in advance. You should give a lot of motivation for complicated proofs and make sure that students can see the big picture of the argument. Regularly ask students (both in class and in office hours) how you could make the course better so they will learn more, collect homework every time you meet. Never let students go more than three calendar days without doing some work; they procrastinate and then feel overwhelmed. Reward students who catch your mistakes.

4.13. Classroom Observation Checklist

Table 13: This checklist guides the investigator to examine the routines of the classroom and there by observe the students' classroom activities in the school.

Use 3 = frequently, 2 = rarely and 1 = not observed

No	Instructional considerations	Rating Scale						mean
		frequently		rarely		not observed		
		F	%	F	%	F	%	
1	The teacher assesses learners' existing knowledge at the beginning of the lesson.	3	25	8	66.7	1	8.3	2.2
2	Encourage learner to participate in group discussion.	1	8.3	9	75	2	16.7	1.92
3	Ask open ended question	-	-	2	16.7	10	83.3	1.17
4	Allow learners to reflect on their own work	2	16.7	10	83.3	-	-	2.17
5	Use lecture/explanation	11	91.7	-	-	1	8.3	2.83
6	Go round in the classroom in order to facilitate learners learning.	2	16.7	7	58.3	3	25	1.92
7	Suitable class size provision of seating arrangement conducive for group work.	-	-	1	8.3	11	91.7	1.08
8	Students are encouraged to solve mathematical activities by discouraging teacher's activities.	9	75	3	25	-	-	2.75
9	Teacher gives feedback on the students' performance?	8	66.7	4	33.3	-	-	2.67
10	Learners are allowed to interact with each other	4	33.3	7	58.3	1	8.3	2.25
11	Give equal attention for all learners in the class by providing them different learning style.	3	25	7	58.3	2	16.7	2.08
	Grand mean		**32.6**		**43.9**		**23.5**	**2.09**

Assessment of learners existing knowledge is very crucial in mathematics lesson implementation (Hestenes and Wells, 1992). Therefore, teachers need to link the new lesson or their teaching to what the learners already know. The teacher can ensure this principle by

being aware of the learner prior knowledge eliciting students' idea presenting the new one or before making the study ideas from textbook, challenging students' initial ideas and finally making the new idea accessible to students. On the other hand, the teacher may switch on the students' brain by telling them the learning outcome or the structure of the lesson. A close look was paid as to how mathematics teacher deal with learners' existing knowledge as their starting point or not.

As indicated in item 1, of table 13, the majority of the observed sessions 8 out of 12 and mean value 2.2 confirmed that teachers rarely assessed learners existing knowledge at the beginning of the lesson. Only 3 out of 12 observed sessions indicated teachers' rare use of learners' past knowledge before starting the lesson. From this we can see that most of the teachers assess learners existing knowledge at the beginning of the lesson except a few.

Constructivist teaching needs a question rich learning environment that provokes discussion among students or student-teacher discussions as well as reflection by individual students. This can be done if the teacher uses more open-ended questions that elicit multiple and contradictory responses, use questions based on students' response, accept and value students' response and suggestions. However, 9 out of 12 observations with mean value 1.92 disclosed that teachers rarely encouraged learners to participate in group discussion. Still 10 out of 12 observations session with mean value 1.17 confirmed as mathematics teachers of CCTE under consideration did not ask open –ended questions to enhance learners understanding. Only 2 out of 12 observed sessions indicates teachers' rare use of open-ended question to enhance learners understanding.

Reflection is of the utmost importance, because real learning and progress take place during reflection on what was done initially (MBEC, 1992). Contrary to this mean value 2.17 and 10 out of 12 observed session revealed that teachers rarely allowed their learners to reflect on their work. From this one can be concluded that teachers did not encourages students to participate in group discussions, teachers did not use open ended questions and teachers rarely allow learners to reflect on their own work. In item 5, 11 out of 12 observed sessions with mean value 2.83 confirmed as teachers frequently used lecture or explanation method in mathematics classroom. In mathematics lesson implementation the teachers moves from the front of the classroom to the middle and other part of the classroom. He or she has to move

around the classroom guiding and following the progress of individual pupils and groups of pupils. Thus the teachers become much more important in classroom. The teacher must guide manage the activities, s/he make sure that all pupils are working productively on activities and must monitor the progress of all pupils (Leu, 2000).

However, 7 out of 12 of the observation sessions revealed that teachers rarely go round in the classroom in order to facilitate learners learning. 11 out of observed sessions with mean value 1.08 showed as there were no suitable class size and provision of seating arrangements conducive for group work. 9 out of 12 observed sessions with mean value 2.75 indicated as teachers frequently allowed their students to take responsibilities of solving mathematical problems by themselves. Moreover, 8 out of 12 observed sessions with mean value 2.67 revealed that teachers frequently give feedback to students. Regarding item 10, 7out of 12 observed sessions with mean value 2.25 confirmed that teachers rarely allowed their learners to interact with each other and with teacher. However, 4 out of 12 observed sessions indicated as learners were frequently allowed to interact with each other and with the teacher. From this we can concluded that teachers go round in the classroom in order to facilitate learners learning, there were no suitable class size and provision of seating arrangements conducive for group work, teachers frequently allowed their students to take responsibilities of solving mathematical problems by themselves, teachers frequently give feedback to students, teachers rarely allowed their learners to interact with each other and with teacher which may affect mathematics lesson.

Learners are distinct and unique. Their distinctiveness and uniqueness must be attended to and taken into account if learners are to engage in and take responsibility for their learning (McCombs and Whisler, 1997). Contrary to this, as in the case of item 11, 7 out of 12 observed sessions with mean value 2.08 revealed as teachers rarely gave equal attention to all students of different competency level. This may be assigning different class activities and homework according to their level. From this we can concluded that teachers did not give equal attention to all students of different competency level frequently. So In order to enhance mathematics lesson teachers should give attention to all students in a class by providing them different learning style.

4.14. Analysis of Teachers' Responses of the Interview

In response to the question, "Do students' prior knowledge and mathematical background have greater influence on their mathematics learning and academic achievement?"

All teachers said that:

> The 'students' use of their own prior knowledge was limited and that their primary level background was not dependable. Students simply sit in class and wait for readymade knowledge. They expect the teachers to give detail explanations on every lesson, but knowledge about the subject matter by itself is not enough for students unless they cannot implement it into practice.

Moreover, for the question "How do you see the attitude of College students toward mathematics?" T1, T2, and T3 said that:

> Most College students' attitude in general overview was negative towards the subject. However, the problem is that most students come with poor background knowledge of mathematics and they need much help on the elementary concepts for instance, on operating fraction.

Whereas T4 said that:

> Since the majority of the students did not participate in almost all activities given by the teacher specially, first year students they have negative attitude towards mathematics.

He also mentioned that the students have poor background knowledge of mathematics and they need much help not only on college mathematics but also on the elementary concepts of mathematics.

For question, "How do you organize interaction session in mathematics class?" All teachers responded that they create interaction during introduction, by initiating them to recall the previous lesson, presentation to actively engage on the days' lesson and summarization to summarize the main points of the days' lesson shortly with respect to the intended objectives of the lesson. The strategies they used to create interaction were asking questions at the beginning and at the end of the lesson. In relation to the classroom interaction, T1, reported that:

> Creating interaction among students is difficult but I mostly used asking question as a strategy to create interaction between me and my students. But the number of students participating in answering the oral questions were again very few.

Moreover, T4, said that:

> I don't have strong interaction with my students because of there is no sufficient time to cover the portion allocated for the year and majority of the students have less interested to learn mathematics.

From this, it can be concluded that, there were possibilities for having interaction in the mathematics classroom between students and teachers especially, when there is class activity given by the teacher, but the interaction was limited with few students due to less interest of students to learn mathematics and shortage of time is also raised as another major factor.

Teachers were also asked how they were evaluating the effectiveness of themselves in implementing the suggested activities indicated in the curriculum and teacher's guide.

T2, said that:

> I am effective to teach. But, since majority of the students in my class have not successfully achieved in mathematics I cannot say I am effective. When I compare the result of students in mathematics with that of the other subjects, there is wide ranging gap. No matter how we mathematics teachers tried our best to help our students even in arranging additional tutorial classes.

T1, T3 and T4 also have similar suggestion with T2, but they underlined that unless government given special attention towards mathematics from elementary school, secondary and preparatory mathematics education system, college teachers alone could not be effective in making their students' attitude favorable and to achieve the stated objectives in each lesson.

In addition, teachers were asked what problems they faced in trying to change college students' attitude towards mathematics and what measures were taken to solve the problem.

T1 and T4 said that:

> In mathematics class teachers daily face many problems, because the nature of the subject matter by itself invites activities to be performed by students and makes a teacher to interact with students, unless the teacher leaves carelessly. But most of students cannot carry out those activities like class work, homework, assignment etc. and this is a challenging problem for the teachers.

T2 and T3 also share the same idea and forwarding the measures they were taken to solve the problem, and they said that, they enforce students to stand and try on the blackboard but this takes much time and is not enough to cover even half of the portion designed for the academic year despite the teacher overcomes the burden.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the findings, conclusion and recommendations of the study based on the research objectives of the study. It also gives suggestions for further research.

5.1 Summary

The purpose of the study was to investigate the practice and Challenges of mathematics lesson implementation in Chiro College of Teachers' Education. Four research objectives guided the study. The research objectives sought to specify the teaching and learning methods being used in the implementation of mathematics lesson; identify the dominant factors that challenges mathematics lesson implementation in Chiro College of Teachers' Education; to identify the teachers' belief about mathematics lesson; Finally, the study sought to analyze the adequacy of teaching and learning resources in the implementation of mathematics lesson in Chiro College of Teachers' Education.

Background of the study, statement of the problem, the objectives of the study, the scope of the study, limitations of the study, significance of the study, definitions of significant terms and organization of the study were discussed.

In addition to this, the study presents an over view of the literature related to the study. The research design used in the study, target population, sample size and sampling procedures have been explained. The description of the research instruments used and analysis of data are also provided.

This study adopted descriptive survey design. The sample comprised of 4 teachers and 236 students. Questionnaires for mathematics teachers and learners', a checklist and document analysis guide were used to collect data. Data were analyzed by using descriptive and inferential statistics (chi-square) with the aid of computer software Microsoft excel. The analysis of data and the findings of the study have also been done. Finally the study presents the summary of the findings, conclusion and recommendations.

Based on the findings, the study revealed that teachers used a variety of methods to teach mathematics in class. However, teachers rated themselves as using lecture/explanation and demonstration methods prominently.

Most teachers have good feeling of mathematics and even the challenges in the subject attract them to have a positive belief that would result in positive attitude towards mathematics. This means teachers' had positive attitude (beliefs) toward mathematics.

Findings further revealed that learning resources for teaching mathematics lesson were inadequate or not available at all. The only teaching and learning resources available and adequately provided for teaching were modules.

Students' academic background knowledge, attitudes, uncovered contents of mathematics in elementary school and inadequate physical facilities were the major factors that influence mathematics lesson implementation in CCTE.

None of mathematics teachers took in service training on mathematics such as mathematics content, mathematics pedagogy/instruction, and mathematics curriculum. But majority of the teachers took only Strengthening Mathematics and Science Education in Ethiopia (SMASEE) In-service Education and Training (INSET)

5.2. Conclusions

The study concluded that teaching and learning methods employed by mathematics teachers were more teachers-centered. Method such as group discussion which promoted active learning in mathematics was not commonly used in classroom. Some of the respondents found it difficult to use certain method due to lack of adequate teaching and learning materials and time. Lack of in-service training for mathematics teachers is clear indication that there was inadequate preparation for the implementation of mathematics lesson. The findings of the study indicate that the implementation of mathematics lesson faced many challenges including critical shortage of teaching and learning resources, methods of teaching, attitude of students towards mathematics, students' academic background knowledge and uncovered contents of

mathematics in elementary school have led to poor performance and low participation in this subject.

5.3. Recommendations

Based on the analysis of the study the researcher wishes to make the following recommendations:

i. All education stakeholders who include College administration, teachers, education officers, parents should encourage students in mathematics lesson. This will help in improving the perception of students on the subject.

ii. The Ministry of Education should design and give additional training for lower grade mathematics teachers to be motivated and their students inspired them. Therefore, it is better for mathematics teachers to create awareness early on their students that mathematics is very important and have many applications in everyday life of human being in relating and demonstrating simple teaching aids in their classroom teaching rather than mere calculations of numbers.

iii. Shortage of learning and teaching resources was identified as one of the major obstacles to the implementation of mathematics lesson. Therefore, College administrations should prioritize the provision of facilities and resources needed for the implementation of mathematics lesson as soon as possible. This will motivate the students and teachers to engage in learning this subject leading to improved performance in this subject.

iv. Mathematics teachers of CCTE have to be given different kinds of professional development activities such as in the areas of mathematics content, pedagogy/instruction, and curriculum.

v. CCTE should prepare all the necessary materials such as teaching aids and reference materials of mathematics in Afan Oromo in advance to minimize the existing problems.

vi. Additional helps should be given for those students who are poor in their mathematics abilities.

vii. Students have to be initiated to develop a positive attitude toward mathematics by using different methods of teaching and learning styles.

viii. College should provide appropriate physical facilities and academic support resources to promote student success in mathematics lesson.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE FOR MATHEMATICS TEACHERS

HARAMAYA UNIVERSITY

POSTGRADUATE PROGRAM DIRECTORATE

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCE

DEPARTMENT OF MATHEMATICS

General Directions for the Questionnaire:

Dear teachers: The main purpose of this questionnaire is to get some information about **"*Practices and Challenges of Mathematics lesson implementation in Chiro College of Teachers Education*"**. Read each question carefully and answer by picking the answer you think is the best or by giving your own answer as accurately as possible. Your responses to these questions are very important in helping to describe Mathematics Education and will be kept confidential. Do not write your name at any place in the questionnaire. It is important that you answer each question carefully so that the information you provide reflects only your situation as accurately as possible. Thank you very much in advance for the time and effort you have put in responding to this questionnaire.

PARTA: DEMOGRAPHICINFORMATION

(Tick appropriately where applicable)

1. Gender: i) Male [ ] ii) Female[ ]
2. Age : (i) Below20years [ ](ii)20 – 30 years [ ] (iii)31 – 40 years [ ]
   (iv) 41 – 50 years [ ] (v) Above 50 years [ ]
3. How long have you taught mathematics?(Tick number of years)
   i) 1 – 5 years[ ] ii) 6 – 10 years[ ] iii) 11– 15 years[ ]
   iv) 16 – 20 years [ ] v) More than 20 years [ ]

PARTB: ACADEMI QUALIFICATIONS

4. What is your highest academic qualification?
   i) BSC[ ] ii) BEd[ ] iii) MEd[ ] iv)MSc [ ] v)PhD[ ]

5. Have you participated in professional development in any of the following activities?

No	**Activities**	yes	no
i.	Mathematics content		
ii.	Mathematics pedagogy/instruction		
iii.	Mathematics curriculum		
iv	Other (Specify)		

PARTC: TEACHING METHODOLOGIES

6. State the extent to which you use the following teaching methods to teach mathematics. Indicate on the scale of: key 5 = very large extent; 4 = large extent; 3= moderate extent; 2 = small extent and 1 = no extent

No	**Teaching Methods**	1	2	3	4	5
1	Questioning					
2	Explanation					
3	Demonstration					
4	Discussion groups					
5	Guided discussions					
6	Brainstorming					
7	Other (specify)					

7. Which methods do you think are effective?

A. Drill and practice B. Lecture C. Cooperative D. Demonstration

PART D: TEACHING AND LEARNING MATERIALS

Please indicate the availability of the teaching and learning materials.

No	**Learning resources**	**adequate**	**Inadequate**
8	Teaching/learning aids e.g models		
9	Mathematics modules		
10	Mathematics reference books in Afan Oromo		
11	Library		
12	Computers		
13	Geometrical sets		

14. In your view, to what extent do the following limit how you teach Math?

No	**Factors**	A lot	Some	A little	Not at all
i	Students with different academic abilities				
ii	Inadequate physical facilities				
iii	High student/teacher ratio				
iv	Other (specify)				

Part E: Teacher Beliefs Survey

15. Please circle the response that best indicates how you feel about each statement in the following questionnaire.

1- Strongly disagree, 2-Disagree, 3-Undecided, 4- Agree and 5- Strongly agree

No	**Statements**	**SD**	**D**	**U**	**A**	**SA**
1	Ignoring the mathematical ideas that students generate themselves can seriously limit their learning.	1	2	3	4	5
2	It is important for students to be given opportunities to reflect on and evaluate their own mathematical understanding	1	2	3	4	5
3	Effective mathematics teachers enjoy learning and 'doing' mathematics themselves.	1	2	3	4	5
4	Allowing a child to struggle with a mathematical problem, even a little tension, can be necessary for learning to occur.	1	2	3	4	5
5	Students always benefit by discussing their solutions to mathematical problems with each other.	1	2	3	4	5
6	Telling the students the answer is an efficient way of facilitating their mathematics learning.	1	2	3	4	5
7	It is not necessary for teachers to understand the source of children's errors; follow-up instruction will correct their difficulties.	1	2	3	4	5
8	It is important to cover all the topics in the mathematics curriculum in the textbook sequence.	1	2	3	4	5

16. What are major challenges of implementing mathematics lesson?

_____
_____
_____
_____
_____
_____
_____

17. What possible solutions would you suggest to solve students' problems/challenges in mathematics lesson implementation?

_____
_____
_____
_____
_____

18. What should you practice to enhance effective mathematics lesson?

_____
_____
_____
_____
_____

Thank you for time spent to respond to the questions above.

APPENDIX 2: QUESTIONNAIRE FOR STUDENTS

HARAMAYA UNIVERSITY

POSTGRADUATE PROGRAM DIRECTORATE

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCE

DEPARTMENT OF MATHEMATICS

General Directions for the Questionnaire:

Dear students: The main purpose of this questionnaire is to get some information about "***Practices and Challenges of Mathematics lesson implementation at Chiro College of Teachers Education***". Read each question carefully and answer by picking the answer you think is the best or by giving your own answer as accurately as possible. You may ask for help if you do not understand something or are not sure how to respond. The information obtained from your responses will be used only for research purposes. The study will be successfully accomplished if you complete all the items honestly and frankly. Your responses will be kept confidential. Do not write your name at any place in the questionnaire. Thank you very much in advance for your kind cooperation, effort and the time to complete this questionnaire!

PARTA: Demographic Information (Circle appropriately where applicable)

1. Sex: (a) Male (b) Female
2. Age: (a) 15 – 20 (b) 21 – 25 (c) 26 – 30 (d) 31 – 40 (e) above 40
3. Class Year: (a) I (b) II (c) III
4. Program: (a) Diploma (b) BID

PARTB: Availability of Learning Materials.

Please indicate if you have the following as a student and in school in general.

No	**Learning resources**	**adequate**	**Inadequate**
5	Mathematics modules		
6	Mathematics reference books in Afan Oromo		
7	Geometrical sets		
8	Others		

9. Which mode of instruction is a better way for you to learn math and explain why?
   (a) Co-operative learning (c) Lecture method
   (b) Problem solving (d) Discovery learning

_____

_____

PART C: Students attitude towards mathematics

10. The following statements are related to your attitudes toward Mathematics. The rating has the following keys: **1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, and 5 = Strongly Agree.**

No	Statements	1	2	3	4	5
1	I often worry that it will be difficult for me in math classes.					
2	I keep trying to do well in math.					
3	I feel bad to my math classes.					
4	I am able to solve math problems without too much difficulty.					
5	I get very nervous when doing math problems.					
6	I get good grades/marks in math.					
7	I worry that I will get poor grades in math.					
8	I enjoy studying and solving mathematical problems.					
9	I am happier in a math class than in any other class.					
10	I often try to think of different way to solve math problems.					
11	I try to relate the math I learn to work in other subjects.					
12	I do not feel confident about my knowledge in Math related issues.					

11. Mention some of the problems that you face while mathematics lesson implementation and what should be done to alleviate them.

_____

_____

_____

_____

Thank you for your cooperation!

Appendix 3: STUDENTS QUESTIONNAIRE IN AFAN OROMO

YUNIVARSITII HARAMAYAA DAAREkTOREETII BARNOOTA EEBBAAN BOODAA MUUMMEE HERREGAA

AJAJA WALIIGALAA:

Kabajamoo Barattoota: kaayyoon gooroo qorannoo kanaa odeeffannoo waa'ee "**Rakkoo hojirraoolmaa barnoota herreegaa Kolleejjii Barnoota Barsiisota Ciroo KEESSATTI jiru"** walitti funaanuuf. Kanaafuu gaaffilee isiniif kennaman sirritti dubbisuun hamma danda'ame kan sitti fakkaate fudhuu deebisi. Yoo gaaffii qabaattan/wanti ifa isinii hin ta'in jira ta'e gaafachuu dandeessu. Odeeffannoon isinirraa funaannamu qorannoo qofaaf akka ta'e beektanii akka deebiftan kabajaan isin gaafadha. Qorannichi kan milkaa'u yoo gaaffilee gaafatamtan hunda obsaan deebiftanii dha. Maqaa keessanhin barreessina. Deeggarsa gootaniif baay'ee galatoomaa!

KutaaA:Odeeffannoo dhuunfaa siilaallatu (Iddoo barbaachisetti itti mari)

1. Saala: (a) Dhiira (b) Dubara

2. Umrii: (a) 15 – 20 (b) 21 – 25 (c) 26 – 30 (d) 31 – 40 (e) above 40

3. waggaa barnootaa: (a) I (b) II (c) III

4. Sagantaa: (a) Diploma (b) BID

KutaaB:Jiraachuu meeshaalee deeggarsa barnootaa.

Lakk.	Meeshaalee deeggarsa herrregaa	Gahaadha	Gahaamiti
5	Mojullii herregaa		
6	Kitaabilee wabii kan herreegaa Afaan Oromoon barraa'an		
7	Kan danaalee ji'oometrii ittiin ijaaran		
8	Kanbiroo		

9. Malleen baruu-barsiisuu kamtu herreega barachuuf siif mijata? Maaliif?

(a) Raayyaan barachuu (c) Od-ibsa

(b) Mala Rakkoo hiikuu (d) Argannoon barachuu

_____

_____

_____

Kutaa C: ilaalcha barattootn herreegaaf Qaban

10. kannneen armaan gadii ilaalcha ati herregaa qabduu kan wal qabatee dha. Akkaataa itti sadarkeessitu furtuu armaan gadii qaba.

Furtuu: **1 =cimseenmorma, 2 = ninmorma, 3 =hinbeekamu, 4 =waliigala, fi 5 =Cimseenwaliigala.**

Lak.	Himama	1	2	3	4	5
1	Waytii herreegatti baay'ee natty ulfaata					
2	Herreegaan gaarii ta'uu nan yaala.					
3	Waytii herreegaa miira gaariin natty hin dhaga'amu.					
4	Pirobleemii herregaa salphamattiin fura.					
5	Pirobleemii herregaa yeroon furu baay'ee natty dhaga'ama.					
6	Herreegaan qabxii gaarii qaba.					
7	Herreegaan qabxii gadi aanaa waan qabuuf na dhiphisa.					
8	Pirobleemota herregaa furuu fi herrega qu'achuun jaaladha.					
9	Baruumsa biraa barachurra herrega barachuun jaaladha.					
10	Herrega karaalee baay'een furuuf yaala.					
11	Baruumsa herregaa barnoota biroon walitti firoomsuun barachuun jaala dha.					
12	Beekumsa herregaa koo irratti ofitti amanamummaa hin qabu					

11. Yeroo barannoon herregaa hojirra oolu rakkoolee simudatan tarreessi. Rakkoolee kana furuuf maal gochuu akka qabamus ibisi.

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APPENDIX 4: INTERVIEW QUESTIONS FOR MATHEMATICS TEACHERS

HARAMAYA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCE

DEPARTMENT OF MATHEMATICS

INTERVIEW QUESTIONS TO BE DISCUSSED WITH MATHEMATICS TEACHERS AND OTHER RELATED PERSONELS

General Information:

Name of the College: _____

Interviewee's name: _____

Sex: _____

1. Do students' prior knowledge and mathematical background have greater influence on their mathematics learning and academic achievement?
2. How do you see the attitude of College students toward mathematics?
3. How do you evaluate your effectiveness in implementing the suggested activities indicated in the curriculum and modules?
4. How much students' background knowledge affects mathematics lesson.
5. What problems did you face in trying to change students' attitude towards mathematics? What measures were taken to solve the problem?
6. What solutions do you suggest for the effective implementation of mathematical activities to change the attitude of students towards Mathematics?

APPENDIX 5: CLASS ROOM OBSERVATION CHECKLIST

This checklist guides the investigator to examine the routines of the classroom and thereby observe the students' classroom activities in the school.

Name of College: _____, year: _____,

Date of observation: _____, Period: _____, Time: from_____ to _____

Number of periods per week: _____, Number of students in the class: _____

Use 3 = frequently, 2 = rarely and 1 = not observed

No	Instructional considerations	1	2	3
1	The teacher assesses learner existing knowledge at the beginning of the lesson.			
2	Encourage learner to participate in group discussion.			
3	Ask open ended question			
4	Allow learners to reflect on their own work			
5	Use lecture/explanation			
6	Go round in the classroom in order to facilitate learners learning.			
7	Teacher gives feedback on the students' performance?			
8	Suitable class size provision of seating arrangement conducive for group work.			
9	Students are encouraged to solve mathematical activities by discouraging teacher's activities.			
10	Learners are allowed to interact with each other			
11	Give equal attention for all learners in the class by providing them different learning style.			

Other things observed in the class room

_____

_____

_____

_____

APPENDIX 6: Calculation of the chi-square ($\chi 2$) statistics for attitude scores of three Groups students out of 60.

First year students

59	54	50	46	42	34	31	24	16
59	54	50	46	42	34	31	22	16
59	52	50	46	41	34	31	21	16
59	52	49	45	40	34	31	21	15
57	52	49	45	40	34	30	21	15
57	52	49	45	39	34	30	20	15
57	52	49	45	39	34	30	20	15
57	52	49	44	39	34	30	20	15
57	52	49	44	36	34	30	20	15
56	51	47	44	38	32	30	19	14
56	51	47	44	38	32	29	18	14
56	51	47	44	36	32	29	18	13
56	51	47	44	36	32	29	17	13
55	51	47	44	36	32	29	17	13
55	50	47	44	35	32	29	17	13
55	50	47	44	35	32	29	16	13
55	50	46	42	35	32	29	16	13
55	50	46	42	35	32	29	16	13
55	50	46	42	35	32	29	16	13

Second year students					**Third year students**		
59	52	40	38	36	59	51	12
59	50	40	38	25	57	49	12
57	50	39	38	20	56	47	12
56	49	39	36	18	56	38	12
54	49	39	36	17	55	13	12
54	49	39	36	12	52	13	12
52	40	39	36	12	51	13	12
52	40	39	36	12		13	12
52				12			

Combination of the Scores of the three Groups of Students to Calculate the Grand Median

59	59	59	59	59	59	59	57	57	57	57
57	57	57	56	56	56	56	56	56	56	55
55	55	55	55	55	55	54	54	54	54	52
52	52	52	52	52	52	52	52	52	52	52
51	51	51	51	51	51	51	50	50	50	50
50	50	50	50	50	50	49	49	49	49	49
49	49	49	49	49	47	47	47	47	47	47
47	47	47	47	46	46	46	46	46	46	46
45	45	45	45	45	44	44	44	44	44	44
44	42	42	42	42	42	42	42	42	42	42
42	42	41	41	41	41	41	41	40	40	40
40	40	40	39	39	39	39	39	38	38	38
36	36	36	35	35	35	35	35	35	34	34
34	32	32	32	32	32	32	32	32	32	32
31	31	31	31	31	30	30	30	30	30	30
30	29	29	29	29	29	29	29	29	29	25
24	22	21	21	21	20	20	20	20	20	19
18	18	18	17	17	17	17	16	16	16	16
16	16	16	15	15	15	15	15	15	15	15
14	14	14	13	13	13	13	13	13	13	13
13	13	13	13	12	12	12	12	12	12	12
12	12	12	12	12						

Grand Median $= \frac{41+40}{2} = 40.5$

Category	Student respondents (N = 236)			
	First year	**Sec. year**	**Third year**	**Total**
Above Median	79(46.2%)	15(35.71%)	10(43.48%)	104(44%)
Below Median	92(53.8%)	27(64.29%)	13(56.52%)	132(56%)
Total	171	42	23	236
χ^2_{cal} = 1.6642, df = (R-1)(C-l) = 2, p ≤ 0.05 χ^2_{cri} = 5.991				
Where R- no of row and C- no of column				

Calculation of the Chi-Square (χ^2) Median Test.

$$\chi^2 = \frac{\sum (f_o - f_e)^2}{f_e} \text{ and } f_e = \frac{RT \times CT}{N}$$

Where f_o – observed frequency, f_e – expected frequency

RT – total number of Row

CT – total number of column

N – total number of observation

Cell	f_o	f_e	$(f_o - f_e)$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
1	79	75.36	3.64	13.2496	0.17581
2	15	18.51	-3.51	12.3201	0.65591
3	10	10.14	-0.14	0.0196	0.00038
4	92	95.64	-3.64	13.2496	0.17581
5	27	23.49	3.51	12.3201	0.65591
6	13	12.86	0.14	0.0196	0.00038
				Sum of χ^2	1.6642