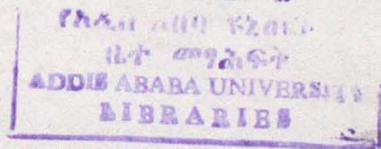


**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATES STUDIES**

**A CASE STUDY OF THE TEACHING LEARNING PROCESS
OF MATHEMATICS IN YEKATIT 25/67
SECONDARY SCHOOL OF HADIYA ZONE**

**BY
ASSEFA SHIMELIS**



**“A Thesis Submitted to the School of Graduate Studies of
Addis Ababa University in Partial Fulfillment of the
Requirements of the Degree of Master of Arts in
Teacher Education and Curriculum Studies.”**

June, 2005

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATES STUDIES

A CASE STUDY OF THE TEACHING LEARNING PROCESS
OF MATHEMATICS IN YEKATIT 25/67
SECONDARY SCHOOL OF HADIYA ZONE

BY
ASSEFA SHIMELIS

APPROVED BY

Gizaw Tesissa

Chairman, Department Graduate Committee

Souman Areaya

Advisor

DESALEGN CHALCHISA

External Examiner

Abdulaziz Hussien

Internal Examiner

Sign

[Signature]

[Signature]

[Signature]

[Signature]

TABLE OF CONTENTS

	PAGE
Acknowledgments-----	viii
Table of contents-----	iii
Acronyms-----	vi
Abstract-----	ix
List of Tables and Figures-----	vii
CHAPTER ONE INTRODUCTION-----	1
1.1. Background of the Study-----	1
1.2 Statement of the problem-----	8
1.3 Significance of the Study-----	9
1.4 Delimitation of the Study-----	9
1.5 Limitation of the study-----	10
CHAPTER TWO REVIEW OF THE RELATED LITERATURE-----	11
2.1. Teaching and Learning Process-----	11
2.1.1. Learning-----	12
2.1.2. Teaching-----	14
2.2. Teaching and Learning of Mathematics-----	15
2.3. Teaching Methods-----	21
2.4 Classification of Teaching Method-----	22
2.4.1. Teacher-Centered Method of Teaching-----	23
2.4.2 Student-Centered Method of Teaching-----	26
2.5 Home Work and Assignment-----	33
2.6 Instructional Materials-----	35

2.6.1. The Contribution of Instructional Material for the Teaching and Learning of Mathematics-----	36
2.7 Student Teacher Interaction during Mathematics Instruction-----	39 ✓
CHAPTER THREE METHODS OF THE STUDY-----	42
3.1. Methodological Approach-----	42
3.2. Design of the Study-----	43
3.3. Data Collection Techniques-----	44
3.3.1. Interview-----	44
3.3.2. Focus Group Discussion (FGD)-----	45
3.3.3. Observation-----	46
3.3.4 Document Source-----	47
3.4. Selection of Research Setting-----	47
3.5. Selection of key Informants-----	51
3.6. Access and Procedure-----	51
3.7. Organization of Data-----	53
3.7.1. Recording of Data-----	53
3.7.2. Transcription and Translation of Interview and FGD-----	53
3.8. Data Analysis-----	54
CHAPTER FOUR PRESENTATION AND DISCUSSON OF THE FINDINGS--	55
4.1. Classroom Organization-----	55
4.2. Teachers Related Variables-----	57
4.2.1. Teachers feeling Toward Teaching Mathematics-----	57
4.2.2 Teachers teaching experience, their qualification, and their teaching load-----	59
4.3. The Way Mathematics Teaching Learning is going on-----	61
4.3.1 Teaching learning where plasma TV is Practical-----	62
4.3.1.1 The Teaching Learning Procedure-----	62



4.3.1.2 Students activity and participation-----	65
4.3.1.3 Student teacher interaction-----	67
4.3.1.4 Teaching Method followed by the TVT-----	69
4.3.2. The Teaching and Learning of Mathematics in Non-plasma Sections -----	71
4.3.2.1 The Teaching Learning Procedure -----	71
4.3.2.2 Students Activity and Participation-----	73
4.3.2.3 Teacher- Student Interaction-----	75
4.3.2.4 Teaching Method Followed by the Teachers-----	77
4. 4. Availability and Utilization of Instructional Materials-----	78
4.4.1 Availability of Curricular materials -----	79
4.4.2. Availability and Utilization of IM in the SPC-----	80
4.4.3 Availability of Mathematics Reference Books in the School Library-----	83
4.5. Factors Affecting the Teaching and learning process of Mathematics in Yekatit 25/67 secondary school-----	85
4.5.1 Teachers' conception on factors affecting teaching of mathematics-----	85
4.5.2 Student conception on factors affecting their learning of mathematics-----	87
CHAPTER FIVE: SUMMERY, CONCLUSION AND RECOMMENDATON-----	89
5.1. Summery and Conclusion-----	89
5.2. Recommendations-----	94

Bibliography

Appendices

Acronyms

- AAU: Addis Ababa University
CRT: Classroom Teacher
ESLCE: Ethiopian School Leaving Certificate Examination
ETP: Education and Training Policy
FDRGE: Federal Democratic Republic Government of Ethiopia
FGD: Focus Group Discussion
FGD₁₀: Focus Group Discussion with Grade 10 Students
FGD_{9p}: Focus Group Discussion with Grade 9 Plasma Section Students
FGD_{9NP}: Focus Group Discussion with Grade 9 Non-Plasma Section Students
ICDR: Institute for Curriculum Development and Research
ICT: Information and Communication Technology
IEA: International Association for the Evaluation of Educational Achievement
IER: Institute of Educational Research
IIRJ: Interdisciplinary International Research Journal
IM: Instructional Materials ?
JER: Journal of Educational Research
MOE: Ministry of Education
NCTM: National Council of Teachers of Mathematics
NRC: National Research Council
NREL: Northwest Regional Educational Laboratory
PTV: Plasma Television
SPC: School Pedagogical Center
SNNPR: Southern Nations Nationalities and People Regional State
TV: Television
TVI: Television Instruction
TVT: Television Teacher

List of tables and Figures

	Page
Table 1-----	58
Figure 1-----	61

ACKNOWLEDGMENTS

First and foremost I would like to thank my LORD and Savior Jesus Christ for His undeserved mercy that He endowed up on me and open the opportunity to join the postgraduate program.

I am very much indebted to my advisor, Ato Solomon Areaya, for his unreserved guidance rendered from the conception to the completion of the study

My at most appreciation and gratitude goes to SNNPR Educational Bureau, Hosanna city administration and Hadiya Zone Education Department for providing me the scholarship. I am equally indebted to those in Yekatit 25/67 Secondary School who left their door open for data collection and all individual respondents for their genuine information.

I am also indebted to the School of Graduate Studies, Addis Ababa University for covering the expenses incurred in this research work

I also express my heart felt thanks to my father Ato Shimelis Begashaw and my mother Wt/o Seleshi Kebede, my brothers and sisters for their unreserved encouragement and for being always with me in prayer.

Last but not the least my thanks goes to Engineer Tesfaye Legesse, Ato Moges Admassie and his wife Aynalem Bogale who have unforgettable input for the success of my study. Also my grateful acknowledgment is expressed to Ato Ayalew Zina, Ato Dawit Demisse, Ato Sode Wapitto, Ato Belete and all his families.

Abstract

The main focus of this study was to examine how the teaching-learning process of mathematics was going on at Yekatit 25/67 Secondary School in Hadiya Zone and factors affecting the teaching-learning process. Having done this, a few speculative suggestions were given to improve teachers' teaching methodology.

To achieve what was aimed at, a qualitative case study was employed. For this purpose, four teachers and twenty-four students were participated as a source of information in the study. Taking these subjects, the data was collected through interview, FGD, observation and document analysis. At the end, the study revealed negative feelings of teachers toward their profession and their traditional methods of teaching in class. As teachers confirmed and observed, this was attributed to large number of students in a class and teachers load allotment. Moreover, the study indicated that there was less students'-teachers' interaction, shortage of appropriate teaching materials and improper utilization of the teaching materials by the teachers. Further, the study showed that teachers did not get adequate training and awareness so as to improve their teaching methodology.

Finally, on the basis of the findings, it was recommended that teachers should be trained and qualified in order to improve the teaching-learning process. Besides, concerning the PTV program, it was recommended that the concerned bodies should attempt to solve the problem of light and teaching classes by looking for some means, for instance, by buying generators so as not to break the TV transmission and constructing of additional buildings and opening of other Secondary School in the town.

CHAPTER ONE

INTRODUCTION

The introduction part of this thesis includes the background of the study, statement of the problem of the study, the significance of the study, delimitation and limitation of the study.

1.1 Background of the Study

Education is viewed as development of life long process and universal practice of human learning resulting from man's interaction with his social and natural environment. In line with this, Tegene and Tsegaye (1999:1) discussed education as a process and practice engaged in by different societies at all stage of development and geared towards shaping an all rounded personality by a harmonious and integrated development of the mental, physical, social, moral, spiritual, aesthetic etc. powers of human being.

In the same way ETP (1994:1) put education as a process by which human beings transmit their experiences, new findings, and values accumulated over the years, in their struggle for survival and development, through generation. From the discussions it can be seen that education is the process of human experiences by which knowledge is acquired, skills developed, attitude and values formed, that enables individuals and society to make all rounded participation in the development process.

Tegene and Tsegaye (1999:1-2) noted that, because of the complex nature of the human personality, human environment and the presence of different philosophies of life and educational theories, many scholars define education in different ways. However, those definitions emphasize one or more of the ideas that put education as a process of experience, growth, habit formation, acquisition of knowledge and skills, social progress and change, molding character, and modification of original character.

✓ As it is stated in ETP (1994:2-3), in our country education is getting into difficulties with complex problems of relevance, quality, accessibility and equity. That is objectives do not adequately indicate future direction and do not take societal needs into consideration. The absence of interrelated content and mode of presentation that can develop cognitive abilities and behavioral change to adequately enrich problem-solving ability and attitude as the major problems of our educational system. And then remembering that inadequate facilities, insufficient training of teachers, over crowded classes, shortage of books and other teaching materials, as indicators of the low quality of education, taken action to develop a new education and training policy with stated objectives, overall strategy and area of special attention and action priority. In addition to that, the policy stated how education becomes the fundamental means for social, cultural and economic development of the country (ETP, 1994:1).

✓ From the meaning given to education and its stated aims, education can be explained as a fundamental human experience that strives for the development and change of human behavior. As a result, society has developed a number of specific strategies to carry out the function of education. Of these strategies informal education, formal education and non-formal education are included (Tegene and Tsegaye, 1999/2000:3). However Curzon (1990:1), explained that formal education is based on teaching and learning processes that can be practical in an educational institution. That means to achieve those educational aims and objectives; it has to pass through such a process.

✓ According to Aggarwal (1996:54), 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 (2002:74) also expressed the teaching learning process 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 into an understandable whole. The teaching learning activities, which are varied and complex have to be harmonized. These elements and activities include the content of the curriculum, the learner and their individual difference, the

teachers, the method of teaching, the classroom conditions, teaching materials, questioning and answering, assignments, thinking, enjoying, creating, practical skills, discussions and many others (Aggarwal, 1996:55; Curzon, 1990:8).

The traditional process of teaching learning is a mechanical affair, in which the job of the teacher is to cover the syllabus (text-books) within the prescribed time through the quickest possible method available to him. That is, teaching and learning both for the teacher and the learner in the majority of the cases are largely routine exercises in which the teacher transmits knowledge and the learner commits the facts to memory (Singh, 1988:1). However, this does not confirm that students learn, because learning is not a matter of covering materials within a certain time or it is not a matter of knowledge transmission or memorizing of facts but it is a change in the learner's behavior. To the contrary, scholars discussed that teaching and learning are inseparably interrelated. That is, for teaching to be meaningful there should be learning on the part of the learner beyond the materials to be covered. That means there should be learning, which is the apparent modification of person's behavior through his activities and experiences, so that his knowledge, skills and attitudes, including modes of adjustment, toward his environment are changed (Curzon, 1990:10; Matiru, 1995:90; David, 1968:1; Clark and Starr, 1991:8; Capel et al., 1995:251)

So far it has been discussed how education is related to the teaching learning process and should pass through this process to achieve its aims and objectives. 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 our educational objectives are stated. In (ETP, 1994:8) some of the objectives are stated as:

*Bringing up citizens who differentiate harmful practices from useful ones, who seek and stand 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.*

In order to answer the questions how and why mathematics greatly contribute for the achievement of these and the other educational objectives, it is enough to look at the nature of mathematics and its relationship with other disciplines and its application to our daily life.

Mathematics is not as traditionally emphasis is given to it as the one that teaches children; how to add, subtract, multiply and divide whole numbers, fractions decimals and percentages. Although it includes these things, mathematics is more than computation. According to (NRC, 1989:33, NCTM, 1991; 1989), mathematics is a science of patterns and relationship, a science and a way of thinking, an art, characterized by order and internal consistency, and it is a language and tool using carefully defined terms and symbols. It has also been explained and discussed that it is at the heart of many successful careers and successful lives. Hersh (1986:56) expressed mathematics as ideas, not marks with pencils or chalk, not physical triangles or physical sets. NCTM (2000:234) 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.

NCTM (1989, 2000) discussed that in addition to being a theoretical discipline, mathematics is an applied science that many mathematicians focus their attention on solving problems that originate in the world of experience. It has useful applications in business, industry, medicine, agriculture, engineering and the social and natural sciences. It has been also discussed that the relationship between mathematics and the other field of basic and applied science is especially strong. This is because the agreement between science and mathematics has long history dating back many centuries and they have many features in common. It is the chief language and grammar of science that provides the rules for analyzing scientific ideas and data rigorously. Mathematics and technology have also developed a fruitful relationship with each other, and Mathematics contributes more generally to engineering.

That is why the Americans gave great emphasis and invested much amount of money, for mathematics education. According to the American National Research

Council (1989:1-35), mathematics education was a massive enterprise, involving over 10 percent of the nation's educational resources about 25 Billion Dollars annually during the 1980's. Each year, 25 millions elementary Schools children, 10 millions secondary schools students, and 3 million undergraduates studied mathematics. Indeed about 60 percent of school level and 30 percent of college level science and technology education were devoted to mathematics. It was also their belief that mathematics is a key to opportunity and careers, providing instrument for understanding the world. It is their saying that mathematics literacy is essential as a foundation for democracy in the technological age. They also believe that mathematics trains the mind for clear thinking in other subjects, and mathematical illiteracy is both a personal loss and a national debt. Because they strongly believe that mathematics is the language and foundation of science and technology, they came to a conclusion that without strong mathematics, there could be no strong science. From this, one can understand how mathematics will play a role in achieving the educational objectives for the development of science and technology and how much attention should be given for its implementation.

How mathematics education is essential and crucial in the fulfillment of our educational objectives is clearly indicated in the statement of the aim of mathematics education stated in the first cycle of our secondary education Mathematics guide as:

Students acquire and develop solid mathematical knowledge, skills and attitudes that significantly contribute to the creation of citizens who are conscious of the social, economic, political and cultural realities of Ethiopia and that can actively and effectively participate in the ongoing process of development of the country
(ICDR, 2004:1).

Therefore to achieve these aims and to value mathematics in achieving our educational objectives and see its applications for the development of science and technology and in other fields of studies, just stating and reading meaningful statements is not an end by itself. Attention should be given to teaching and learning process. If there is a problem on the teaching learning process of mathematics achieving those goals and objectives is not more than a tiger on a paper. Because as it has been discussed by scholars (Costello, 1991:73-80; Sidhu, 1981:102-138; Dean,

1982: 1-63; UNESCO, 1979: 164-171), like any discipline the teaching learning process of mathematics is influenced by the totality of situations like, the school environment, the culture in which the learner and the teacher come from, the social, psychological and the economic factors. Most importantly, the instructional aspects which include the teaching methods followed by the teachers, how students learn, the instructional materials used, the classroom environment, the teacher student interaction will have an influence on its teaching learning process.

However, scholars have discussed how students learn mathematics and how mathematics is being taught effectively. According to Burns (1992:24) it is not only important to consider the content of the mathematics curriculum, but also is important to know how students learn mathematics. He also discussed that students need to learn mathematical concepts and see relationships among these concepts. Because concepts and relationships are constructed by people and exist only in their mind. That means to learn mathematics students must construct these concepts and relationships in their own mind. The NCTM, (1989:5) strengthen this idea by describing what it means to learn mathematics and teachers role in teaching mathematics as:

Knowing mathematics means being able to use it in purposeful ways. To learn mathematics, students must be engaged in exploring, conjecturing and thinking rather than only in rote learning of rules and procedures. Mathematics learning is not a spectator sport, when students construct personal knowledge derived from meaningful experiences, they are much more likely to retain and use what they have learned. This fact under lies teachers' role in providing experiences that help students make sense of mathematics, to view and use it as a tool for reasoning and problem solving.

Van de Walle (1995:132) also discussed on effective teaching learning of mathematics, and explained that the key to effective teaching learning is helping students to be active, reflective thinkers so that their minds will be working and forming relationships, making connections, and integrating concepts and procedures. He also suggests how teachers might structure lesson to promote reflective thought like creating a problem solving environment, using models, manipulative, drawing, encouraging interaction and discussion. Furthermore, active involvement of students

in their own learning, multiple modes of information presentations, frequent opportunities for teacher and peer interaction, diagnosis and selection of IM and methods, ongoing assessment of learning, individual and group opportunities for the development of higher level thinking, problem-solving, goal-setting, and reflective self-awareness, developmentally appropriate opportunities for students choice and self-regulations, heterogonous and diverse grouping of students for learning activities, and quality interpersonal relationship based on understanding and on mutual respect between student and teachers, and students and students were suggested by McCombs (1993:298-299) to maximize student learning, motivation and achievement in mathematics teaching- learning.

All these shows how an attention should be given for the teaching and learning of mathematics so that the learners can learn mathematics and in turn they can apply their knowledge of mathematics in solving problems of the society and in the development of science and technology. This will be true when active involvement of the learner in the teaching learning process of mathematics is practical. Unless and otherwise the learners learn mathematics by their own with great effort done by the teacher, simply information transmission or rote memorization of facts by the learners will not have effective result in learning the fundamental knowledge of mathematics and applying it to other fields of study.

Likewise, quality education becomes the talk of the day in both developed and developing countries. They are discussing about learning outcomes and profoundly concerned with the quality of teaching. That is, good teaching and good learning using varied means, methods, styles, materials and soon. Amare and Taswe cited in Akalu(2000:1) forwarded that in many countries, evidence suggested that students achievement have declined. It is with no question is a case in Ethiopian mathematics education in general and in Yekatit-25/67 Secondary School in particular. The students' failure can be attributed to many factors like, shortage of educational inputs, learning environment, teachers' attitudes and the way students taught are some of the problems (Lockheed, 1991:40). In addition to this, a study made by ICDR (1998:2-5) listed the method of teaching followed by the teachers which is highly teacher centered, students low ability to understand English language as a medium of

instruction, less educational level of teachers below the required qualification level for teaching secondary school mathematics, shortage of textbooks and other reference materials in the library, negative attitude of students toward mathematics, and over crowded classrooms as major problems of mathematics education in our secondary schools that have a negative influence in students learning and their achievement.

Although there are studies which have been done in relation to the syllabus implementation of mathematics and instructional aspects in some other areas, no direct study has been done upto now on the teaching learning process of mathematics in Hadiya Zone in particular on Yekatit 25/67 secondary school. In addition to this, during the 13-years of my experience in teaching mathematics I observed that there is a growing feeling in the students that mathematics is a difficult subject to learn and to have good achievement. In addition to that students' achievement in classrooms and national examination become low. These feelings of the students and the resulting low achievement in examinations initiated me to study the teaching learning process of mathematics in Yekatit- 25/67 secondary school.

1.2 Statement of the problem

The purpose of this study is therefore to examine "how the teaching-learning process of mathematics instruction in Yekatit 25/67 Secondary School of Hadiya Zone is going on, and to identify factors influencing mathematics instruction of the school, and to suggest possible solutions for it.

Accordingly the study assessed on classroom organization of the school, on teachers' related variables, on how the teaching learning is going on, on the availability and utilization of IM, and on factors affecting the teaching learning process of mathematics in the school.

This study therefore answers the following research questions:

1. How suitable is the classroom organization of the school for the teaching learning of mathematics?
2. How does teacher related variables could affect the teaching- learning of mathematics in the school?

3. How is the process of teaching and learning of mathematics going on?
 - In PTV-sections
 - In non-PTV-sections
4. How is the activity and participation of students?
5. How is the teacher - student interaction in the teaching learning of mathematics?
6. Which methods of teaching are dominantly followed by the teachers?
7. To what extent IM are available in the school and utilized by the teachers?
8. What are the factors that affect the teaching learning of mathematics in the school?

1.3 Significance of the Study

The study attempts to:

- Show the main affecting factors of the teaching learning process of mathematics in Yekatit 25/67 Secondary School.
- Create awareness for teachers, school directors and other educational personnel about the teaching learning of mathematics in Yekatit 25/67 Secondary School.
- Help the Zone, the Region will benefit from the finding of the study to improve and facilitate the quality of Mathematics education.
- Serve as a reference for further detailed study on the process of mathematics teaching learning.

1.4 Delimitation of the Study

The teaching learning process is a broad idea, which can be influenced by the totality of situations. It is fruitful and permanent if these total situations are related to the life situation of the learner and the society as a whole. Besides, it can be influenced by the factors like the learner, the teacher, the curriculum, the instructional materials under utilization, the technology, the administration of the school, all the psychological, physiological, economical and social situations of the learner and the teacher, and the school environment as a whole. Although all these issues are very

important and crucial factors in the teaching learning process and the study could have significant result if these variables were included in the study. Because of shortage of time, money, and other resources and to make the size to be manageable, the study is delimited specifically on the instructional aspects primarily related to the classroom and those that are taking place in the classroom. It is also delimited only on the process rather than on the product. That is, the study focuses on how the teachers are teaching, i.e. the method of teaching they are using, and how the students are learning, and the instructional materials used, on the teacher and student interaction and classroom organizations.

1.5 Limitation of the study

In qualitative case study the researcher is the main instrument for data collection that needs his presence for a long period of time at the research site. To do that, time and money were the main limitations. It was also a serious problem to get a volunteer assistant researcher especially a person who can do the observation with me. So I did the observation alone. Had not been for such limitations I believe that better result might have been found.

CHAPTER TWO

REVIEW OF THE RELATED LITERATURE

This part of the thesis deals about the theoretical background of the problem under study related to the research questions.

2.1. Teaching and Learning Process

Education as a human activity is largely based on the process known as the teaching and learning. The teaching learning process can be understood and be clear in light of the discussion on how teaching and learning takes place. Aggarwal (1996: 54-55) explained the teaching learning process as a means through which the teacher, the learner, the curriculum and other variables are organized in a systematic manner. Although what Aggarwal said is correct, it is not only the predetermined goals and objectives can be attained. It is also possible that the unplanned and unintended objectives could be attained through the teaching-learning process. Amare (2002: 74), further expressed that the teaching-learning process is a systematic process which involves inputs, process and output. As inputs of the process included in the curriculum which is mainly the objectives and content of teaching, the teacher whose role ought to be management, demonstration of intellectual excellence, evaluation and program development of the process, the students who must have a need that exists with in for learning and who need to be motivated, and the technology which he mean the teaching-learning methods. As a process, he expressed the interaction of the curriculum, teachers, students and technology. And as an outcome of the process the knowledge the degree to which the learner is informed of the subject and the method of investigating the subject, the skill which is the set of procedural competencies and abilities of the learner, and the attitude that is the affective aspect that predisposes learners to act or not to act in a certain way.

These ideas show that the teaching-learning process is an activity in which all the various elements of the teaching-learning situation have to be brought into an intelligible whole. That is, the teacher-learner activities that are varied and complex has to be harmonized. These elements and activities include the teachers and their individual differences, the method of teaching, the materials to be taught, the classroom conditions, the instructional materials under utilization, the interaction between the teacher and the learners, practical skills and others. Moreover, it becomes fruitful and permanent if these total situations are related to the life situation. Then teachers can play an important role by planning, motivating, initiating students in participation and their knowledge of the subject matter in facilitating the process taking into account the needs of the learners. Tekalign (2001: 13) stressed on the interaction between the teacher and the learner as the core of the process. That means teachers are expected to initiate students to be involved actively in the teaching learning process.

Although the teaching learning process is a very wide topic that cannot be handled in short, the discussion on the teaching and learning here under will give a brief highlight.

2.1.1. Learning

Learning is one of the significant processes in the teaching learning process. According to Darge (1995: 90-91), the scientific study of the learning process has a long history in psychology. It noted that there are researchers who argued that learning is essentially a matter of different forms of association. These scholars are not interested in what happens in the mind of the learner. Others are also proposed that limitation or observation considerably influences learning. Similarly others describe the learning process with in the person that is how the individual handles in his mind the information he gets, using the terms like short-terms and long-term memory. By saying this Darge tried to show how the learning process is very wide, and he said that learning is an enduring change in how we think, act, feel about things. That means we learn facts, we develop skills, we solve-problems, we like something and we dislike others. We also learn how to learn. In addition, he

suggested that all these outcomes are the result of the interaction of many factors. These factors can be related with the characteristics and needs of the learner, the relevance of the curriculum to the learner, the interest and skills of the teachers, the adequacy of instructional materials, the purpose and method of evaluation, and the learning environment in general.

In agreement with the idea discussed on learning, different scholars and educators have dealt with it, and they put it as a complex process, which result in change on the learner. Curzon(1990:9) also discussed that learning is an activity that develops new knowledge and abilities in the individual, it is a process by which an activity originates or is a change through reacting to an encountered situation, a relatively permanent change in behavior or in behavioral potentiality that result from experience. Gagne (1977a, 1972) cited in Gredler (1997: 108) expressed human learning as a complex, multifaceted process and is a mechanism by which an individual become a completely functioning members of the society. McComb (1993:291) strengthened the idea of Gagne on learning expressing that human learning is an active, volitional, internally mediated, and individual process of constructing meaning from information and experience, filtered through each individual's unique perceptions, thoughts, and feelings.

Looking at the meaning and discussion on the nature of learning, it is associated with a change in the learner. Moreover, an active complex and multifarious process, which can be explained as a change from not understanding something to understanding it. The change in the learner may be observed in the learner's experience, emotion, activities and behavior. It also shows that it is an activity that teachers are expected to play the greatest role, in initiating students to be involved actively in the teaching- learning process. That means in students' active learning, cooperative learning, problem- solving skills, in critical thinking, higher order thinking, and other activities that enhance students' learning. In support to the importance of teachers in helping students to learn, (Gage, 1985; Brophy and Good, 1986) cited in Eggen and Kauchak(1996:6) noted a large body of educational research and the findings consistently indicate that the teacher is an important factor outside the home in affecting students learning and development. In the same way,

teachers who have clear goals, actively strive for learning, and who use effective methods produce results.

2.1.2. Teaching

Teaching is one of the most important instructional aspects, which is directly related and interconnected with learning. Teaching is a system of activities intended to induce learning, comprising the deliberate and methodological creation and control of those conditions in which learning occurs. Scholars have also discussed it as an activity causing a person to learn or acquire knowledge or skill and desirable ways of living in the society. (Reda, 2001: 13; Curzon, 1990: 18; Chauhan, 1979: 10)

The above discussion shows the interconnection between teaching and learning. That means the goal of teaching is to bring about a desirable change in the learner, which shows that unless there is a change in the learner talking about teaching may be meaningless.

However, there is a conception that teaching is an ability to impart knowledge or the transmission and dissemination of knowledge. That means there are teachers who feel and think that their primary role is information dissemination and that information can be disseminated in the same way to all students. Such teachers tend to select contents that refer to the lowest level of cognition believing that what is expected of them is transmitting knowledge (Nigussie, 2002: 24, Smith, 1990: 372; Chauhan, 1979: 11).

This traditional conception of teaching as imparting, transmission or dissemination of knowledge has been criticized. According to Nigussie, such conception is a defective conception that has a limitation and it can negatively influence the selection of content, methods and the understanding of the nature of the learner because it looks teaching without considering learning. It is also a conception that emanates from lack of knowledge and skill of the science and art of teaching, which is planned, goal oriented activities that facilitate learning. In agreement to this idea (Pellicer, 1984; Gage, 1984) cited in Smith (1990: 372) asserted that when teaching is viewed as an art, it involves much more than providing information to

students. It requires improvising, spontaneity, the handing of a vast array of consideration of form, style, pace, rhythm and appropriateness. Singh (1988: 5) also expressed teaching as a creative endeavor, which must result in the development of creative thinking abilities among learners rather than transmitting and imparting of knowledge. In the same manner Skinner (1953) cited in Nigussie(2002: 24) discussed on what is expected of education. It is not only the acquisition of knowledge but also the development of skills, values and attitudes, which can not be realized through imparting of knowledge rather it requires engaging the learner's in learning experiences which give them a chance to practice the desired behavior.

Therefore, the objective of teaching is to promote learning rather than transmitting and dissemination of information; it is an interactive social process that involves active communication between the learner and the teacher. It is the teacher who is always to think of his teaching and on students learning and to take the necessary decisions, preparation and adjusting situations so that students have to learn and his teaching to be meaningful. An effective teacher always thinks for the effective and efficient learning to occur. Effective teaching occurs where the learning experience structured by the teacher matches the needs of the learner. Effective teaching is also considered as creating favorable conditions in which appropriate learning and the building of those condition that foster the process of learning.

2.2. Teaching and Learning of Mathematics

What has been discussed on the teaching and learning process is a fact that can be applied on the teaching and leaning process of mathematics. The discussion here under will not contradict the general idea on the teaching and learning so far. What follow will concentrate specifically on mathematics teaching and leaning.

From our experience, in school and in our daily life, we understand that mathematics is the subject matter that serves as a tool and basic for other subject matters or for social interaction. Although it is not the purpose of the researcher at this time to discuss on what mathematics is, it is better to mention some issues raised by scholars. Many have discussed specially on its function. Nevertheless, most fail in

giving the clear meaning of what mathematics is. There are some who tried to give the picture of mathematics. Sidhu (1981:1) explained it as the numerical and calculation part of man's life and knowledge. That means it helps man to give an interpretation of his idea and conclusion. It enables man to study various phenomenon in space and establish various relationships between them. He also viewed it as a science of abstract form and logical reasoning. Locke cited in Sidhu(1981:3) looked it in the same way and he expressed it as a way to settle in the mind a habit of reasoning.

Bell cited in Roszkopf and Fey (1972: 20) described mathematics as the hand median and servant of the science. This is to mean that it is a subject matter of great application and is a means to understand other subject and activities, which are happening in the world. Portman and Richardson (1993:105) supported the idea of Bell by explaining mathematics as a way of organizing our experience of the world. That means it is the subject matter that enriches our understanding and enables us to communicate and make sense of our experiences. Keppel (1963:9) who discussed on school mathematics explained that, mathematics is a subject of great humanistic value; its importance to the educated man is almost as great as its importance to many technical specialists. According to Keppel, many poor patterns of thought common in an ordinary life may be modified by the study of mathematics. It is a growing subject with building of confidence, in one's own analytical power as the major goal of its education, with far excellence in which intellectual efforts can be a real laborsaving device. All the ideas what have been discussed are showing us how mathematics is useful, applicable for our daily life and it reminds all of us the teachers, students and others to be aware of this fact. All these can be summarized by statements made by NCTM (1989:5) that having a good knowledge of mathematics enables the students to get the following advantages:

Knowing mathematics means being able to use it in purposeful ways. To learn mathematics, students must be engaged in exploring, conjecturing, and thinking rather than only in rote learning of rules and procedures. Students should learn to value mathematics, reason mathematically, communicate mathematically, become confident of their mathematical abilities, and become mathematical problem-solvers.

All the ideas that have been discussed so far shows that the function of most of the disciplines is based on mathematics. That means the teaching and learning process of mathematics has great contribution not only for developing the knowledge of mathematics but also for the enhancement of other subject matters and even for daily life application. Considering these facts proper attention should be given on the teaching and learning process of mathematics in all levels of schools, whether in pre-elementary, elementary, junior, secondary schools, colleges and universities.

Most scholars discussed on the mathematics teaching and learning indicating that the traditional approach has little effect in the learning of mathematics and they gave emphasizes on modern way of teaching. Owne and Rousham(1996:223)discussed the traditional way of teaching mathematics as very didactic in style and regard the child as a blank sheet on to which the teacher writes mathematical knowledge. They also noted research that is beginning to establish sufficient findings so that significant changes are called for in the teaching of mathematics. And they criticized traditional classroom, which focuses on competition, management, the mathematics taught is assumed a fixed body of knowledge, and it is taught under the assumption that learners absorb what has been covered. However, they also discussed those learning proceeds through construction, not absorption, and that good teaching involves more than management. In support to what have been discussed by the scholars Hilary Shuard cited in Whitebread (1996: 255) objected this traditional approach that it will not only ignore the understanding the child already has about mathematics but also it assume that all children will learn the subject in the same way, in the same order and at the same rate. According to Shuard if we are to be more successful in helping children learn mathematics we need to see them as people who think about their experiences and build on them. That means we have to come to the idea to see children as mathematical thinkers in their own right, trying to develop their thinking, and the teachers need to provide the experience from which they can build mathematics for themselves.

Whitebread (1996: 257-266) noted on giving recognition and distinction between the three elements understanding, knowledge, and application in

mathematics teaching and the need on ensuring its balance. According to Whitebread the failure to recognize the distinction between these elements will lead to poor learning and hence poor teaching. He also noted that the over-emphasis on rote learning of facts and procedures produces children who cannot adapt or use their knowledge.

According to a synthesis made on three studies and prepared by a committee of the NCTM (1989), where the studies included a national survey of current practice Weiss(1979), a review of literature Suydam and Osborne(1977), and a set of case studies Stake and Easley(1978) all cited in Romberg and Carpenter (1986: 862) on the teaching of mathematics, concluded that the predominant pattern of teaching is "extensive teacher directed explanation and questioning followed by student seat work on paper-and pencil assignment. It has also characterized three serious limitation of mathematics instruction. First mathematics is assumed to be static bounded discipline. In which its emphasis is on teaching the concept and skills associated with aspects of the discipline. Second students are treated as place of registering apparatus that store up information isolated from action and purpose. Moreover, the daily lessons of such traditional classroom are geared to absorption and not inquiry. However, according to Romberg and Carpenter current research indicates that acquired knowledge is not simply a collection of concepts and procedural skills filled. Rather individuals structure the knowledge in meaningful ways, which grows and change over time. Thirdly the role of teachers in the traditional classroom is managerial or procedural in that there job is to assign lessons to their classes of students, start and stop lessons according to some schedule, explain the rules and procedures of each lesson, judge the action of the student during the lesson, and maintain order and concepts through out.

This is the discussion made by NTCM (1989) what learning mathematics means:

Learning mathematics extends beyond learning concepts, procedures, and their applications. It also includes developing a disposition toward mathematics and seeing mathematics as a powerful way for looking at situations. Disposition refers not simply to attitudes but to a tendency to think and to act in positive ways. Students'

mathematical dispositions are manifested in the way they approach tasks-whether with confidence, willingness to explore alternatives, perseverance, and interest and their tendency to reflect on their own thinking (NTCM, 1989: 233).

In line with what is said Cockcroft(1982) cited in Swan et.al (2000: 12), Krantz(1999: 103-104) explained that mathematics teaching should include a broad range of learning activities, exposition, discussion, practical work, practice, problem solving and investigation and particular elements that should be present in successful mathematics teaching to pupils of all age. Bell et.al. (1985) cited in Swan et al (2000: 12) noted that a teaching methodology based on discussion proved much more effective than more usual methods, particularly for longer-term retention. McCormick and Pressley (1997: 301) discussed cooperative learning to be an effective mathematics instruction. Although they believed that cooperative learning could be used for many content areas, it is especially appropriate for mathematics education, since contemporary mathematics educators emphasize social collaboration in problem solving. As to Davidson (1985) cited in McCormick and Pressley (1997: 301) noted studies have demonstrated that students become problem solvers as a function of participating in cooperative learning experience. Davidson and his colleagues believe that cooperatively interacting to solve problems can be a transformative experience for many students with advantage that include;

- Students come to value the process of problem solving rather than production of process.
- Mathematics anxiety is reduced when students work in cooperative group.
- Cooperative instruction permits more challenging and less conventional problems to be presented to students.
- Multiple representation of problem situation is offered in discussion.

When they discussed on the need for students to participate actively in the teaching learning process Manning and Payne(1996: 139) said that, students should be taught to become aware of their own learning processes, monitor their current task performance and gain control of academic tasks.

Research also strongly links the use of time and students achievement outcomes Greenwood (1991) cited in Ysseldyke et al. (2003:176) have argued constantly that students' academic responses and the extent to which they profit from instruction are dependent on how students spend their time in school and students spend their time in turn is dependent on specific features of the classroom environment. In the same way, Fisher et.al.(1980) cited in Ysseldyke et al.(2003: 70) concluded that the amount of time students spend engaged in an academic task is appropriate to their skill level in a strong predictor of student mathematics achievement. It is also discussed that, the difference in the content coverage in classroom should result in different achievement. That is the more time one devoted on content coverage show superior performance when contrasted to similar student with less time (Romberg and Carpenter, 1986: 861).

Therefore, for effective mathematics teaching-learning process, effective mathematics teachers are needed. That means these teachers should work very efficiently and effectively so that students can actively participate in the learning process, that is in cooperative learning activities, in problem solving practice, in group discussion, in devoting more time in learning mathematics, in doing out of class assignments and in general in learning how to learn mathematics. Since good mathematics teaching is a product of preparation, effort, and good attitude on the part of the teacher so the teacher have to give great emphasis toward his teaching, have to devote great effort in preparation and have a good and positive attitude toward his teaching. He has to make an effort to communicate with his students and respect them. He needs to master the material before he enters the classroom. The teacher must not make mathematics harder by putting artificial barriers between himself and his students. That is the teacher must clarify while teaching mathematics. Clarity in having good blackboard technique, speaking clearly, writing clearly, well organization and well preparation (Krantz, 1999: 1-9. Dubish, 1963: 2-13). In support to this Ysseldyke et.al. (2003: 163-173) briefed that it is the work of the teacher to identify and implement effective instructional techniques which is believed to be the first step. He noticed teachers to use specific instructional strategies and tactics that help to increase students' success in mathematics. Some of the instructional features broadly

grouped as planning, managing, delivering, and evaluating, which are related to student success. That is to say that appropriate match of the level of instruction to the skill level of the learner, appropriate amount and kind of practice, direct and frequent monitoring of progress, and corrective, motivational feedback must be presented in a natural classroom environment to benefit students out comes in their mathematics learning.

2.3. Teaching Methods

Teaching is a science and an art that will result in a change on the learner. For this science and art of teaching to be practical there should be a means or methods to be applied. So it is the behavior of an effective teacher to know what to teach that is the content of his subject and how to teach the method to be applied to teach the content.

Teaching methods are the means by which the teacher attempts to bring about the desired learning and the way to understand and practice the art of teaching. That means methods in teaching concerns the way teachers organize and use teaching techniques, subject matter, teaching tools, and teaching materials to meet the teaching objectives. It enables the child to learn and how to communicate knowledge (Sidhu, 1991: 102). Although teaching methods are essential and important in the teaching learning process, there is no one method, which is neither the weakest nor the best. A method best serves one purpose and fails for others. There is no best method of teaching or method that will suit to all occasions (Sidhu, 1981: 102-137; Dean, 1982: 30; Montagu(1987)cited in Smith, 1990: 275; ICDR, 1999: 66).

These scholars gave emphasis on the use of different methods of teaching at different times for different levels of students and for different topic of a lesson and for different age level. That means the method of teaching the teacher is using should be tailored for the specific teaching-learning situation to be maximally successful. In each one of the situation the teacher must decide what objectives he should strives for, what content he should include and exclude, what procedure he should use, how best

to evaluate what he has accomplished how to capitalize on what he has accomplished, and how to repair any errors and omissions in the students' learning.

Therefore method of teaching is not merely a device or random collections of techniques adapted for communicating a certain item of information to students and exclusively the concern of the teacher who is supposed to be at the giving end. It must link up the teacher and his pupils into an organic relationship with constant mutual interaction. They are means of conveying ideas and skills to impart and acquire a certain subject matter in a more concrete and comprehensive ways. They are tools for educating learners and required appropriate selections and applications (Ward and Rose Cited in Aggarwal, 1996: 79; Connell, 1987: 213).

In agreement with what is explained Aggarwal (1996: 86) discussed objectives of the methods of teaching as they should aim at, developing "love for work", inculcating the desire to do work with maximum efficiency, provide adequate opportunities for participation and cooperation, develop the capacity for clear thinking, expand students interest, providing opportunities to pupils to apply practically the acquired knowledge and skill, transforms schools into work and activity schools, and they should be adapted to the 3A's-Age, Ability and Aptitude of the students.

2.4 Classification of Teaching Method

Although they mean the same thing scholars have classified teaching methods as

- Teacher-centered and student centered.
- Direct instruction and indirect instruction.
- Conventional and non-conventional methods.
- Traditional and modern (non-traditional) methods.

(ICDR, 1999: 68; Borich, 1988: 163; Callahan and Clark, 1988:176; Clark and Starr, 1991:223), however the researcher prefers to use the terms teacher-centered and student centered methods because these terms are not new for most of us.

2.4.1. Teacher-Centered Method of Teaching

As educators discussed the teacher-centered method gives the priority role and responsibility for the teacher. The teacher is considered as the source and the students are recipient, educators not learners that determine the standards, contents, and methods. Participation by students in deciding on processes and purposes is minimal. It is basically expository in nature and time honored used by teachers to impart knowledge to neophytes. Their major aim seems to be to ensure mastery of what is in books and in the educators' minds mostly through verbal communication. Their basic technique is to give learners information and then insure remembering, and their role is to provide students with knowledge that will provide a foundation for higher thinking. In this method of teaching the teacher is the center of classroom activity and active while the student is passive. The teacher either wrote notes on the board that the students passively copied in their exercise book or the students memorized the information from their textbooks and the teacher use "Chalk and talk." All decision-making is in the hands of the teacher regarding purposes, content, process, and participation. (Callahan and Clark, 1988: 176-177; Clark and Starr, 1986:234; Davies, 1981: 31; Borich, 1988: 143-145, ICDR, 1999: 60-70, Siduh, 1981: 103; Withall, 1987: 327).

Eventhough there can be many other methods that can be considered under the teacher-centered method, the lecture, question and answer, and demonstrations are the dominant ones.

The **lecture method** is a widely used and well-known method in transmitting factual information to a large audience in an economically way through speech. It is a method of presenting word picture of an idea. It is an autocratic in form and allows little or no room for active audience participation. It is a one-way traffic flow of ideas, the speaker gives ideas and the listeners take them. It has been discussed that because of its misuse and overuse, it has been fashionable in some circles to down grade the lecture even though it has been used with success in the past, is being used with success at present, and no doubt will be used with success in the future.

Scholars also explained that in spite of its values, lecture is a rather ineffective method of teaching middle and secondary school students because learning from lecture is relatively passive, is often relatively sterile, do not give students opportunity to explore, to think or interact, is not conducive to study in depth, but rather tend to make students receivers of knowledge, it does not allow for differing responses for the exercising of one's curiosity, it is seldom useful for changing attitudes or imparting the higher cognitive skills, very little of the lecture sticks in the students' minds, it gives very little opportunity for reinforcement to take place or for one to assess the progress in learning of either the group or individuals (Clark and Starr, 1986: 200-202; Davies, 1981: 38; Walklin, 1990: 55-56).

Noting that lecturing is the most frequently used method of instruction in secondary schools, Smith (1990: 275) reviewed criticisms it has received during the late 1960s and 1970s that many teachers who used this method lack sensitivity towards students, are not effective presenters, are not sufficiently prepared.

Through out the course of history **questioning and answering** has been one of the most common teaching techniques. It has been expressed as a common classroom interaction between the teacher and the students, in which students are initiated, by the teacher and students response followed by the teacher evaluation. It is believed that questions serves as means of organizing knowledge, or correlating the results of educative experiences. It serves to test the previous knowledge of the students to enable them to recall something, to recognize something, to think over something, to reason about something, to elicit something from students and to stimulate interest and effort, to promote students mental activity, and it involves learners as partners in the instructional process (Callahan and Clark, 1988: 182-183; Clark and Starr, 1986: 206; 1991: 219; McCormick and Pressley, 1997: 237; Davis, 1981: 163).

Depending on the purpose to address questions can be categorized in different types. Therefore it is an effective teacher tries to adapt the types and the form of questions they ask to the purpose for which they ask it. Narrow questions usually seek recall of facts or specific correct answer while broad questions are more complicated and it may require the learner at his own conclusions (Callahan and

Clark, 1988: 183; Clark and Starr, 1986: 206). An identical category according to (Capel et al, 1995: 84-85; Davies, 1981: 163; Carin and Sund, 1989: 153) is closed question, which are simple recall, or question which ask for confirmation or denial, or a specific piece of information and open questions, which are though-provoking and challenging often used to develop understanding. Higher-order questions, which require manipulation of information and reflection and lower-order questions, require simple recall of information (McCormick and Pressely, 1997: 237).

From these discussions it is easy to see that questions have different types of response depending on the nature of the question. So it is the teachers who think of and plan the type of question to ask in order to achieve what he is intended to achieve. He has to look for the effectivity of his questions Clark and Starr (1986: 207-208, 1991: 220-222)

Students do not always learn from what the teachers tell them. Often showing them how or running through a practice is much more effective. **Demonstration** is one of the ways, which gives students' clear understanding of the processes, skills and how to perform activities. Knott and Mutunga in Matirue (1995: 191) put demonstration as mostly designed to illustrate and consolidate theoretical principles out lined in lectures, they emphasized on applying demonstrations after lectures. Clark and Starr (1986: 215-216; 1991: 218), Callahan and Clark (1988: 193-194) commented on telling how to do something does not make clear how to do it or what happens in certain processes. Applying the principle "seeing is believing" Clark and Starr discussed that to get understandings and skills across, a teacher have to use the show-how tactics (demonstrations). Davies (1981: 40) also agrees with the above ideas and discussed that demonstration has certain similarity with the lecture method of teaching in the case of demonstration a considerable amount of time is spent showing learners how something ought to be done. It is highly visual as well as an oral method of teaching. In the demonstration method a teacher has to impart not only knowledge but also skill with importance given to understanding. The method is based on the idea that skill comes from seeing how something is done.

Therefore demonstration as a practical display or exhibition of a process serves to show or point out clearly the fundamental principles or actions involved. It

can be used as a useful tool available to the teacher and plays an important part in the teaching of skills.

2.4.2 Student-Centered Method of Teaching

Student-centered teaching is a new approach in education, which describes learning situations in which learners are expected, within reasonable limits, to take responsibility for identifying and agreeing objectives, planning and implementing their own learning activities and appraising learning outcomes with a teacher. In this method of teaching students are not passive recipients of knowledge and information from their teachers and books they are active learners. Students collect information, record it systematically, discuss it, compare it, analyze it, draw conclusions from it and communicate about it. It is a method that views knowledge as a product of creative inquiry and student participation in the learning process. That is only through genuine student involvement and interaction can hypotheses be tested, views expressed, questions raised, controversy examined, and insight developed, along with other desirable cognitive processes. Which is to say that learning results from real experience obtained by doing things, by action learning, that is by taking an active part in work related activities, tackling problems or completing assignments (Callahan and Clark, 1988: 211; ICDR, 1999: 71- 108, Walklin, 1990:31-33; Withall, 1987: 327-333).

The student-centered method of teaching does not reject the importance of the teacher rather it is a method that de-emphasizes the direct spoon-feeding instruction of the students by the teachers. In this method of teaching the teacher has great responsibility and his role is different from that of the teacher-centered. The teacher's role in this method of teaching is to organize activities through which students will gather or use information, make sure students are really thinking and analyzing, asking questions, accepting students' feelings, acknowledging students' ideas and giving praise and encouragement, and checking their progress to make sure that all students are learning (Bruner, 1961; Gagne, 1965; Wittrock, 1966) cited in McCormick, Pressely (1997: 13) and Flander (1970) cited in Perrott (1982: 2).

Callahan and Clark (1988: 212) characterized the student-centered class sessions by; the probing exploration of ideas, concepts, and issues; building up on

student responses in a developmental flow; interaction among all participants; questioning, sharing, differing, conjecturing on the part of all; shifting leadership among participants; student participation in decision-making; hypothesizing and problem-solving.

Although there are different methods in which the student-centered method can be expressed, the most dominant ones are inquiry (discovery), problem solving, discussion group methods, and cooperative learning (Borich, 1988: 163-191, McCormick and Pressley, 1997: 253-255, Callahan and Clark, 1988: 237-263; ICDR, 1999: 71-72).

Indirect instruction (learner-centered teaching) is an approach to teaching and learning in which the process of learning is inquiry, the result is discovery, and the learning context is a problem. These three ideas-inquiry, discovery, and problem solving are brought together in special way in the learner-centered model of teaching and learning (Borich, 1988:163).

The psychologist Jean Piaget cited in Walklin (1990: 163) gave an emphasis on the student-centered teaching in his studies of children's thought process and he concluded that teachers cannot further understanding simply by talking to pupils. And he proposed that good pedagogy must involve presenting pupils with situations in which they may experiment and hence learn by actively constructing their own knowledge through interacting with the learning environment.

Discovery learning is one of the most important of the learning approaches because of it's highly motivating and can help students to structure what they are learning. It is the process by which the learners use their mind in a logical and mathematical ways to organize and internalize concepts and principles of the world. It is an example of active learning that occurs when pupils are left to discover things for themselves. The belief that pupils' learning is more meaningful, thorough and usable when pupils seek out and discover knowledge rather than just being receivers of knowledge is the main notion of discovery learning (Callahan and Clark, 1988:237; Dean cited in Cohen etal, 1996: 177; Capel, 1995: 232).

The basic idea behind discovery learning is that students will learn by doing and then reflect up on what was done (Dewey cited in Carin and Sund, 1986: 103). It

has been also discussed that in discovery learning, teachers present tasks that offer opportunities for students to construct understandings. That means students interact with objects in the classroom, exploring, manipulating and performing experiments. The teacher's input is often limited to answering students' questions and monitoring for incorrect conclusion. The role of the teacher is of a guide rather than dictator. As a guide to students learning, the teacher try to raise problem issues and questions that will pique the students' interest and call for further investigation, encourage students to pursue and guide them in their investigations, helping them to clarify the issues, the facts, and their own thinking and as well as to draw reasonable conclusions. For students to learn through discovery it is essential that teachers cultivate their natural curiosity, that is teachers have to be sure students have the necessary knowledge to allow discovery, appropriate materials are available, and students are interested (Bruner, 1961; Gagne, 1995; Wittrock, 1965; Suchman, 1960; cited in McCormick and Pressley, 1997: 253; Clark and Starr, 1991: 275, Callahan and Clark, 1988: 208, 238-239; Borg et al. 1970: 205). Dearden cited in Cohen (1996: 177-178) discussed mathematics as the most relevant to this method of teaching

Gagne (1990) cited in Orton (1992: 25) classified **problem-solving** as the highest form of learning and he defined it as "a process by which the learner discovers a combination of previously learned rules which can be applied to achieve a solution for a novel problem situation." problem solving can be described as the ability to solve problem. It is a way of thinking, way of analyzing situations, it is a way of using reasoning skills not learned through memorization of specific facts, but by immersing one self in problem solving process and applying both past experience and knowledge to the problem at hand.

In agreement to the above idea Newell and Simon (1972) cited in ICDR (1999: 81), and Broomes et al (1995:25) put problem solving as a process of producing or closing a perceived problem gap. It begins with a task pupils understand and willing to engage in, but for which they have no immediate solution. It is associated with developing and learning ways to tackle and solve problems. In this activity, the most important thing is that students should generate more ideas about the stated problem

for major stages of the process. Callahan and Clark, (1988: 241) state the following points as stages for problem-solving approach.

- *the learner become aware of the problem;*
- *the learner defines and delimits the problem;*
- *the learner gathers evidence that may help solve the problem;*
- *the learner forms a hypothesis of what the solution to the problem is;*
- *the learner test the hypothesis;*
- *The learner successfully solves the problem or repeats the earlier steps until the problem will be solved, or gives up.*

These stages are in agreement with the set of general strategies for problem solving recommended by the mathematician George Polya (1957) cited in McCormick and Pressley (1997: 294). These are:

1. Understanding the problem
2. Devise a plan for solving the problem
3. Carry out the plan
4. Look back

The ability to solve problems, particularly academic problems, does not seem to come naturally to most people. Excellence in problem solving is a skill that must be learned, so must be taught. If a teacher supervises students carefully at every stage of the problem-solving process, he may be able not only to help the pupils solve the problems but also to help them improve their problem-solving techniques.

Discussion method of teaching is one of the student-centered method in which group members can share their ideas, knowledge, information, attitude and perception using speaking, listening and nonverbal processes in order to achieve instructional objectives (Gall, 1987: 232; Borich, 1988: 183; Curzon, 1990: 287).

In the process of group discussion speaking, listening, observing and nonverbal processes are considered to be essential and critical attributes. This is to say that when a discussion member communicates to others in the group by speaking (utterances and intonation of voice) and by non-verbal signs, such as facial expressions, hand gestures and bodily movement the other participants receive this communications by listening and by visually attending to the non-verbal signs. This is to mean that it is a method that initiates and encourages the learners of group

members' active participants instead of being passive in the process of learning (Curzon, 1990: 287; Gall, 1987: 232-233).

The group discussion method of teaching has been highly recommended as useful and important in the teaching learning process. It has been discussed by scholars that it involves the development of multitude skills like critical thinking, independent inquiry, group participatory behavior, examining alternatives, judging solutions, making prediction, discovering generalizations, it can also genuinely involve learners in the assessment of their work and is one of the many steps towards the creation of autonomous learners (Borich, 1988: 183; Callahan and Clark, 1988: 208, 218, Gall and Gall (1976) cited in Borich, 1988: 183; Curzon, 1990: 286-287). Much evidence on the effectiveness of the group discussion method in promoting instructional objectives has been accumulated. Gall (1987: 233-240) reviewed discussions made on the effectiveness of discussion method in promoting subject matter mastery, attitude change, moral development, problem solving, and communication skills.

So group discussion method of teaching is an important and essential method that needs the teacher devoted effort in its application for his effectiveness in the teaching learning process.

Cooperation is the key to successful discussions and group work. Cooperative learning should be infused in all subjects because of the role that it plays in all of life's experiences.

Cooperative learning is a cluster of instructional strategies that involves student working collaboratively to reach common goals. It evolved in an effort to increase student participation, provide students with leadership and group decision-making experiences, under a condition that includes positive interdependence, individual accountability, face-to-face promotive interaction, appropriate use of collaborative skills and group processing (Eggen and Kauchak, 1996:121; Johnson et al., 1991: 56; Juijman, 1994: 1095).

In a similar manner Slavin (1991:21) who have done a lot on cooperative learning discussed that it is a successful teaching strategy in which small groups, each with students of different levels of ability, use a variety of learning activities to

improve their understanding of a subject matter. Each member of a team is responsible for not only learning what is taught but also for helping teammates learn, thus creating an atmosphere of achievement.

Scholars have discussed more on the usefulness and effectiveness of cooperative learning as an instructional method. In addition, they reasoned out how it is effective and useful.

- Cooperative learning is by its nature an active method, which upgrade the idea that students learn more by doing, something active than by simply watching and listening. Moreover, it enhances learning in several ways. That means weak students working individually are likely to give up when they get stuck; working cooperatively, they keep going. In the same way strong students faced with the task of explaining and clarifying materials to weaker students often find gaps in their own understanding and fill them in .
- Relative to students taught traditionally, that is teacher-centered teaching, individual assignments, and competitive grading, cooperatively taught students tend to exhibit higher academic achievement, better higher level reasoning and critical thinking skills, deeper understanding of learned materials, more on task and less disruptive behavior in class, lower level of anxiety and stress, greater intrinsic motivation to learn and to achieve, greater ability to view situations from others' perspectives, more positive and supportive relationships with peers, more positive attitudes towards subject areas, and higher self-esteem(Johnson et.al., 1991:65; Mckeachie, 1996 cited Slavin, 1994:3).
- It increases students' participation and provides students with leadership and group decision-making experience (Eggen and Kauchak, 1996:231).
- It is in cooperative work that children get experience with and develop skills and become more conscious of what others in their group are doing and will plan their own.
- It creates a democratic citizenship that developed the habit of working cooperatively.

Research done on cooperative learning have supported the above listed ideas.

Juijman (1994: 1097-1098) have reviewed research done on cooperative learning and the result supports the usefulness of cooperative learning for improving student achievement at a variety of grade levels and in many subjects, intergroup relationships, relationships between mainstreamed and normal-progress students and student self-esteem, cooperative learning was more effective than the traditional forms of instruction using productivity as an out come measure, produced higher levels of interpersonal attraction than individualistic approach, it produced higher level of thinking skills, interest in subject matter, likelihood of attending class, ability to diagnose own knowledge of subject matter and general class moral.

According to (Davidson, 1995; Bassarear and Davidson, 1992; Davidson and Kroll, 1991) cited in McCormick and Pressely (1997: 301-302) even though cooperative learning is used for many content areas it is especially appropriate for mathematics education, since contemporary mathematics educators emphasize social collaboration in problem solving and many studies have demonstrated that students become better problem solvers that cooperatively interacting to solve problems can be a transformative experience for many students, with advantages that include:

1. *Students come to value the process of problem solving rather than production of a correct answer;*
2. *Mathematics anxiety is reduced when students work in cooperative group;*
3. *Cooperative instruction permits more challenging and less conventional problems to be presented to students;*
4. *Cooperation fosters students' explanations and re explanations to one another;*
5. *The discussions bring to light misconceptions, which can sometimes be resolved via discussion;*
6. *Students make connection to other knowledge as they discuss a problem, with different students offering varying insights about how the mathematics being learned connected to the world;*
7. *Multiple representations of problem situations are offered in discussion, which is very important, since good mathematicians and problem solvers realize that any situation can be represented in a variety of ways (McCormick and Pressely 1997:301-302).*

Although students take the role of learning and teaching, the teacher is one of the most important one who play the greatest role to make cooperative learning effective. So according to Eggen and Kauchak (1996: 157), the teacher often use

whole-group instruction to introduce and explain basic concepts and skills, he remains in the classroom moving from team to team, facilitates and monitors group progress. Rather than functioning as all expert dispenser of information, as in the lecture format, he is in a more collegial role, structuring the learning environment so that students are more interactive with one another and with the teacher. His beings with the organization of groups, providing the groups where they can work together, continue with building a sense of teamwork.

2.5 Home Work and Assignment

As learning is an active process that learners should actively participate in it. That means students need to be provided with opportunities to learn. Of these opportunities homework and assignments plays the greatest role by giving the learner a sense of responsibility and achievement. Davies (1981: 328-333), Capel et al.(1995: 239),McCormic and Pressley(1997: 244) discussed on homework as an out-of-class assignment and independent study. It has been considered as a way of life and fact of life for most students, which has a valuable and important role to play in enhancing learning

These scholars also discussed and commented that home works should not be assigned to make students busy, or it should not be assigned for students to read through a chapter to night and will be given a quick test on it the next day. Rather it should be assigned as an integral part of the course, which is non-optional. It should be assigned to have satisfying experiences, worthwhile and relevant to the needs of the learner. It should be assigned to extend and revise the amount of work, which can be covered in class, and to allow the application of lessons learned in class to the solution of problems arising from new situation (Davis, 1981: 331; Curzon, 1990: 252; Capel, et.al, 1995: 239).

Davies further discussed on the purpose of homework and assignments that it gives students an opportunity to; practice skills, as well as increase speed and accuracy; read, absorb, and summarize what they have learned; accept responsibility and be accountable for their actions; act in an honest and persevering manner; manage time effectively; to develop confidence in their own ability. He also expressed

that homework and assignment can range in identifying problems, diagnosing problems, solving problems, evaluating solutions, writing reports, performing tasks, performing roles, reviewing literature and procedures (Davis, 1981:328-333). If homework and assignments are to be successful, it must be carefully planned, organized and should be a necessary part of the course, clearly assigned with clear instructions for their completion, definite and limited in scope, limited in length, with a definite time limit for its completion (Davis, 1981: 330; Clark and Starr, 1991: 320-321).

It is also emphasized that homework and assignment should be corrected, checked by the teacher in the manner understood by the students and should be handed back as soon as possible. This may help to avoid the opportunity that unchecked written homework and assignment may serve only to grind erroneous techniques and incorrect concepts into students mind. The other way round recognition of good homework serves to stimulate students' self-esteem, interest, and effort (Clark and Starr, 1991: 321-322; Davis, 1981: 329; Curzon, 1990: 252). It is also commented that unless used or graded and feedback is given soon after completion, homework should not be assigned.

According to Coulter(1987: 273-274) a study made by International Association for the evaluation of Educational Achievement (IEA) in 20 countries showed that homework has relationship in school achievement. In seven subject areas, across a number of different age levels, the study indicated positive relationships between time spent on homework and school achievement in certain subjects, the strongest relationship being for mathematics and science. Another study made by IEA cited in Bennett and McNamara (1979: 220) found moderate positive relationship between homework and mathematics achievement. Coulter (1987: 276) tried to summarize studies made on homework. Apart from studies, which surveyed attitudes of parents, teachers, and students toward homework, concluded that homework achievement is one of the larger numbers of factors that is related to school achievement.

Stevenson and Baker (1987) cited in McCormick and Pressley (1997: 244) summarized research done on homework and reached the following conclusions.

- *Doing homework promotes learning.*

- *The positive effect of homework increased from the upper elementary to high school years.*
- *The effect of homework on mathematics, reading, and English are greater than on social studies and science achievement.*
- *High school students are more benefited from homework.*
- *Homework also elicits parental involvement in school, a fact that promotes academic achievement.*

Discussion made by Clark and Starr (1991: 319- 321) also shows that properly conducted homework activities can make schooling more effective and it tends to increase time on task. As to Clark and Starr in a mathematics research studies it is indicated that boys and girls who are required to do homework do better on tests than those who are not so required. They also concluded that unless and otherwise homework is properly conducted it can be a waste of time and can retard learning.

2.6 Instructional Materials

For any teaching learning process to be meaningful and effective the application and utilization of instructional materials plays a great role. Instructional materials are those materials that are used by the teacher and the learners including the media used for the teaching learning process. Instructional materials are all materials that relate to all forms of materials with which students and teachers interact for the purpose of teaching and learning (Amare, 1999: 53). Supporting this idea Nkuuhe (1995) cited in Akalu (2001: 34) said that instructional materials are all devices and materials used in the teaching and learning process.

Romiszowski cited in Nkuuhe (1995: 224) considered electronic communication media devices such as slides, photographs, teacher-made diagrams, charts, real objects, handouts and textbooks that we used in the process of planned instruction as instructional materials.

Therefore, all the materials that the teachers and students are using like student textbooks, teachers guide, syllabus, any instructional aid, the instructional media that is under use, any materials in the school pedagogical center, materials in

a department and reference books in the library are considered to be instructional materials.

2.6.1. The Contribution of Instructional Material for the Teaching and Learning of Mathematics

Instructional materials have a great contribution and will have an influence on the teaching learning process by providing the teacher with tools to engage students powerfully in the teaching learning process and will bring about quality education. Supporting this idea scholars have discussed a lot on the contribution of instructional materials on the teaching learning process. Among them are (Heinich et al., 1989: 24; Callahan and Clark, 1988: 412; Clark and Starr, 1986:231) who discussed that instructional materials serves as a catalyst to change in the whole instructional environment, used to facilitate and help for intellectual development. It can help to provide a learning atmosphere in which students can actively participate in the teaching learning process. Instructional materials can reduce verbalism, increase student involvement and interest and also it enable the teacher to use time effectively and efficiently to attain the intended objectives. Most of them agree that instructional materials can increase interest, comprehension, retention and correctness of the learning process. Amare (1999: 54) discussed that instructional materials can provide the learner with many experiences such as doing, drawing, reading, observing, sketching, computing, discussing and speaking.

There is a conception, which is developed in most students that mathematics is a difficult subject to understand and is impossible to achieve it well. Because of this and some other reasons teachers face problems in teaching mathematics. That is most of their students are not successful in their result and unable to apply mathematics in their daily life. A lot of reasons may have been raised and may be raised. Most importantly the nature of the subject may take the line share. That is mathematics by its nature is an abstract science that may take much time and great effort to make the abstract idea to be concrete. For the purpose of concretizing its abstract nature mathematics needs an effective application and utilization of instructional materials.

Larcombe (1985:42) noted how instructional materials support mathematics learning at all stages in concept formation. Scholars like Hiebert and Carpenter (1992: 72), Clements and Battista (1992: 494) discussed that instructional materials provide a public representation to which attention can be drawn and a focus for discussion. Because the materials are public all the students in the class can share them. And students perceive the same mathematical features. Communication among the students and teacher is enhanced because all the participants can focus their attention on the same entities and relationships between entities. Concrete materials by providing a comparatively clear target, thus make such shared discussion possible.

Clements and Battista also discussed that the use of instructional materials seemed to allow students to try out their ideas, examine and reflect on them. That is by interacting with the materials and with others about those materials students are likely to construct relationships that the teacher intends.

According to MOE (1991) cited in Akalu (2001: 36) instructional materials can promote the quality of teaching and help the learner to acquire behavioral change that is cognitive, conviction, and practice. Scholars discussed many contributions of instructional materials to the teaching learning process as cited in Akalu (Williams, 1963; Clements and Battista, 1992; Kieran, 1992). Among the contributions are; promote the quality of teaching; make computation tasks on practical value; broaden the base of students understanding; give students an immediate, intuitive grasp of certain geometric ideas; give feedback; help to initial introduction of mathematical concepts; help to increase special visualization ability; facilitate the construction of sound representation of geometric concepts; encourage the use of more senses; allow students to try out their ideas, examine and reflect on them; maintain students interest; assist students in creating definition and new conjectures.

According to Clement and Battista (1992: 448) students use a diagram to interpret a theorem; they must alter the corresponding mental image by distinguishing its essential aspects during the abstraction process. The image becomes a guide for thinking about and applying the theorem. Kabanova- Meller cited in Clement and Battista (1992:448) stated that mastery of geometric theorem is characteristically

accomplished through the perception of diagrams and is intimately connected with the development of spatial images.

Research done by different researchers reviewed by Clement and Battista (1992: 443-449) confirm that the use of instructional materials can facilitate the construction of sound representation of geometric concepts. The reports of the research were; positive correlations have been found between spatial ability and mathematics achievement at all grade levels; exposure to a greater variety of stimuli positively affects achievements in geometry; manipulating geometric solids helps learn geometric concepts.

Lockheed, et.al. (1991:49-51) also reviewed some studies made on the contribution of IMs in Nicaragua, Philippines, and Brazil students in class randomly assigned to receive textbooks-scored significantly higher on tests of mathematics achievement.

All these show that the utilization of instructional materials can greatly affect the teaching learning process of any subject in general and mathematics in particular. Although they have such great effect and influence, most of the time teachers are unable to use instructional materials effectively. Among the many reasons may be because of the source of these materials. Clark and Starr (1986:420) discussed on the source of instructional materials and said that materials for learning could be found almost every-where. There are local, states, national and international sources of free and inexpensive materials. Heinich et.al.(1999: 107), recommended that school pedagogical centers (SPC) and school library are the main sources of instructional materials. Teachers, students and SPC coordinators can be sources of instructional materials. They can prepare multimedia instructional materials. They can produce drawings, charts, graphs, tables, and models and can communicate effectively using these graphic media (Heinich, et.al 1989: 86; Clark and Starr, 1986: 420).

Hienich et.al. (1989: 43) commented that SPC are the main sources of available instructional materials. They are also places to find and produce instructional materials at different levels. These centers support teachers and students in the preparation of instructional materials and prepare materials based on

lesson content. According to Hienich, et.al. the school library is also another source of print material.

2.7 Student Teacher Interaction during Mathematics Instruction

For the teaching learning process to be effective the interaction between the learners and the teacher/the relationship between them/ is an important factor that have to be considered and have to get attention. The effect of classroom interaction on learning has long been a concern to educators. Walter, et.al (1970: 201) classroom interaction what they call it verbal interaction is a critical variable in pupils learning. There are researchers Amidon and Hunter (1967) cited in Walter, et.al. (1970: 211) who defined teaching primarily in terms of verbal interaction between the teacher and the learner. Clark and Starr (1986: 199, 1991: 211) shows that pupils learn more and remember more as they involve themselves more in saying or in verbal interaction and doing that is in practicing by them selves. That is for an effective or better teaching to happen the teacher and student interaction has a greater value.

There are also researches that are looking teaching from the point of view of teacher student interaction. For learning to takes place, there must be interaction between the teacher and student. These interactions can be verbal or non-verbal (Medley, 1982; Bellack, et.al, 1966; and Boydell, 1979) cited in Mccaal(1994: 13).

Flander (1970:31-34) classifies verbal interaction as either being direct or indirect. And he discussed that direct teacher talk limits student's participation, whilst indirect talk encourages student involvement in learning. It is his suggestion that a more equal balance of direct to indirect talk in the classroom improves learning. In the same way Beaumont (1984) cited in Mccaal (1994:17) found that students attained higher scores in basic mathematics and reading when student initiated talk was intense rather than limited. In support to this Pandly (1981) cited (Ibid) in his research on teaching behavior in science classrooms concluded that accepting pupil's idea and giving praise, had a significant positive correlation with concept attainment. He also found that questioning and encouraging pupils' response aided pupils' learning.

Good relationship between teachers and students are vitally important in the give and take of classroom life, where they exist there is less likelihood of difficulties arising (Cohen et al. 1996: 350). As to Evans cited in Cohen et al. (Ibid) pointed out "Teacher-pupil relations" is fairly a general term and, it covers such ideas as the influence of teachers on the immediate behavior of their student that is on their intellectual and social development, the contribution which teachers make to the mental health and adjustment of students, the students' like and dislikes with regard to their teacher and the effects on the teachers daily contact with their students.

At the heart of effective teacher-student interaction or relationship lies respect and giving due consideration for the students as important and valuable persons. Daweny cited in Cohen et al. (1996: 350) discussed the respect for the students involves treating them as individuals, recognizing and valuing their singular characteristics', helping them in developing the kind of self-concept that allow them to regard themselves as of value.

There are many factors contributing to effective teacher-student relationships. According to Kutnick cited in Cohen et al (1996:350) effective relationships do not just happen. Teachers must plan for particular relationships. Non-verbal immediacy behavior is among the factors and research on immediacy suggests that they can be a positive force in the classroom, particularly in bringing about better teacher-pupil relationships.

Cohen also suggested the importance of the method of teaching, which can establish good relationship between teachers and students. In this respect he stressed the importance of cooperative learning. Kutnick cited in Cohen (1996:352) has shown for cooperative learning to promote more effective mixed ability teaching, inter-racial friendship, and sensitivity between pupils, helping, the integration of handicapped children, and more. And he considered that cooperative learning should become a dominant teaching technique because of the social and emotional development that ensure.

In any way round to create such a good and effective relationship it is the teacher to find himself as effective and creative toward his teaching and his students. It is only then that he creates a good interaction between him and his students.

There are also scholars who have related the interaction of teachers and students with communication. And they discussed that effective communication is one aspect of classroom management that can affect the relationship between the teacher and students. Constructive assertiveness and empathic responding are considered to be the two vital communication skills. An effective communication skill not only adds meaning to the teaching session but also minimizes boredom, which can be achieved through variations in the style of communication such as change in voice, selective use of stress, gesture humor and movement Darge in Matiru(1995: 99-100),(Emmer et.al.,1994; Everston etal. 1994) cited in McCormick and Pressley (1999: 258).Darge also said that a teacher can capture and hold the attention of his student and create a good relationship if he can present the instructional materials in a vivid, novel, and unusual way or create instructional situations that involve manipulations and exploration of objects.

According to Clark and Starr (1986: 199; 1991:212) with out an optimum amount of student-student and teacher-student interaction classes tend to become stifling. That means there should be a balancing teacher-student participation in the teaching learning process. Although interaction is determined by objectives and design of a lesson plan and other factors, Clark and Starr listed criteria's that apply to most lessons in general, for which there is a balanced interaction between the teacher and the student.

- *Students should be actively participating at least half of the time.*
- *As far as possible, every student should participate in some way.*
- *Either teacher or students should give to thoughtful, creative activity rather than to mere recitation of information a good share of the class time.*

CHAPTER THREE

METHODS OF THE STUDY

3.1. Methodological Approach

Qualitative method of study is an inquiry process of understanding social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting (Wester, 1991; Goez and Lecomte, 1991) cited in Desalegn (2000:112-113). It means that qualitative method of research places emphasis on understanding through looking closely at people's words, actions and records. It examines the pattern of meaning, which emerges from the data that are often presented in the participants' own words. Its task is to find patterns within those words and actions and to present those patterns for other to inspect while at the same time staying as close to the construction of the world as the participants originally experienced it.

Denzin and Lincoln (1994: 2) discuss qualitative research as:

Qualitative research is multi-method in focus, involving an interpretative, naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meaning people bring to them.

This study, therefore, uses qualitative method of research. This is because to investigate issue in education, which is human endeavor, using a qualitative approach is appropriate. The approach helps the researcher to study the teaching learning process of mathematics in the school under the study in its natural setting attempting to make sense of or interpret phenomena in terms of the meaning people bring to them. Supporting this idea, Lecompte and Pressle (1993:24) stated that qualitative research can be employed in educational research when the concern is with people, because controlling and manipulating activities of human beings are some how

difficult. Bogdan and Biklen, (1992) in Amera (2004:28) also stated that using the natural setting of humans as the direct source of data, which is primarily characteristics of qualitative research, is recommended in educational research.

3.2 Design of the Study

A case study design has been used for this study. Since the present study investigates closely issues related to the teaching and learning process of mathematics in Yekatit-25/67 Secondary School of Hadiya Zone in SNNPRS, a qualitative case study design is appropriate. In a case study, a researcher makes a detailed exploration about a single case rather than making general explanations about a population. In support to this, Wiersman(1995:213-214) noted that a qualitative case study has focused to research on a few cases and many variables. In other words, it takes few research settings and makes detail explorations around and in the research settings. Yin (2003:13-14) also stated case study as an empirical inquiry that can be utilized to investigate a contemporary phenomenon within its real-life context. He also explained the case study inquiry that copes with the technically distinctive situation in which there will be many more variables of interest as one result relies on multiple sources of evidence with data needing to converge in a triangulating fashion. This means that the case study as a research strategy comprises an all-encompassing method covering the logic of design, data collection technique, and specific approach to data analysis.

Gomm et.al (2000:3) stated that the case of case study might be an individual, an event, an institution or even a whole national society. According to Gomm and his associates, usually, case study refers to research that investigates a few cases, often just one in a considerable depth.

This study, therefore, considered one research setting, Yekatit 25/67 secondary school, 4 informant Mathematics teachers and 24 students for FGD who are able to give detail explanations about the school's teaching learning process of mathematics, and various issues that help to explore the problem in detail. The investigation was carried out with an extensive review of the literature and preparation

of the proposal, which was necessary to develop a conceptual framework, data collection instruments, and strategies of the investigation. Preliminary assessment that was a contact with different important peoples in the school took place. Moreover, I made informal observation, interview and document assessment in the school to get general information and develop appropriate data collection procedures for the investigation. Based on the information obtained, the study identified the information rich informants in the school. After the collected data has been studied, organized, and categorized the data analysis have been conducted.

3.3. Data Collection Techniques

Educators have discussed on the necessity of multiple methods of data collection. This is because by selecting complementary methods, a researcher can cover the weakness of one method with the strength of another. It is also recommended that good qualitative case study will often include multiple methods of data collection, and advised that no single source has a complete advantage over all the others. Documentation, in-depth interview, observations, FGD, have been stated as key ways of collecting qualitative case study data (Yin, 2003: 83-96; Best and Khan, 1993:198-203; Merriam, 1988:85).

Therefore data for this study have been gathered through observation, interview, FGD, and document analysis.

3.3.1 Interview

In qualitative case studies, interviewing is a major source of data needed for understanding the phenomenon under study (Merriam, 1988:86). It is defined that an interview is a kind of conversation; a conversation with purpose. And a researcher interview is an interpersonal situation, a conversation between two partners about an issue (Robson, 1993:227; Kvale, 1996 cited in Cherinet, 1999:37). This is to mean that interview is a specific form of human interaction in which common understanding evolves through dialogue. In explaining the importance of using an interview, Robson (1993:228) stated that:

Interview carried out for research or inquiry purposes are very commonly used approach, possibly in part because the interview appears to be a quite straightforward and non-problematic way of finding things out. That is an interview situation is a situation where one-person talks and another listens. The situation that provides to the interviewee the opportunity to describe his/her ideas and to give more emphasis on what he/she thinks important.

Best and Khan (1993:199), Fraenkel and Wallen (1993:385), 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 can not directly find out through observation and through any other means unless we interview people.

To this end, interview was found to be an appropriate method in order to get detailed information from the informants about the over all process of the teaching and learning of mathematics in Yekatit 25/67 secondary school. Detailed interview was conducted with four key informative teachers, because key informants are critical to the success of a case study. With the consent of the informants the interview has been audio recorded. This helped the researcher to minimize loses of information during the interview process. Each tape used in recording the interview was labeled with the date and time of the interview, and the code of the interviewee.

3.3.2 Focus Group Discussion (FGD)

Making a discussion among individuals more than two may provoke individuals mind to generate ideas and to make an exhaustive argument among each other. Therefore, in addition to the interview, FGD among members of the small group made up of perhaps six to ten individuals have been considered as a good instrument to obtain helpful information (Wellington, 1996:59-69).

The reason why the study utilized FGD is to obtain stronger, well-discussed and useful information which can increase the reliability of the study. Moreover, FGD helps to understand issue with agreement and variation among the member of the

discussion. To this end, based on their classroom participation and their good background on the subject, three groups of students have been identified to conduct the FGD. Each group contains 8 informative pupils who are assumed to have adequate information on the teaching- learning process of mathematics in the school. The FGD are FGD₁₀ from grade 10 students, FGD_{9P} from grade 9 plasma (TV I) section students, and FGD_{9NP} from grade 9 non-plasma section students. Since there are two types of classes in grade 9, those sections in which plasma television is practical and other sections in which plasma television is not practical were taught by their classroom teachers. The process of the discussion was supported by tape recording with the permission of the respondents in order to minimize loss of information by the discussants during the discussion process. Each tape used in recording the discussion was labeled with the date, time of the discussion and the code of group discussants.

3.3.3 Observation

Yin (2003:92) discussed that observational evidence is often useful in providing information about a topic being studied. He also noted that some relevant behaviors or environmental conditions would be available for observation that can serve as a source of evidence in a case study. Merriam (1988:102) also confirmed that observation is a major means of collecting data in case study research. This means it gives a first-hand account of the situation under study; when combined with interviewing and document analysis, it allows for a holistic interpretation of the phenomenon being investigated. Wamahiu and Karugu (1995:124) label observation, as a more appropriate method in qualitative case study because the researcher's sense organs are the key instrument to collect data.

Hence, I used observation as data collection instrument in the study in addition to interview and FGD. Classroom observations have been conducted in 12-different sections; 4-sections from grade 10, 4-sections from grade 9 plasma sections, and 4 sections from grade 9 non-plasma sections with primary permission of the school director and the classroom individual teachers. It has been done for five periods for each section. Unstructured observations have been conducted by taking

note on what has been going on in the class. That means, during the observation, I recorded what was going on in the classes as a report.

With the intention of getting additional information on the teaching- learning process of mathematics, informal observation was used. This includes students' - teachers' relationship outside the classroom, teachers' discussion in the staff room, and students' activity outside the classroom. From all what have been observed, those which seem relevant to the study have been recorded.

3.3.4 Document Source

Best and Khan (1993:191-193), Yin (2003:85), discussed that document analysis are important and relevant sources of qualitative case studies. That means document sources could serve a useful purpose in yielding information that is helpful in explaining social or educational practices.

Therefore, to collect information about the number of teachers and their total teaching load, the total number of students, number of students' textbook ratio and the availability of other curricular materials, the kind and number of instructional materials in the SPC and how it is utilized, and reference books in the library in addition to document source demographic information and inventory have been conducted.

3.4. Selection of Research Setting

Among the six secondary schools which are found in Hadiya Zone, this study has focused on Yekatit-25/67 secondary school. Of these secondary schools, the selection of Yekatit 25/67 as a research setting is justifiable at least due to the following reasons.

1. It is the oldest and historical school in the Zone which has started to teach as an elementary school then grown to secondary school and again come to a level of elementary school and again upgraded to a secondary school (Yekatit 25/67 Senior secondary School yearly bulletin, 1997:5-7).



2. As to the best knowledge of the researcher, no research has been done on it although it is the oldest and historical school
3. Because the researcher had 7- years of teaching mathematics in the school, that helped him to have better past exposure, better access to different information and better knowledge about the selected school than other schools in the Zone. This helps to improve the quality of the study, which is a qualitative case study of its nature. Because in qualitative case studies, the involvement of the researcher is very active and essential as an insider (Merriam, 1988; Burgess 1985; Bogdan and Biklen, 1990 cited in Amara, 2004:33).

As it is mentioned the research setting of the present study is Yekatit 25/67 Secondary School. The school is found in Hossana Town, the center for Hadiya Zone. Hadiya Zone is one of the zones found in the SNNPRs and is divided into 7 woredas called: Lemo, Sorro, Badewacho, Konteb, Gibie, Duna and Shashogo. It has a population of 1,050,151 of which 299,166 are in Lemo the Woreda which the school under study is found (according to 1994 E.C Census). Hossana is about 232kms from the capital of the country. There are different governmental and non-governmental organizations in Hossana. Among these are the Hossana teachers training college, the Hossana technical and vocational training college, the two different secondary schools Wachamo Secondary and Preparatory School and Yekatit 25/67 Secondary School.

In Hadiya Zone, there are six secondary schools: two in Lemo Woreda Hossana -Yekatit 25/67 Secondary School and Wachamo Secondary and Preparatory School, one at Badewacho- Shonie Secondary and Preparatory School, one at Sorro-Gimbichu- Gimbichu Secondary School, one at Konteb- Morsito Secondary School, and the newly opened school with only grade 9 at present is at Shashogo - Shashogo Secondary school. The total number of secondary school students in the zone is about 21,235 of which 5632 are in Yekatit 25/67 Secondary School.

The main focus of the present study, Yekatit 25/67 Secondary School, has its own historical development. According to the information on the yearly bulletin of Yekatit 25/67 Senior Secondary School (1997: 5-7) the school was established nearly

six decades ago. Its historical foundation is laid up on Church School with 50 students at the shadow of trees at Hosanna St.Mary Church. The school started its formal function in 1934E.C. using 260 students. At first, the name of the school was "English School" and after a year changed to "Hosanna School". During the years 1934_1943E.C. the school used three different places. Considering the problem of the school and an increase in the number of population of students, the ministry of education has built a new building that costs 47,386.50 Birr on 62,500 square meters of land bought with 10,000 Birr from the land owner where the present secondary school is found. And start its function in 1944E.C. the same year when the school starts to teach grade 7. In 1945E.C the name of the school changed to "Ras Abate Boyalew" and students sat for grade 8 national examinations for the first time.

During the years 1953_1956E.C.the number of students become increasing and 125 students were forced to seat in a class. This in turn initiated the community as a whole to build extra buildings. As a result the school grown to Secondary School by opening grade 9 in 1957E.C. and grade 10_12through the years 1958_1960E.C.It was in 1960E.C.for the first time that students sat for ESLCE.

Because of the increase in the number of students and scarcity of classrooms a new secondary school, the former "Lije Abebe W/Semayat" and the present Wachamo Secondary and preparatory school was built in the years 1962-1963 E.C. and start to function in the year 1964 E.C. So all students from grade 7-12 of "Ras Abate Boyalew" School were transferred to the new school with all its laboratory, library and any other junior and secondary school materials, and then the school comes to the level of elementary school. As the school was serving as an elementary and then junior school during the years 1964-1969 E.C, to commemorate the proclamation that made extra land to the masses, the name of the school is changed to "Yekatit 25/67 School" by a letter written on Nehassie 14/1969 E.C.

After this the increase in junior Secondary Schools in Hossana and the surrounding and an increase in the area of the town forced to open another secondary school. So in 1985 E.C. again Yekatite 25/67 school become secondary school starting with grade 9 by 245 male and 113 female totally 358 students. Then the school served from grade 1-12 in 1985-1987, grade 5-12 in 1988, grade 7-12 in

1989, grade 8-12 in 1990, grade 9-12 in 1991-1993, and from 1994 still now it is serving as secondary school teaching students from grade 9-10 (all the years are in Ethiopian calendar).

According to the director's office of the school, today the school has 81 academic teacher 78-male and 3- females and 17 administrative workers including 5-guards. In the academic year the school has registered totally 5632 of which 2430 are grade 10 and 3202 are grade 9 students. All these students have been assigned in 63 sections, 27 sections for grade 10 and 36 sections for grade 9. The teaching learning is conducted in two different shifts, the morning and the afternoon. In both shifts both grade students are learning, 31 sections in one shift and 32 sections in the other shift. The number of students in one section is more than 90.

The school has 32 teaching classes in 6 different types of blocks, some of them are newly constructed and good in appearance and some others are very old and damaged and can not be used as teaching classes. For example, the new blocks are built using blocks, with good floor made of bricks, having good ceiling and good windows made of glass, the benches and tables and the blackboard are convenient. On the other hand, there are blocks that were constructed 50 years ago in 1941 E.C. Other blocks are built using wood and mūd with floors full of dust, windows made of wood which do not allow light to inter well and blackboards are very small and rough and the seats are poorly made. And also there is a building that is cracked and almost students are in danger that it may fall down on them. It has also 5 administrative offices, one store house, one-pedagogical center, one ICT center, one laboratory room, one teachers staff and one-library that can accommodate about 280-300 students at a time.

The school is situated almost at the center of Hosanna town very near the Hosanna bus station and along a roadside to Gimbichu one of the Woreda in Hadiya Zone and a road to the Hosanna Hospital. Its teaching learning activity is easily disturbed by the sound coming from the bus station and from the road sides and great bulk of dust moved by the cars on the way to Gimbichu and the Hosanna Hospital, especially three of the blocks is just attached to the road. And also the school is constructing two additional blocks of eight classes and is fence. The school has no

fence before except using wire and "*qoshim*". The fence is under construction starting from 2004 planned to be completed within 5 years. However about 40% have been completed at the time of the researcher presence in the area for data collection (Director Office of the school).

3.5. Selection of key Informants

As cited in Amara (2004:33) Tshome (1998) explained the term "selection," as to locate information rich sources of data rather than to seek a representative portion that possesses the qualities of the whole works well for the purpose of this study. Therefore, selecting appropriate information rich persons in the school has been accomplished through purposive strategy. Dooley (1993:136) stated that in purposive selection researchers choose informants because of certain characteristics. Cohen and Manion (1989:103) also expressed in purposive selection the researcher handpick the cases to be included in his study on the basis of his judgment. Because of their long years of teaching experience in the school, their better qualification, their interest to participate in the interview, and my previous contact with them, four informants' teachers among the 12- mathematics teachers in the school were selected for the interview. The other 8-teachers were selected for classroom observation.

The FGD have been conducted with three different groups of students. Students who can give rich information about the issue under study have been selected. That is their mathematics teachers selected students who can express themselves well and have good mathematics background. For each group 8-students from 8- sections of grade 10, grade 9-plasma sections and grade 9 non-plasma sections one student from the eight sections were selected.

3.6. Access and Procedure

After the review the literature and proposal of the study were done, the researcher went to the target school, Hosanna, with letter of cooperation from AAU,

department of Curriculum and Instruction. The researcher first contacted the director of the school to get a permission to conduct this study within the school. After getting permission, the researcher introduced himself and the reason why there to the members of the school especially for the members of the mathematics department. So that through selective interviews, critical observation, and the informal talk with teachers, directors, and unit leaders, the information-rich people were identified. In order to get introductory information that helped to adjust the interview items, the data collection instruments, I discussed with two of mathematics teachers and conducted class observations for a week at different sections. After the preliminary discussion and observation has been completed, I have revised the interview items and observation procedures. And then 4 information rich teachers from the mathematics department and 24 students, 8 from grade 10, 8 from grade 9 plasma sections and 8 from non-plasma sections were selected with help of their teachers. Sections for observation were selected based on the convenience of their timetable.

First the observation was conducted based on what is generally going on in the classroom; and I recorded what is going on in the classroom-using notebook. Each section has been observed 5 times periods in different days.

After the observation has been done the next step was conducting an interview with each selected informant. In the entire interview tape-recorder was utilized. In order to avoid language barriers and to have common understanding and for the informants to express their feelings and ideas freely Amharic language was used as a communication language. After the interview had been finalized FGD was conducted. Again Amaharic language was used and tape recorder was utilized to record all the discussion. In the interview as well as in the FGD tape-recorder were used with the consent of individual and group informants.

All the informants who participated in the interviews as well as in the FGD were not willing in mentioning their names in the discussion of the study. So the present study has utilized a coding system of naming throughout its discussion in the next chapter.

3.7. Organization of Data

3.7.1. Recording of Data

Logbook (Notebook)

What has been observed during observation time was recorded using logbook. Some background information, the grade and section, the time and date of each interview were also noted in the notebook. Any information from document in the SPC, the director's office and the library, demographic data was recorded. Finally what have been observed in different days has been summarized according the observed sections and observed teacher.

Tape Recording

The interviews and FGD were all recorded using a tape recorder. Each tape used in recording was labeled with the date and time of the interview and discussion with code of the informants.

3.7.2. Transcription and Translation of Interview and FGD

Transcription

All the recorded interviews and FGD were transcribed by the researcher word by word in Amharic and noted on a notebook which is labeled by date, time, place and code of the informants corresponding to each tape transcribed.

Translation

Data obtained through interview and FGD were translated from Amharic to English and written down in another notebook that was labeled in the same way as the notebook for transcription. The translation is done by the researcher with the help of another 2nd year masters student in the department of Curriculum and Instruction who was there for data collection for his master's thesis and a teacher at Wachamo Secondary School at Hosanna.

3.8. Data Analysis

Based on the research questions thematic contents were formulated in the discussion and presentation of data. Qualitative data analysis is a complex process that involves moving back and forth between concrete bits of data and abstract concepts, between inductive and deductive reasoning, between description and interpretation (Merriam, 1988 cited in Amera 2004: 42). Bogdan and Biklen cited (Ibid) have also shown that data analysis in qualitative studies basically involved in words argumentation than numerical explanation. Best and Khan (1993: 203) explained the qualitative data analysis as:

Once the data have been organized, the researcher can move to the stage in data analysis, description. The researcher describes the various pertinent aspects of the study including the setting both temporary and physically; the individual being studied; the purpose of any activities examined, the view points of participants; and the effects of any activities on the participants.

Therefore the data drawn from interviews, observation, FGD, document source, after it has been studied carefully and repeatedly, which was done by referring the notebook and tape-recorder cassettes have been discussed and presented in chapter four.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF THE FINDINGS

Factors that are related to the teaching and learning process of mathematics at Yekatit 25/67 secondary school have been treated. The discussion is made item by item based on the research questions.

4.1. Classroom Organization

Classroom organization is one of the variables to be considered in the process of teaching and learning at school. Under this issue the physical set up of the school includes: the buildings, the classrooms and furniture in the classes like the seats and tables and the black boards.

From the classroom observation and an informal discussion with teachers in the staff the buildings in the school under study can be grouped in to six types. Some of them are newly constructed with blocks having good floor made of bricks, good roof well ceiled, and have windows made of glass in which light can easily enter the room. The seats and tables in the rooms of such buildings are relatively better than others. On the other hand, there are some buildings, which were built 50 years ago when the school was serving as an elementary school. Some are made of stones and others with wood and mud. In such buildings some of the classrooms are very small; windows are made of wood in which light can not enter well. As a result, students are facing problem of reading what is written on the blackboard. In addition, the floors in some of the classes are dirty (full of dust), in all the classes the seating arrangement is too crowded for teachers to move around the classes and to look and check their students work. Although there are a large number of students the seating arrangement for those newly constructed sections is relatively better than the old one. A teacher in an informal discussion astonishingly said that, *"I fear that one of the buildings one day may collapse on students because they are very old and have cracks"*. Moreover, those rooms in one building are very dark because the windows are made of wood that do not let light enter easily. Another teacher when he express

as how much the seats are too crowded said that, "when we give tests we never collect papers by moving around. Instead we simply stand in front and tell students to pass it forward".

The teacher informant T₃ explained the classroom condition as follows:

Because of the large number of students in the school all the classes are very crowded with large class size 90 or more in a class for which students sit in 3s and 4s on a bench. Because the windows are made of wood that do not let light go through easily, some of the classes are dark, the classrooms are dirty and suffocated, and blackboards are small and rough. All these conditions are not suitable for the teaching and learning of mathematics that forced us to take teaching as a burden that we carry it out with little interest and pain rather than love and enjoy our profession.

In the FGD_{9P} students discussed that:

The classroom condition is very difficult for us to learn, it is not convenient, and there are large numbers of students more than 90 to 105 in a class. The rooms are dusty and full of dirt. Since the school is near to the main road to a Woreda and to the Hosanna Hospital the noises that come from the roadsides and the Hosanna bus station can easily disturb us while we are learning. We are forced to sit crowded in 3s and 4s, which we are not comfortable to write. There is always bad smell in the classroom as it is suffocated. Especially when we are taking tests and exams, there is great problem that students are simply copying from each other. All these conditions made teachers upset, they cannot move freely while they are teaching because students sit quite near the black board.

From the observation, interview and FGD, it can be seen that there is no favorable atmosphere in the school for the teaching learning of mathematics. Although it is good for the teachers and students to face all such problems and perform their activity, expecting a quality education upon such a condition will be difficult. Because as it has been discussed by (Cotton, 1996:121; Cushman, 1997:54; Lee and Smith, 1996:239) school size, class size, and classroom organization can affect and influence students learning and their achievement. In such classrooms both teachers and students don't feel comfortable. Therefore, it is not surprising to hear teachers are complaining that students are not working hard, they are poor at

mathematics, and they lack good background. On the contrary students are often heard to say that their mathematics teachers are not teaching them well. They complained that the teachers are not so concerned for them and their education. All these show that, although it may be very difficult to avoid it unless and otherwise there is an improvement in the classroom organization in the school it is not suitable for the teaching and learning of mathematics and it will have negative effect on what students are learning.

4.2. Teacher Related Variables

Under this sub topic I intended to discuss the following variables.

- Teachers feeling toward teaching mathematics
- Their teaching experience,
- Their qualification,
- Their teaching load.

4.2.1. Teachers' feeling Toward Teaching Mathematics

To know teachers' feeling towards teaching mathematics detailed interview was conducted with the teacher informants. Because teachers can play a great role in student learning, and the role teachers are playing also depends on the feeling they have towards the subject they are teaching.

T₁ said that:

I have been teaching mathematics for 20 years at three different schools starting at Junior School. I love my subject very much and I was very happy when I first started teaching. The value that it gave me being a mathematics teacher was very great. Sometimes even I used to say that, although I am a teacher, it is good to be a mathematics teacher (አስተማሪ ከሆንኩ እንኳንም የሂሳብ አስተማሪ ሆንኩ) . But at present my feeling and attitude towards teaching in general and mathematics in particular is very different that I am not happy and I feel no good towards teaching. It may be because I am in old age, but mostly it is from students' behavior, especially this year students' behavior and manner is not good, they became immoral and unethical. They never submit to their teachers, they never respect us, and even I think that there may have been a policy under practice which says do not punish them, it may

be because of that they are unethical and immoral. Even I cannot arrange the seat of my students while I am giving tests and exams. They think that it is their right to sit with whomever they like. And also there are students who try to beat their teachers and even there are some one who did it. At the same time the office of the directors did not took any measure up on such kinds of students. Do you think this is less for me to be negative and hate teaching?

T₂ also expressed his feeling being a mathematics teacher as:

I am teaching mathematics for 15 years in two different secondary schools. I love mathematics and happy being a mathematics teacher. I am not teaching direct memory but a subject of conceptual knowledge that can be applied to other subjects and in my daily life. However I feel no good on the present atmosphere to become a teacher of my subject, because students are weak, they are not working, I have no time to attend on their home works and assignments, and they have no good attitude towards the subject. Especially after the introduction of plasma-TV instruction, students never consider me as their teacher. As far as there is TV- they do not consider my existence and even when they came late after the class has began they never wait my permission they simply rush to the class and when I ask them why they are late their response is that does not concern you it is the TV- that is teaching us so what is your importance. I do not go further because; if I go further my customers (the students) will be disappointed, which the principle of out- come-based evaluation does not permit. So I am developing a habit of negative attitude towards my profession.

T₃ is not different from T₁ and T₂ and he said that:

I have taught mathematics for twenty-three years at four different schools starting at Junior School. It is my favorite subject I like it very much. Even though I like it and will like my subject till the end of my life, students have no interest to learn the subject. They are weak in mathematics and they fear it, and they have no good background and as a result I do not like to teach it at present. In addition, to that the heavy teaching load I am carrying out and all the large class sizes force me to develop a negative attitude and feeling towards teaching the subject. Therefore I feel that I am wasting my energy, my time and all my effort rather than teaching them.

T₄ has different feeling and attitude toward teaching the subject than the other teachers and said that,

I have taught mathematics for five years in two secondary schools. I love the subject and to teach it. Teaching mathematics

is my choice. I will never stop teaching it .I will continue to teach it. Because it was a subject that I love when I was a student and it is a subject applicable to other fields of studies.

The interview result shows that all the teachers expressed their love to the subject and they were happy being mathematics teachers. However, except one of the teachers, i.e.T₄, all the other informants have developed a negative attitude towards teaching the subject at present. They discussed students' behavior, school environment, their working load, and students' lack of interest towards learning the subject as the major reasons for developing such a negative feeling. Such attitude of teachers toward teaching their subjects and their students can highly affect the teaching and learning of the subject. With such a feeling, teachers will not teach heartily and devotedly. They will not have a good relationship with their students. As a result students will develop negative attitude toward the subject as well as their teachers. Jussim et al. (1998:24) confirms this idea that teachers' general belief and attitude toward their profession and their students can affect what students are learning. Because they are their teachers, instead of developing such attitude it is good for them to challenge all the problems and be models for their students and try to change their students' manner and behavior from non- acceptable to acceptable pattern.

4.2.2 Teaching experience, qualification, and teaching load of teachers

Table 1 Teachers experience, qualification, and teaching load per week

Service years	No. of Teachers	Qualification	No. of Teachers	Teaching load per Week	No. of Teachers
1_5	1	Diploma	3	25	9
6_10	0	12+3	3	30	3
11_15	4	First Degree	6		
16_20	4				
21_25	2				
26_30	1				
Total	12		12		12

The above table shows that except one of the teachers all have teaching experience of more than ten years; this shows that teachers have got an opportunity to develop good experience in teaching. These long years of experience may also help the teachers to develop a good understanding of the subject matter they are teaching and it helps them to know which method of teaching they have to apply when and where. It also helps them to develop an understanding of different behaviors and abilities of their students who came from different environments. This is because as it has been discussed in 2.1 above most of the teachers in the school have taught at different schools that can help them to develop such experiences. As it has also been discussed by scholars' experience in teaching is one of the basic factors that facilitate teaching effectiveness. That is personal teaching effectivity raises with experience and increasing confidence in one's own teaching ability is the result of mastery experiences (Johnston, 1994:199; Ross, 1998:52).

The table also shows that 3-teachers are qualified in Diploma, 3-in 12+3, and the other 6 in first Degree. According to the Education and Training Policy of Ethiopia to increase and keep the quality of education of the country grade 9_10 students have to learn with teachers who have a qualification of first Degree. But almost half of the teachers are under the required qualification. This has its own negative effect on the teaching learning process. For one thing, there is an imbalance distribution of teachers for the same grade level of students that in turn can create a psychological impact up on students that lead them to think they are learning by teachers of different qualification and level. On the other hand teachers' specialization, that is their knowledge, and training can play greater role to determine their teaching. Ross (1998:52_53) explained that teachers' with graduate degree have higher teacher effectivity than those who do not.

Looking at the table again, the teachers' teaching load is 25_30 periods per week. The heavy teaching load with an addition of large class sizes more 90_students in a class will be difficult for teachers to manage and to make the teaching learning to be fruitful. It has been discussed by scholars that heavier teaching load can affect the effectiveness of teaching; in addition large class sizes can affect teachers teaching

effectiveness. As to Ross (1998:55) teachers' effectiveness is small in high schools with large class size and reduced class size can improve students learning, affective development, and achievement. That is teachers with heavier teaching loads will have low effectivity, their feeling stressed or burned out, and their confidence diminishes in their ability to complete their tasks successfully. For example one of the informants T₃ said that:

Because of the heavy load that we carry out per week and the large class size more than 90 in a class, we teachers have a problem of checking our students' exercises books for homework and class works. We have also the problem of attending their day- to-day improvement, arranging independent work, group work activities and other cooperative learning activities.

Therefore teachers' feeling especially their negative attitude towards their teaching , and their students, under qualification of teachers for the required level, and heavy workloads can negatively affect the teaching learning of mathematics. However, the long years of teaching experience of teachers can be positive factor that can enhance the teaching and learning process of mathematics in the school.

4.3. The Way Mathematics Teaching Learning is going on

In order to examine and know how mathematics teaching learning is going on in Yekatit-25/67 Secondary School the researcher conducted classroom observation, detailed interview with teacher informants, and FGD with students.

From the observation, interview and FGD, it is obtained that the teaching and learning of mathematics in the school is going on in two different ways. The teaching-learning is going on using the plasma TV and classroom teachers, and the teaching-learning is practical only by classroom teachers. In both cases the study treated the following:

- The teaching learning procedure
- Students activity and participation
- Teacher student interaction

- The method of teaching followed by the teachers

4.3.1 Teaching Learning Where Plasma TV is Practical

4.3.1.1 The Teaching Learning Procedure

Classroom observation, teachers' interview, and FGD show that PTV is used to teach mathematics in the whole grade 10 sections and in some of the 25 sections of grade 9. The total time allotted for each period is 42 minutes. Of these 12 minutes are assigned for the classroom teacher for giving general introduction on the daily lesson for the first 5 minutes and to give summary and to have a discussion with students in the remaining minutes. In both grades 30 minutes were allotted for the TV lesson in each period. The transmission begins by revising the previous lesson with in a couple of minutes, and then explanation is given on the topic of the daily lesson. Then sample examples are provided. Finally, selected exercises are given so that students can practice with in a limited period of time. By the end of the given time they are provided with answer key by the TVT and the process continues in the same way until the end of the 30 minutes and lastly the PTV lesson will end by telling students what the next lesson will be.

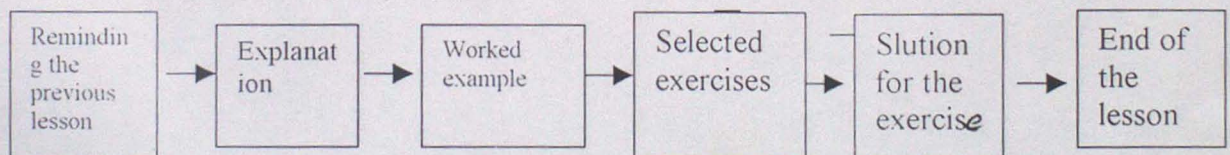


Fig -1 Teaching procedure followed by the TVT

It has been observed that in all the sections no CR used the first 5 minutes assigned for giving an introduction. Most of the time teachers came to the classrooms late. Of the 40 periods observed, in 12 periods teachers were late after the start of the PTV program for 5-25 minutes. 13 periods were recorded with no PTV transmission because of the break in electric light and other technical error in the school ICT center. For 6 periods there were no CRT, and also there were periods in which there were no PTV program and the CRT. It has also been observed that the TVT is teaching so fast that students had a problem of catching up with what is explained by

the TVT and face problem of copying (writing) what is displayed on the screen of the TV.

When students in FGD_{9P} explained the reason for this as:

Our plasma teacher is very fast while he is teaching that we could not catch up with him. Most often we cannot understand what he is teaching. There are very few students who can understand, most of the students are confused and mostly we are copying what is written on the TV screen and even we cannot finish copying, as a result most of the time we leave statements and ideas with out completing. We have also problem of understanding the speech of the TVT.

This idea of students agree with my observation that most students are busy in writing (copying) rather than listening and attending the lesson. And also I have tried to look students' exercise books and found that most of the statements were left unfinished. Although most of the students were busy in writing, there were some students who were simply listening to the TVT. There were some other students who were simply talking and chatting with each other.

Similarly, other group of students FGD₁₀ discussed that:

Since we have no good background of the subject matter most students have got problem in learning and understanding of mathematics especially when we are learning using PTV. Most of the students have English language problem, and the TVT is too fast while she is teaching, so we are forced to miss most of the lesson without understanding. Because the TV screen changes fast we cannot copy the whole idea of the lesson. Our teachers most of the time came late that we couldn't get an introduction of the lesson. Most students do not attend the lesson well. Even though there are few students who can properly attend the PTV lesson, most of the students are behaving as if they are watching film or drama. Mostly we are forced to miss the lesson because of the break in the PTV transmission.

The interviewee also expressed the teaching learning of the PTV lesson that the teachers are so fast while they are teaching that students are unable to understand the lesson. Students have shortage of time for copying, because of students' language problem they happened to miss what the TVT is teaching. T₁ said that:

As in other subjects mathematics teaching learning is going on using PTV. Since students have no good background of the subject they are too weak in understanding the PTV lesson. The TVT are teaching so fast that students cannot catch up with them, they simply think as if they are watching drama. More than half of the students have no exercise book because they cannot write from the TV screen. Even if they write, they leave statements unfinished.

In the same way T₂ expressed the PTV teaching and learning of mathematics as:

Unless and other wise there is a radical change in the process of teaching I do not think that students are learning and will get basic knowledge of mathematics. The TVT are very fast for students to follow. Since most of the students have language problem and students have no good background of the subject, they most often miss what the TVT is teaching. The students are too slow that they have to pick up each letter to write a word, which is quite impossible since the plasma do not wait for them to write all. As a result students' exercise books are full of unfinished statements that do not give them meaning when they are reading. Although it is designed that the CRT should give an introduction of the daily lesson, most of the time I and the other teachers do not do it because this 5 minutes is even not enough for us to move from one section to the other since we are not assigned in consecutive sections we move relatively long distance from one section to the other in the school.

From the observation, teachers interview, and FGD results it can be seen that the procedure of teaching followed in the PTV-lesson seems good because it is a teaching practice that involve the TVT, the CRT and the students. However, the problem is that the teachers as well as students in the FGD explained students' background and their problem on language do not match with the TVT that affect the students learning of the subject. The TVT never check whether students understand or not, whether students have taken the necessary note or not, they simply go or move as it has been programmed. They do not go with the principle of learning that teaching-learning as a two way process needs the students' action and teachers have to look students' problems and go according to the students' pace not according to theirs. The other thing that create a problem in this teaching learning is that students mostly do not get a general introduction on the PTV- Program by their CRT and the break in the PTV transmission has its own problem because once the students missed the day's lesson the next lesson depends on the previous one which students have already missed and missing in a period will have great effect on the next

lessons. Although the teaching learning process needs the involvement of both the teachers and the students, the PTV-lesson is almost one way communication that students have very limited opportunity to be involved in the teaching learning by raising questions, answering questions, doing group activities. Most of the lesson time is taken by the TVT who is so fast in teaching that will create problem for understanding the lesson and shortage of time for taking notes. These and the problem of students in understanding language of instruction will force students to miss what the TVT is teaching.

4.3.1.2 Students activity and participation

It has been observed that except during the classroom exercise all the time is used by the TVT in explaining, doing examples and giving solution for the given exercises. Students' activity and participation in the PTV-section is very much limited. Although the activity and participation of students can be seen in how they ask and answer questions, doing classroom exercises, homework exercises, group discussions and other activities related to the teaching learning process, students were not observed doing these activities other than copying and listening. Even though they are given exercises after an explanation of an idea, students were not doing it rather the CRT were doing (answering). Most students simply copy the exercise and wait for their teachers or TVT to give them solution. Not more than 3 or 4 students in a class were observed answering the given exercise. Students are not involved in homework activities. Only one CRT was observed giving homework assignments but he was not observed giving correction for the given home exercises.

In addition to the observation, the interviewee expressed the activity and participation of students to be weak, less and minimum. T₃ said that:

Students' activity and participation in the teaching learning is very little. Mostly they do not ask questions; even if they have questions there is no time for them to ask. Their less participation is reflected when they are given classroom exercise by the TVT and they do not do it rather they simply wait for solution after they copy the exercise. Mostly the time given is short but students do not even try within that time. It is we teachers mostly who are doing the exercise. In the same way students do not do their homework, since there is no time the next day that we teachers have no possible way to check students exercise

books for homework. There are only very few students not more than 2 and 3 who are trying. The majority of the students are passive learners.

The other teachers also agree with what T₃ has said. For example T₄ said that:

In PTV sections most of the time is consumed by the TVT and the CRT uses the rest. Students have little way to be actively involved in the teaching learning. Their participation in doing class works and homework is very limited. Although the TVT gives them time to do exercises after an explanation, they do not try it. They simply copy it and wait for the solution to be given by the CRT and the TVT. Since they are not doing it mostly we teachers are the ones who are showing them the answer. There are very few students who are trying it and are not more than 5% in a class. The rest are busy in simply copying from the screen.

When the FGD students discussed their activity and participation said the following:

Our activity and participation is very little. Most of our activity is copying what is on the TV-screen and what our teachers write. Mostly we are passive listeners of the TVT and CRT talks. We have no time to ask questions and do not do home works because our teachers do not give us. Even though the TVT gives us classroom exercises, most of the students are not doing it, because the time given is very short. So you cannot find more than 3 or 4 students in each class who have an active participation in the teaching learning (FGD₁₀).

In the same way FGD_{9p} discussed their participation in almost the same way as in FGD₁₀.

Our activity and participation is weak, less, dead and almost nil. Not more than 4 or 5 students in a class can participate well by doing class work, by asking and answering questions. We are not doing homework because our teachers do not give us; even if they give us, they do not check our exercise books and give us correction. Most students do not like the subject; only few students who are gifted in mathematics can participate actively. Most of us have no good participation, we are rather passive.

From the observation, interview and FGD results it can be seen that the activities and participation of students in the teaching and learning of mathematics in the plasma TV sections of the school under study is so poor that students are passive learners. Their participation is mostly listening and copying. This shows that the

students' understanding of the subject is weak; as a result they do not develop an ability to apply the subject in solving their daily problems. Because teaching learning of mathematics needs the activities and participation of both the teachers and students, unless and other wise students are actively participating and involved in the teaching and learning they do not learn what they are expected to learn. As Curzon (1990:9), Gredler (1997:108) discussed that learning is a complex and multifaceted process and is a mechanism by which an individual becomes a completely functioning member of the society. This will become true only when students are engaged in activities in the classroom and out of classroom to improve their participation. Yssldyke,etal.(2003:70) also noted for effective mathematics learning teachers should work very effectively and efficiently so that students can actively participate in the teaching learning process.

In the PTV teaching process students were not engaged in doing home works and other out of class assignment, which were an opportunity for students to be engaged in an independent work. Because as it has been discussed by (Davies, 1981:328-233, Capel etal, 1995:239, McCormic and Presley, 1997:244) that homework and other assignments play a great role by giving the learner a sense of responsibility and achievement by considering it as a way of life and fact of life for most students having a valuable and important role to play in enhancing learning. The other thing that block students' activity and participation in the teaching learning are those conceptions of teachers about their students that they view them as having no good background, they also assume them as weak and could not understand the subject. The other is students' self-conception on the subject they think they have no good background of the subject as mathematics is very difficult to understand and the like are hindrance to their participation.

4.3.1.3 Student teacher interaction

As it has been explained in the earlier sections (4.3.1.1 and 4. 3.1.2) the PTV-lesson is almost one way interaction in that students' involvement by asking, answering, explaining their views or feeling is very limited. In the same way the time assigned for CRT after the transmission of the TV lesson is so short that they were

forced to give only simple summary of the day's lesson, so good interaction between their students has not been recognized. However there were some teachers who let their students speak after them while they give summary and when they solve exercises and examples. And even this does not show that there is sufficient interaction between the teachers and the students. In the plasma TV lesson students are mostly listeners and copy what is written on the screen.

Students in the FGD₁₀ expressed their interaction with their teachers as:

There is a great gap between the students and teachers, especially after the PTV is practical. The TVT do not ask questions, we students do not ask and answer questions. There are also CRT who are annoyed when they are asked questions they think it is easy, and embarrass students by saying how do you ask such simple questions? What are you doing here without knowing this simple thing, and such kind of words? Most teachers are teaching in their own pace not in student pace, they do not consider that there are different kinds of students.

In the same way when FGD_{9p} discuss their interaction with their teachers said that:

Our teachers are mostly not positive to accept questions and they feel that students are asking them for the sake of challenging them, so they do not respond well and also they down grade and become angry when students ask questions. For example, one day a student asked the teacher that, how can we learn and understand since both you and the TVT are talking fast? The teacher answered that either you have to attend quickly or to stop. Therefore, we have no good interaction as such with our teachers. We have no personal or social problem with them but our academic relationship is not good.

However a student in this same group expressed teacher-students interaction of his class as good and said that:

My teacher is a good one who always trying his best in encouraging students to ask and to answer questions and to actively participates in the teaching learning process. He gives us good response to our questions; check students' exercise books and he let students do exercises on the black board.

Although there are students in FGD_{9p} who accepted that there is good teacher student interaction, in most cases there is a problem. That means teacher- student, student-student interaction is very limited in such kind of classrooms. As it has been

discussed by scholars such as Walter et al (1970:201), Flander (1970:30), Mccaul (1997:17), and Clark and Starr (1986:199) teacher student interaction is one of the factors that highly influence the teaching learning and is a critical variable for pupils learning. Without an optimum amount of student-student and teacher-student interaction classes tend to become oppressive. Therefore, students should actively participate at least half of the time i.e. every student should participate in some way, and a good share of the class time should be given to thoughtful and creative activity rather than the mere recitation of information by either the teacher or students. And also it has been discussed that accepting pupils idea and giving praise, questioning and encouraging pupils response, accepting or using ideas of students talk in response to teachers, students' talk-initiation, and giving due consideration for students as important and valuable persons lies at the heart of effective teacher student interaction. However, in the present study in the PTV-lesson the teaching learning is dominated by the TVT talk and then by the CRT in which students have little time to be involved in the interaction between the teacher and students. This in turn will have a negative effect on students learning and understanding mathematics.

4.3.1.4 Teaching Method followed by the TVT

As it has been discussed in the first three sections except the exercise all the time is taken by the TVT in explaining, doing examples and in giving solution to the exercises. During this time students are passive listeners and they simply copy what is on the screen of the PTV. It has been observed that the TVT is following the traditional (teacher- centered) method of teaching, especially the lecture method. On the other hand, the TVT also practices the demonstration method of teaching. Even though most students did not practice it after showing model examples, exercises were always given for students to be done with in a fixed time. For example as I have strictly recorded for grade 10 from 15/06/97-26/07/97 for 12 periods during the classroom observation, 3-5 exercises of 3-12 questions to be done within 5:30-16 minutes were given to students. That is to the average 3-4 exercises of 7-8 questions were given to be done in 9-10 minutes per period. That means almost one-third of the

time is assigned for students to do exercises in each period after model example is given. The same is true for grade 9 PTV-lesson.

The teacher informants expressed that the teaching method followed by the TVT is a teacher centered. For example, T₂ said that:

The plasma TVT purely uses the lecture method of teaching. "በትክክልም የሚጠቀመው ሌክቸር ዘዴ ነው። ያውም ቀላል ሌክቸር እንዳይመስል እንዳለ ዝርግፍ ነው የሚያደርገው ። በአንድ ጊዜ ነው የተሌሊ ሻርጎ መስኮት-ልት የሚለው። በዚህ ጊዜ ሂደቱን አያሳይም።" During the TV -lesson students' activity is limited to writing and copying from the screen. They are passive receivers.

T₃ also said that:

What I could not understand is, mostly we are saying that it is the student- centered method that is fruitful as students should be given only the hint to learn for themselves. If all the things are given by the teacher, students will become passive. But plasma TV teaching is one way communication, students have no way to ask questions, it is spoon feeding system; the teaching method followed by the TVT is not different from the traditional teacher centered method of teaching.

In addition to the direct observation and interview, the FGD₁₀ have said the following on the teaching method followed by the TVT that:

We are not learning according to the principle of the student-centered method of teaching. That is our involvement is very minimal. Most of the time is consumed by the TVT and what left is used by the CRT. We are hearing that 75% of learning has to be done by the students and the teacher has to do 25%, but in our case even the reverse is not true. It was good if our teachers have properly done 75% and we are actively involved in 25% of the teaching learning process. In almost all the cases we are passive listeners and copy what is written.

As it can be seen from the observation, interview and FGD results the mathematics teaching learning in Yekatite 25/67 Secondary School have no difference from the traditional (teacher centered) conception of teaching-learning that view teaching as an imparting of knowledge and dissemination of information. This was highly criticized in that it limits students to be passive recipients of information and have a negative influence in students learning of the subject. It has also been criticized because the objective of teaching should be to promote learning rather than transmitting and dissemination of information. Due to the abstract nature of the

subject unless and other wise students are involved in the teaching-learning, understanding and learning mathematics through one way communication will not result in learning. This is because it has been argued that the traditional approach of teaching mathematics will have little effect. Such method of teaching will not enable students to be mathematical problem solvers, to reason things out mathematically, to communicate mathematically and to become confident of their mathematical abilities (McCombs, 1993:300). The student-centered approach gives emphasis to students' active involvement in the teaching learning of mathematics. Swan et al. (2000:11-12), Krantz (1999:103-104) has supported this idea and said that mathematics teaching should include a broad range of learning activities, expositions, discussions, practical work, problem solving and investigations. In the same way McCormic and Pressley (1997:301), Cohen (1996:177-178) explained the discovery learning, cooperative learning, problem solving to be an effective and most relevant methods for learning mathematics which actually were not practical in the PTV- Mathematics instruction. As a result students' understanding and learning of the subject will be seriously affected.

4.3.2. The Teaching and Learning of Mathematics in Non-plasma Sections

The direct observation of the classrooms shows that in Yekatit 25/67 Secondary School in 11 sections of grade 9 plasma TV was not practical. Students are learning only by their CRT. According to the school administrators this was not a deliberate action rather it is because of the shortage of PTV since the school was forced to accept students beyond its plan.

4.3.2.1 The Teaching Learning Procedure

In all the observed classrooms teachers started their lessons by giving revision on the previous lesson, and then writing the topic of the recent lesson on the blackboard. The teachers use chalk and blackboard during their teaching. Mostly they explain the idea of the lesson followed by different worked examples on what have

been explained. While they are teaching most of the time is taken by the teachers' talk. Although there are teachers who look for response from students while they are explaining and doing examples, very few students give response to their teachers while most students are always busy in writing (copying) what the teachers have written on the blackboard. Other than writing and simply listening students' involvement in asking and answering questions, group discussions, cooperative learning activities, discovery learning activities, and other activities that enhance students learn by their own and activities that show their active involvement have not been observed. Even if students raise questions, they ask for steps or unclear words and statements written on the blackboard. In the same way rather than explaining and doing examples and raising simple questions that need only simple recall, teachers were not observed to raise issues that motivate students to think critically and develop higher order thinking skills. It is only after they have finished what they have planned that they ask students if they have any question with no time for answering. Unlike the TV-lesson most of the time teachers do not give classroom exercises to be done by the students. Homework exercises were often given but teachers never give correction or ask students for their homework. Teachers discussed shortage of time and the TVT being in advance of them for not giving homework and classroom exercises.

For example T₄ said that:

As you have seen the TVT is teaching very fast and do not go in depth. He/she teach the main ideas so that covered more topics than those in the non- plasma sections. In order to reach the topics where the plasma TVT arrive we have to jump giving class works and homework exercises by doing what we think is to be done by ourselves. What we advise our student is always to do exercises from their textbooks.

In the FGD_{9NP} students also expressed how the teaching learning of mathematics is going on in their classes. They said that:

The teaching learning is not good that it lacks many things. Teachers are teaching only using chalk and talk, they do not use different instructional materials. Teachers mostly do not come to class on time mostly they are late. Although we need mathematics to apply in solving most of our daily problems, what we are learning is not enough.

Teachers do not teach us deeply, they are teaching us nominally. Mostly they assume that we cannot understand the subject. They do not consider that they are teaching different kinds of students, there are slow learners, average learners and fast learners in the class but teachers' most often go with fast learning students. Most of the time we have no chance to ask questions and practice by ourselves, what we do is we simply listen and write what the teachers are talking. It is the teachers who are talking almost all the periods.

However one of the students in the group said:

The teaching learning is good that our teachers are teaching us well. The problem is teachers do not teach using different approaches and using different materials.

Form the observation and FGD it is seen that the teaching learning of mathematics in the non-plasma section is teacher dominated that students' involvement is very limited. Students are mostly involved in writing and listening what their teachers are talking. Teachers mostly run for completing the topic. It does not go with principle of learning that, for learning to take place the learner should be active participant and should be involved in an activity that is to be done independently and cooperatively.

4.3.2.2 Students' Activity and Participation

Although activities and participation of students can be seen in how they ask and answer questions, doing class work exercise, doing homework exercises, group discussions and other activities that can involve students in the teaching learning process, in these sections other than listening and writing students were not observed in these activities. The activities observed were that few students were responding after their teachers.

The entire teachers' informants agree that students' activity and participation in those non-plasma sections is very weak and limited. T₃ said that:

Students' activity and participation is too weak, limited, dead, and almost nill. Not more than 5% of students can be found in a class who can participate. They are not active participants rather they

are dormant and passive listeners. This is because students have no good foundation (background) from their elementary school, they do not consider mathematics as a subject matter their concern is only to get mark and pass to the next grade.

In the same way FGD_{9NP} discussed their activity and participation in the teaching learning as;

Our activity and participation is too weak and limited because most of us do not understand the subject matter. Teachers do not initiate and encourage us to participate in asking and answering questions and in doing other activities. They do not raise questions and issues that will lead us to be in an active participation. Since our teachers do not give us class works and home works most of the time we do not do class work and homework. There are teachers who disgrace our participation by insulting and throwing bad words. The bad words teachers are speaking towards us forces most of the students to hate the subject and they leave classes rather than doing activities and to be involved deep in the teaching learning. Most of the students come to class in order not to be absent and not to miss tests and exams; most of them developed a habit of dislike toward learning the subject.

Within the same group a student objected what have been said of teachers and she said that:

What is discussed of teachers is not true at least for my teacher, because he is initiating us well to be involved in the teaching learning and students' participation is also good.

Looking at teachers' response and FGD it can be seen that students' activity and participation in the teaching learning is blamed to be less, minimum, and weak. My observation also support their response that student activity and participation is limited to listening and writing. For the students' passivity teachers blame the students in that they have no a good background and they do not consider mathematics as an important subject. On the other hand, students blame their teachers that they do not initiate and encourage them to be active participants. In what ever the case unless and other wise students are

engaged in an active participation in the teaching learning, it could be in vain to expect the students to learn and understand what they are expected to learn.

4.3.2.3 Teacher- Student Interaction

According to Flander(1970:30-34),Clark and Starr(1986:199;1991:212) good student- teacher interaction can be seen when students actively participate at least half a time, every students participate in some way, teachers accepting students feeling, praising or encouraging students action or behavior, accepting or using ideas of students, asking questions by the teachers so that students answer, giving direction so that students obey, students talk response to teachers, students talk initiation. However, except teachers' explanation and talk and limited students' response after their teacher, proper classroom interaction has not been observed in these sections.

Concerning their interaction with their students', teacher informants said that they have good relationship with their students. For example T₁ said that:

My interaction with my students is like father and son. Always I initiate them to ask questions freely, even when they did mistake I mostly correct and advise them rather than ashaming and demotivating them by speaking rough words.

Although T₁ said that he has good interaction with his students he contradicts his response of his feeling on teaching mathematics that, he is not happy and developed negative attitude towards his profession because of students' behavior. That shows he does not have good father and son interaction.

In the same way T₄ said that:

My relationship with the students is good. I initiate them to ask any question which is not clear to them, I advice them to study well, even I encourage them to ask me any questions outside the classroom but not outside the school. If we meet outside the school people may give no good meaning and they assume that we have illegal relationship. Even if they made mistake, when they ask and answer questions I never let them feel psychologically demotivated and ashamed.

T₂'s response is in harmony with that of T₁ and T₄ however T₃'s response is a little bit different and it shows there is no good interaction between him and his students. He said that:

What I do not deny is that because of the workload that I carry and my students are weak in mathematics. I often become angry with them when they bring and raise questions from other sources. Although they are not able to do simple addition of integers they try to outshine simply by asking questions, which they may think I will not answer. He expressed his students by quoting an Amharic saying "አባቱን አያውቅ አያቱ ናፈቀው አይነት ናቸው ተማሪዎቹ". I do not give time to students for discussion and to have group work I mostly let them do it individually.

When the FGD_{9NP} discussed on their interaction with their teacher said that:

Our interaction with our teacher is not good; it is not a father and son relationship. Teachers do not initiate us to raise questions and even if students raise questions they assume as if students are challenging and ashaming them. They are not happy to be asked. If one will raise question which they assume is difficult, they ashame the student by speaking disappointing words. Sometimes even teachers record students' name and suspend them from the class and take some other measures. In most cases, we never approach our teachers and ask them questions because they show us hard and frown face from a distance. There are teachers who consider their students as their enemies. Because of these there are students who hate the teacher as well as the subject. For example, one of our teachers most of the time looks at us cruelly and with frown face instead of giving answer for question raised by the students, he often says "I am the one who faced that university and successfully graduated." He is always telling us his unpractical knowledge and ability.

However another student in the group said that:

In my understanding our relationship with our teacher is good that we can ask any question we like and he gives us the right response. He himself raises questions and initiates students to answer, and gives us brotherly advice on how we do and study.

From the observation, interview, and FGD, although teachers assume their relation with their students is good, and also some students explained it as good, mostly it is seen that there is an academic distance between teachers and students. What is mostly practical is teachers' talk and students listening and

copying which does not show there is good interaction that can positively affect the teaching learning process. Had there been a good interaction and relationship between teachers and students, there wouldn't have been much complaint from both teachers and students.

4.3.2.4 Teaching Method Followed by the Teachers

As it has been discussed in (4.3.2.1_4.3.2.3) the classrooms in the non-plasma sections are mostly dominated by teachers. Teachers use most of the time by giving explanation and doing examples on the lesson. It has also been observed that students are involved in passive listening and writing. No sections were observed for which students were engaged in an interactive activity like group discussion, cooperative learning, discovery learning, critical thinking and higher order thinking activities. The observation shows that the teachers follow the traditional teacher- centered method of teaching especially the lecture method. Although the questions they are raising are simple and need only simple recall of facts and are not thought for provoking, some teachers were rarely observed using the question and answer method of teaching in addition to the lecture method.

Teacher informants too discussed that they were following the traditional teacher- centered method of teaching. For example T₁ said that:

It is me who use more than 32- minutes of the period and I give the rest time for the students if they have any question, other wise I use all the period. In the same way in the Plasma section it is me who mostly use the time left for discussion. Students are mostly passive learners. If not, I use much of the time I could not complete the textbook that I am assigned to teach.

Supporting this idea T₂ also said:

I am using spoon-feeding system, because students are not able to do class works and homework, they are not active participants. So I always apply the lecture method of teaching. It is not only I but also

other teachers are using the same method. As the head of the department, I have the chance to observe how others are teaching. The reason why we are using the traditional teacher-centered method and could not apply the modern student-centered method is because our textbooks are so large in volume that it is only when we cover that we will not be blamed and will be rewarded. So to do that or to cover more portion of the text, there is no other effective method than lecture. The school always looks how much we cover the textbook not how much students have learned. The other reason is the teaching load we carried; and the large class size does not allow us to apply the method. Unless and other wise we cover the textbook we will be considered as lazy teachers and we may not pass the outcome-based evaluation.

From the observation and interview results it can be seen that the method of teaching the teachers are following is teacher-centered. It did not give chance for active student involvement in teaching learning by their own with a little help or support from the teacher. As it has been discussed in (4.3.1.4) such method of teaching has been criticized as having little effect on mathematics learning. Although our new educational policy gave emphasis on preparing citizens who have a problem solving ability which will be achieved only when students are engaged in exploring, conjecturing, and thinking rather than only rote learning of values and procedures. Such traditional method of teaching approach will not enable students to value mathematics, develop mathematical reasoning, be confident in their mathematical abilities, and become mathematical problem solvers (McCombs, 1993:300).

4. 4. Availability and Utilization of Instructional Materials

Instructional Materials are important variables to be considered in the teaching and learning of mathematics because they are essential materials in influencing the teaching learning process of subject matter. Textbooks and other curricular materials, materials in the SPC, reference books in the library are considered to be IM in the present study. SPC and school libraries are also suggested to be the main sources of instructional materials (Hienich, et al., 1989: 43).

4.4.1 Availability of Curricular materials

Even though textbooks, teacher guides, syllabus, and manuals are very essential in the teaching learning of mathematics, the entire teacher informants and students in the FGD discussed that the availability of these materials is scarce.

Concerning curriculum materials T₄ said that:

Textbooks are not distributed for each individual student. For grade 10 students 1 book is distributed for 4 and more students, while for grade 9 it is better than grade 10 as 1 book for 1 student and in some other cases for 2 students have been distributed. We have no syllabus, which we were forced to prepare a yearly plan as we feel without knowing the time distribution for each chapter and topics of units. There are few teacher's guides for grade 10 but not for grade 9. We have no TV manual, what is present in the hand of the school vice director is 1-CD soft ware that contains guide lines for grades 9-12 together, which we do not use it because the school does not have computers.

The document source from the director's office and the school book store shows that in the academic year 2430 students for grade 10 and 3202 students for grade 9 were registered. But the number of student textbooks distributed was 677 for grade 10 and 2465 for grade 9. This shows that student to textbook ratio for grade 10 is one to four (1:4) while for grade 9 it is almost 2:3. In the same way there are no teacher's guides for grade 9, no syllabus, no manuals but there are two teacher's guides for grade 10. In addition to all these during the classroom observation most of the teachers do not bring and use textbooks in the classrooms. Only two of the 8 observed teachers came to the class with their textbooks. Most often teachers come to class with pieces of paper and so do the students. For example, one day when a teacher was in need of textbook he couldn't get from the students so he was forced to go to the library and get one from there. On the other day another teacher asked students for a textbook but no one had the textbook, and the teacher became disappointed and angry with them. Immediately when a student asked a question the teacher responded "you have no moral sufficiency (*yemoral biqat yelehim ,antebilo*

yecivics tamari) to ask questions since you are a student who does not like to carry text book. How can I answer your question?" And he rejected the question.

All these show that there is a great problem of curricular materials in the school, if students do not have textbooks of their own, they will face problems of doing exercises, or studying. As it has been discussed in the previous section most of the students couldn't complete copying from the PTV screen since it is very fast. Students' learning and achievement in the subjects will be influenced. Even one of the teacher informants said that, *"the reason why I mostly did not give homework to students is that they have no textbooks"*. In the same way the absence of teacher's guide, syllabus and the TV-manuals will affect the way the teachers are teaching. If they face problems on the content of textbooks they must have teachers guide to consult. Besides, while they are preparing their plans they have to refer to the syllabus. However the problem is not only shortage of materials but also students and teachers do not use the available ones properly.

4.4.2. Availability and Utilization of IM in the SPC

On the availability and Utilization of IM in the SPC all the teacher informants agree that there are no materials in SPC, which are commercially produced by the school, or any other organization. But they said that, there are some materials that were prepared by the teachers and students using wood, glass, graph papers, and clothes. Even though these materials are in the SPC, most of the time they do not utilize them. When T₂ justifies the reason said the following:

These locally produced materials are not good and attractive when they are compared with the IM used by the TVT. Ours do not attract attention and their quality is poor. The TVT use different teaching materials which are decorated and attractive.

T₂'s reason for not utilizing these materials is unacceptable. He should not compare the materials that are available in the school with those materials in the plasma TV. He should have been able to use these materials irrespective of their quality at least in those non-plasma sections. Because using even such materials is better than not using them at all.

T₃ also said, *"Although we know that we should not teach each period without using instructional aids, I rarely use them "*.

All the FGD agree that their teachers are not using different instructional materials when they are teaching. They said that they have never seen their teachers using instructional materials other than chalk and board.

FGD₁₀ discussed that their teachers do not use different IM but their TVT uses different IMs when he/she is teaching. One of the students said:

The plasma teacher used good IM like adding machine, bar when teaching about percentile, ruler, and graphs showing histograms, slide rule and others. But I have never seen my CRT using different IM other than chalk and board. I remember how he draws a line, it was unclear and deformed. It would have been good if he had used a ruler. I doubt that the school has such materials.

Students in FGD_{9p} have the same discussion that they did not see their teachers using different materials other than chalk and board, they said that they have never seen their teacher using a ruler while he is drawing graphs. He simply sketches it as he likes.

Students in FGD_{9NP} also agree that their teachers do not use different IM. One of the students said:

It's not only physical materials that can be used as an aid to teach; our teachers do not use even different formulas. If they can relate and teach us the subject with the real environment it can be used as an IM. If our teachers are concerned with the issue of using different IM, the environment, the class by itself can be taken as an IM. But our teachers do not use it.

During the classroom observation no teacher was observed using different IM other than chalk and board; even most of the teachers do not use their textbooks.

Observing the SPC and document source, there are 137 mathematics teaching materials made up graph papers, wood, glass, plastic materials and cloth. Of these 98 are made of graph paper, 24-wood, 8 plastic, 4 cloth, and 3 – glass materials. 28 are solid figures, 19 plane figures, and 90 of them are about graph of different

functions of which 54 are about graph of trigonometric functions and the rest 36 are about graph of other functions. Most of the materials are of the same type and they are repetitions. Of these materials in the academic year since the arrival of the researcher in the site six teachers have used only 16 of them. 4 teachers' used once and 2 teachers used twice. The other six teachers have not been documented of using materials from SPC. Of the total materials about 100 were prepared in this academic year. Teachers and students may have prepared it not because they need it for their teaching and learning, but because preparing such materials is one of the criteria for outcome-based efficiency evaluation. I do not simply said this, I informally observed that teachers were counting the number of materials they produced and their students have prepared while they were dealing about their evaluation result with the vice director.

From the observation, interview, FGD, and document source it can be concluded that there are some materials available in the SPC, but with very little utilization. This can influence the teaching learning process of the subject. Because IM can help students understanding of the material being taught and even it can help in concept formation, help the learner to develop their experiences such as doing, drawing, reading, observing, sketching, computing, discussing and speaking (Amare, 1999:54). Furthermore, it can help teachers to be effective in their teaching and can facilitate the teaching learning. So being reluctant and unaware of utilizing IM means to lose what some one can get from them. During my stay in the research site the topics of the lesson were on trigonometric functions and their application in grade 10. So most of the materials that have been in the SPC were to be utilized because many of the materials were prepared on trigonometric functions and their relationships. These shows that the teachers were not so concerned with these materials and did not analyze their significance in the teaching learning process, more than getting good result on their outcome based evaluation.

4.4.3 Availability of Mathematics Reference Books in the School Library

School libraries are important sources in providing IM, especially reference books that can enhance the teaching learning process of a subject matter.

In order to consider the availability of these materials interview with teacher informants, FGD with students and direct observation have been conducted.

All the teacher informants agree that the availability of reference materials in the School library is very few and poor in quality. They expressed that there are no appropriate reference books, which can help the students to refer to the new curriculum under practice. The books that are present in the library are old ones. Except few, most of the mathematics books that exist in the library are of little importance which was to be avoided. T₄ said that:

There are some books in the library but they are not enough. There are no modern books. Except some, most of the books in the library are not necessary at all. There are no books that can broaden students' knowledge and understanding, and can prepare them for further education.

"It is the building of the library that exists, internally it is empty. There are no reference books, what exist are textbooks (T₁)".

T₃ also said that:

Those books that are available in the library are handouts, worn out old books that are important for nothing. Most of the books are very old and out-dated. What exist in the library are some few books, which can prepare for commercial purpose. I cannot exactly say there is a library in the school. There is no importance of the building with out books

All the students in FGD discussed that there is a problem of reference books in the library. Those books that are in the library are old ones, which do not match with the new curriculum. There are no modern books. Even those old books are very limited in number. A student in FGD₁₀ said that:

Rather than saying there is a library in the school it is better to say there is no, because there are no up-to-date books that help for the present curriculum. Although there are a very large number of students in the school there are very few books not more than 10 that are useful. Most of the time students come to the library to read textbooks, and those students who do not feel free at home although they cannot get reference books.

In the same way FGD_{9NP} said that,

The library has no necessary and new books. The books are old and worn out which are spoilt by ink and even not possible to read. Even though there are some books that may help us, it is impossible to get them because they are reserved for those students of the library club who paid 10 Birr per year for membership. Those who cannot pay and not the member of the club can not get these books.

As the researcher directly observed and conducted a simple inventory on the availability of reference books and see its relation with grade 9 and 10 mathematics curriculum; there are totally 245 mathematics books of 76 types. Of these books 17 are the present grade 9 and grade 10 textbooks. The other 58 are those old curriculum from grade 7-12. As to my identification on the relationship of those books with the present grade 9 and 10 textbooks, 57 books of 28 types can be used as a reference most of them are old publications. Another 34 books contain higher mathematics and can be used at the college or university levels and can be used as reference for teachers but have no value for the students at present. Although it is unfair to say they are not useful the rest 79 books are simply shelved in the library. Their importance is not clear. They are big materials with hard cover and their inside is colorful and decorated, but they are very old and out dated as well as too elementary, and some others have no relation at all with the present grade 9 and 10 curriculum. Even the librarians commented and showed the researcher very few books that were mostly used by the students from the shelf. They also commented that the library could accommodate 280 – 300 students at a time.

From the interview, FGD, and observation there is a library in the school, and also books in the library. But the available books in relation to the present grade 9 and 10 mathematics curriculum are too limited. Having a library but no essential and important books makes no difference. This can in turn affect students' performance in developing what they have learned and in getting new things by reading books. It also affects students' self-investigation and reaches their own conclusion by referring books. It forces students to be dependent on the teacher and not to become active learners.

4.5. Factors Affecting the Teaching and learning process of Mathematics in Yekatit 25/67 secondary school

In whatever activity is performed, there are factors that affect its process and practice. In the same way there can be factors that may affect the teaching learning process of mathematics in Yekatit 25/67 Secondary School. Therefore to know those factors that can affect the teaching learning process of mathematics, detail interview with teacher informants and FGD with students have been conducted.

4.5.1 Teachers' response on factors affecting teaching of mathematics

In one way or the other the factors that have been raised by teachers were discussed in the previous discussions. The teachers highly stressed on the shortage of qualified teachers, large class size and their over teaching load, shortage of IM, attitude of students toward learning the subject, physical organization of the school, and the school administration as factors that affect the teaching learning of mathematics in the school.

T₁ discussed the factors as:

To my understanding those factors that affect the teaching learning of mathematics are shortage of trained teachers which forced us to carry high teaching load 25-30 periods per weeks in both shifts that limit us

not to give extra classes and help our students. Shortage of materials like students text books, large class size that force students to sit very closely on a bench, students reluctance towards learning the subject , shortage of free classrooms that may serve for make up and tutorial, and the problem of the administration in taking serious measures on those students who misbehave against their teachers and who are immoral towards their characters.

In the same way T₂ explained factors that affect the teaching learning of mathematics in his school as:

As to me the large population size in the school, the problem of the school having no fence that lets students become undisciplined that they leave and enter the school whenever they like. The problem of sufficient textbooks and other instructional materials, problem of extra classrooms and department rooms, problem of guidance and counseling in the school, shortage of teachers which forced the present teachers to carry over load in two shifts, and the absence of strong mathematics club in the school that can bring teachers together and can support the teaching learning are some of the factors.

T₃ and T₄ also have no different attitude than T₁ and T₂ on this issue.

For teaching to be effective and bring a desirable change on the learner there should be helpful atmosphere in the school. That means all the necessary conditions should be fulfilled. What the teachers raised are the most serious factors that can highly affect the teaching learning of mathematics in the school which actually were confirmed during the observation. In addition to what the teachers explained as factors that affect the teaching learning the teachers themselves can affect the teaching learning. It is seen during the observation and the interview that most of them are not happy toward their profession, their attitude toward their student is mostly negative and they do not use the available IM. For example, they do not use their text books while they are teaching and they are not committed to be good models for their students.

4.5.2 Student response on factors affecting their learning of mathematics

As one of the parties in teaching learning process students can express which factors can affect their learning. They discussed the way their teachers are teaching, shortage of teachers, students' attitude toward learning the subject, their lack of good background of the subject, the problem of the break in the PTV transmission, shortage of IM, large number of population in the school, large class size, and the classroom conditions as factors affecting the teaching learning of mathematics in their school.

FGD₁₀ students discussed that:

The way our teachers are teaching and preparing exams, that means they do not make things easy on the way we understand the lesson, for that we are forced to take much time to understand and the difficult exams they are preparing lead us to lose hope when we get low marks. The method of teaching the teachers are following mostly not participatory which tends to subject centered and teacher centered rather than student centered that do not invite most of us to practice what we have learned and the students misconception on the subject thinking that mathematics is the most difficult subject to learn are some of the factors that affect our learning.

In addition to what FGD₁₀ discussed FGD_{9p} students said that:

Shortage of teachers that forces the existing teachers to carry loads beyond their capacity that inhibit them from helping us by giving tutorial and make up classes, our problem of having no good background on the subject from our elementary grades, the break in the PTV transmission are factors that affect our learning

Those students in the non-plasma sections FGD_{9NP} discussed the problems as:

The disappointing words teachers are speaking that affect our feeling and emotion lead us to hate the teachers as well as the subject, shortage of text book and reference books in the library, the negative attitude of students toward the subject, the large number of students in the class, the inconvenience of the materials in the classroom, and the number of subject that we are learning more than 10 subjects are some of the problems that can affect our learning of the subject.

Teaching learning process is not a simple task rather it is aimed at changing human being. To be changed from not knowing something to knowing, from not understanding to understanding and in general to make the learner a functioning member of the society, they need proper and suitable conditions. However from their discussion it can be seen that there are factors related to teachers, related to students and related to the schools that can affect the students learning of the subject. These all show that unless and other wise these conditions are not to be minimized, talking about teaching and learning of mathematics in the school may not be satisfactory. Since these conditions can hamper both teachers and students' initiation to be devoted, they contribute for the realization of the objectives of education. Otherwise, no more learning will be achieved other than promoting students to the next grade level with no change in the individual competency.

CHAPTER FIVE

SUMMARY, CONCLUSION and RECOMMENDATION

5.1. Summary and Conclusion

Education is viewed as a life long process and a universal practice by which human being transmit their experience, new findings, and values accumulated over the years or it is a process of human experience by which knowledge is acquired, skill developed, attitude and values formed, that enable individuals and society to make all rounded participation in the development process. It helps strengthening the individuals' and societies problem solving capacities, positive attitude towards the development of science and technology by relating education to the environment and societal needs.

For education to fulfill its objectives, mathematics as a science, an art, language, tool and way of thinking play the great role. Being theoretical and applied science mathematics develops human thinking and reasoning power. As a base and language its contribution for the development of science and technology is great. This implies that mathematics education should be given great emphasis and attention.

When we think of mathematics education, the teaching learning process that it passes through must be considered. The teaching learning process in general is a process that considers the learner, the curriculum, the teacher and other related variables. All these determine what result will be expected from the process. The learner is at the center of any teaching learning process that is expected to bring a change as a result of learning. The teaching learning as a two way process needs active involvement of the learner in the process. With out student involvement and active participation learning may be very difficult. As a result the learner is no more expected to contribute something for the society that he is living in. The traditional approach to teaching learning is being criticized that the main concern of the teacher is in covering textbooks or teaching material through the possible method and means available. It is one-way information transmission that creates maximum social distance between the learner and the teacher. It has also been noted that our

teaching learning should be on the way that could develop students' knowledge, cognitive abilities, and behavioral change, problem solving ability and attitudes. For that to be true all the conditions related to the teaching and learning should be organized and situated so that students can learn. That means the school conditions, classroom conditions, the way teachers are teaching, the instructional materials, the interaction between teachers and students should be helpful so that students are actively involved in the teaching and learning process.

As it has been discussed in Education and Training Policy inadequate facilities, insufficient training of teachers, over crowded classes, shortage of books and other teaching materials indicates the low quality of education and the teaching learning, which should be improved.

Therefore, for pupils to learn mathematics and for mathematics to be taught effectively, students must be engaged in exploring, conjecturing and thinking rather than rote memorization of rules and procedures. Also teachers have to play a role in providing experiences that help students make sense of mathematics, be active, reflective thinkers, by creating problem solving environments, encouraging their interaction and discussion, selection of convenient IM and methods, individual and group opportunities for the development of higher level thinking.

Based on this and what have been discussed in the analysis the following conclusions have been drawn.

The classroom organization of the school is not convenient for the teaching learning process of mathematics. That is most of the building of the school are old with small classrooms having windows made of wood which do not let light enter easily. As a result students have problem of reading what is written on the blackboard. The classrooms are so crowded that students' sit in 3 and 4 on a bench with 90 and more students in class. The classrooms are mostly suffocated and dirty, blackboards are small and rough. Although these problems are very serious that the teaching learning of mathematics may not be an easy task with such condition and can greatly affect what teachers are teaching and how students are learning. Knowing that with Zonal as well as with our country economic standard it may not be possible to solve it with in short period of time. Therefore, teachers and students have to

devote themselves for the success of the teaching of the subject instead of complaining and always thinking of the problems.

With regard to the teachers related variables the study showed that, although teachers liked their subject and were happy for being mathematics teachers, at present most teachers become unhappy and have developed negative feeling toward teaching the subject because of students' bad characters and poor performance in learning the subject, and the heavy work load they are assigned to perform. This shows that if teachers develop negative attitude toward their profession they cannot teach effectively and efficiently.

Half of the teachers have a qualification of first degree in mathematics and half of them have qualification less than the required level to teach grades 9_10. In addition to the large class size 90 and more and assigned to 5 or 6 sections with qualification below the required level can highly affect the teaching learning process. Therefore, teachers will not have time to check students' class assignments and homework. They may not also have time to plan and implement group work, discussion, cooperative learning activities, and discovery learning activities. Even if they may have time they will become fading up and develop negative attitude toward teaching the subject rather than developing love for their profession and devote themselves in helping their students. On the other hand all the teachers except one of them have teaching experience of more than 10 years. This is a good opportunity for the school having such experienced teachers who have developed good understanding of the subject matter, good knowledge of how to handle students with different behavior, and an understanding of how to approach students who have different level of understanding.

— The teaching learning of mathematics in the school is practical in two ways. All grade 10 students and some of the grade 9 are learning using plasma television and the class room teachers; while some other sections of grade 9 students are learning using only the classroom teachers (non plasma TV program is practical). In those sections where plasma TV is practical 30 minutes of learning time is assigned for the TVT and 12 minuets for the CRT. From the total time of the TV lesson almost one-

third of the time is given for students to do exercises. But practically, very few students are trying the exercises, while the rest simply wait for their teachers or TVT to give them solution. In these classes students' involvement in the teaching learning is minimal; they passively attend to the TVT and write from the screen, whereas in the non-plasma sections most of the time students are not given classroom exercises. Here also there is very less student involvement. Most of the students are writing (copying) what teachers write on the blackboard and they became passive listeners of their teachers.

In both the PTV section and non-plasma sections students are passive listeners and mostly they pass their time of learning by copying (writing). Students are not engaged in activities that enhance their participation such as group activities, problem solving, cooperative activities, and activities that invite students' investigation and coming up with their own conclusion. Most often teachers are following the traditional (teacher centered) method of teaching. The classroom Teachers reasoned the large volume of the textbook, and poor background of students toward the subject for not to use the student centered method of teaching. Both the TVT and CRT are more concerned on covering the content of the textbook than what students have learned. In both the PTV sections and non-plasma TV sections there are only few students not more than 3 or 4 who can raise questions and try to answer question which are raised by teachers. Even teachers do not initiate or encourage them to raise issues for discussion. Encouragement by the teachers and praising of their students has not been practical. Mostly students do not do classroom exercise and home work exercises. As a result students' activity and participation is very poor. And also teacher-student interaction is very minimal to enhance and encourage interactive teaching and learning. Most of the teachers have no good attitude toward their students; they assume their students as not having a good background of the subject, as careless. While students, too, assume that their teachers are not so concerned for their learning; they do not teach them well, they disappoint them by speaking bad words. This shows that there is no good student teacher interaction.

It is clearly seen that the teaching learning of mathematics in both plasma and non-plasma sections dose not enhance students learning of mathematics, since

active student involvement in these teaching learning is minimal. Less interaction between students and teachers has also its own influence in students learning because good interaction is an essential factor in developing student autonomy to helping them to be free to express and share their idea. The non participative traditional method of teaching followed by the teachers limits the students to become passive learners and it aimed at imparting of knowledge or dissemination of information that lead learning to be simply rote memorization. In general the actual teaching learning process is not aligned with effective principles of mathematics learning. Students learn mathematics and be taught effectively, when they are engaged in experiences that help them to make sense of mathematics, in helping them to be active, reflective thinkers, creating problem solving environment, encouraging their interaction and discussion, selection of convenient teaching methods, individual and group opportunities for the development of higher level thinking (NCTM, 1989:5; Van de Walle, 1995:123). In addition it does not consider, what is expected from teachers significant the greatest role in initiating the learners to active learning, cooperative learning, problem solving activities, in critical and higher order thinking skills and other activities which can enhance students learning (Eggen and Kauchak, 1996:6).

Although instructional materials can play great role in the teaching learning of a subject matter, there is great shortage of them in the school. Students do not get textbooks individually; teachers do not have teachers guide, they do not have syllabus and manuals for the TV-lesson. In the same way there are no adequate reference mathematics books in the library. Even though there is very limited number of teaching materials in the SPC mostly teachers do not make use of them. Thus, without adequate IM the teaching learning of mathematics will not be effectively performed.

The study also revealed that large number of students in the school and large class size, shortage of well trained teachers, shortage of IM, negative students' attitude toward learning the subject, teachers negative attitude toward their students and their profession, absence of extra classroom for giving make up and tutorial

classes, having no department office, having no guidance and counseling service in the school, the teaching methodology being teacher centered which do not allow students to be active participant, less teacher student interaction, the partial use of PTV-in the school, large volume of the textbook which forces teachers to think of only in covering the material rather than their concern on how much students learn as factors(problems) that negatively affect the teaching learning of mathematics in Yekatit 25/67 Secondary School.

All these shows that the current teaching learning of mathematics in Yekatit 25/67 Secondary School could not enable students to achieve the aim of mathematics teaching in the first cycle of our secondary school aimed at *“students acquire and develop solid mathematical knowledge skill and attitudes that significantly contribute to the creation of citizens who are conscious of the social, economic, political and cultural realities of Ethiopia and that can actively and effectively participate in the ongoing process of development of the country (ICDR, 2004:1) ”*. As a result it is very difficult to contribute to the achievement of the aims and objectives stated in our educational and training policy related to mathematics.

5.2. Recommendations

Therefore, participants of the present study recommended the following points to improve the future teaching learning process of mathematics in Yekatit-25/67 secondary school.

- The Hadiya Zone educational office has to think of opening another secondary school in Hosanna town so that the large number of students in the school can be shared.
- Increasing the number of well-qualified teachers.
- The school has to work hard in providing enough IM by organizing government and non-government organizations.

- Changing teachers' negative feeling toward teaching their subject and their attitude toward their students by arranging panel discussion among teachers and students, among teachers themselves, and giving short term and long term trainings and any other possible means.
- Creating a good teachers-student interaction so that students will feel free in expressing their idea.
- The TVT have to consider the time to be given for exercise and should give some gap for students to write (copy).
- Teachers should try to use method of teaching that can enable students be actively involved in the learning process and should be flexible in applying different methods of teaching.
- Guidance and counseling service have to be practical in the school
- Textbooks should be revised so that its volume of the content could be manageable and it can encourage students' active participation and that can enable them to solve practical problems in their daily life.
- Generator or some other means should be provided so that students will not miss TV-lesson during electric light break.

Bibliography

- Aggarwal, J.C (1996). **Principles, Methods and Techniques of Teaching**. Vikas Publishing House: Delhi
- Akalu.C(2001).**Availability and Utilization of Instructional Materials for Mathematics Instruction in Primary Second Cycle Schools. The Case of Sidama Zone in SNNPR**. (Unpublished) M.A thesis. AAU.
- Amare. A (1999). **Availability and Use of Instructional Materials in Tigray Primary School**. IER FLAMBEAU, Vol. 7, No. 1.AAU
- Amare (2002). **An Andragogic Approach to Teaching and Learning**. IER FLAMBEAU. Vol. 8, No.1, pp73-88. AAU.
- Amera. S (2004). **Educational Research Practices of Bahir Dar University Teachers: The case of Education Faculty**. (Unpublished) M.A Thesis. AAU
- Benett. N and McNamara. D (1979). **Focus on Teaching**. Readings in the Observation and Conceptualization of Teaching. London:Longman Group Limited
- Best, J.W, Kahun, J.V (1993). **Research in Education** (7thed). New Delhi:Prentice Hall Indian Private Lid.
- Borg, W.R etal., (1970). **A Microteaching Approach to Teacher Education**. California: Macmillan Educational Services, Inc.
- Borich, G.D (1988). **Effective Teaching Methods**. NewYok: Macmillan Publishing Company
- Broomes, D etal. (1995). **UNESCO. Teaching Primary School Mathematics** Jamaica: Ian Randle Publishers
- Burns,M.(1992).**AboutTeachingMathematics:AK_8Resource**. Sausalito,CA:Mathematics Solution Publication

- Callahan, J.F and Clark, L.H (1988). **Teaching in the Middle and Secondary Schools. Planning for Competence (3rd ed)**. New York: Macmillan Publishing Company
- Capel, S etal., (1995). **Learning to Teach in the Secondary School. A Companion to School Experience**. London: By ROUTLEDGE
- Carin, A.A, Sund, R.B (1989). **Teaching Modern Science (5th ed)**. Melbourne: Merrill Publishing Company
- Chauhan, S.S (1997). **Innovation in Teaching Learning Process**. New Delhi: Vikas Publishing House Pvt Ltd.
- Cherinet T.W (1999). **Parental Attitude Toward Children with Mental Retardation. The Case of Five Families in Nazareth Town, Ethiopia**. (Unpublished) M.P Thesis. University of Oslo
- Clark, L.H and Starr, I.S (1986). **Secondary and Middle School Teaching Methods (5th ed)**. London: Collier Macmillan Publishers.
- _____ (1991). **Secondary and Middle School Teaching Methods (6th ed)**. London: Collier Macmillan Publishers.
- Clement and Battista (1992). **"Geometry and Spatial Reading"**. In Grows, D.A. (ed). Handbook of Research on Mathematics Teaching and Learning. New York :Macmillan
- Cohen L. etal (2003). **Research Method in Education**. New York: Taylor and Francis Group
- Cohen, L and Manion, L (1989). **Research Methods in Education (3rd ed)**. London: ROUTLEDGE
- Cohen. L, etal. (1996). **A Guide to Teaching Practice (4th ed)**. London: By ROUTLEDGE
- Connel W.F (1987). **History of Teaching Methods**. In Dunkin, M.J (ed). The International Encyclopedia of Teaching and Teacher Education. Oxford: Pergamon Press. PP201-214

- Costello. J (1991). **Teaching and Learning Math's 11-16**. London: Routledge
- Cotton, K (1996). **School Size, School Climate, and Student Performance**. Portland, Oregon: NREL
- Coulter. F (1987). **Home Work**. In Dunkin M.J (ed). **The International Encyclopedia of Teaching and Teacher Education**. Oxford:Pergamon Press.pp272-276
- Cox, D.R (1968). **Principle of Learning for Teachers**. Addis Ababa: Artistic printers Ltd.
- Curzon, L.B (1990). **Teaching in Further Education**. An Out line of Principles and Practice (4th ed). London: Cassel Educational Limited
- Cushman, K (1997). "Why Small Schools are Essential. Horace
- Darge Wole (1995). **The Learning Processes**. In Matiru. B etal. (ed). **Teach your Best**. Germany: Institute for Socio-Cultural Studies. University of Kassel
- Davies, I.K (1981). **Instructional Technique**.New York: Mc Graw-Hill Book company.
- Dean, P.G (1982). **Teaching and Learning of Mathematics**. London: WOBURN PRESS.
- Denzin N.K, Lincoln Y.S (1994). **Handbook of Qualitative Research**.London: Sage Publication, Inc.
- Desalegn.C (2000). **Qualitative and Quantitative Methods in Educational Research: Conceptual Frame Works and Empirical Studies**.Current Issues of Educational Research in Ethiopia Proceeding of National Conference Held in Nazereth. IER. Addis Ababa University. Pp111-125
- Dooley. D (1995). **Social Research Method (3rd ed)**. New Delhi: Prentice Hall of India PTV. Ltd.
- Dubisch. R (1963). **The Teaching of Mathematics**. From Intermediate Algebra Through First Year Calculus. New York: John Wiley and Sons, Inc.
- Eggen, P.D and Kauchak, D. P (1996). **Strategies for Teachers**. Teaching Content and Thinking skills. Singapor: Allyn and Bacon.

- FDRGE (1994). **Educational and Training Policy**. Addis Ababa: St. PRINTING PRESS
- Flander (1970). **Analyzing Teaching Behavior**. Sydney: Addison-Wesley Publishing Company
- Fraenkel, J. R. Wallen, N.E. (1993). **How to Design and Evaluate Research in Education (2nd ed)**. New York: Mc Graw-Hill Inc.
- Gall M.D (1987). **Discussion Method**. In Dunkin, M.J (ed). The International Encyclopedia of Teaching and Teacher Education. Oxford: Pergamon Press. pp232-237
- Gall, M.D et al. (1996). **Educational Research an Introduction (6th ed)**. USA; Longman
- Gomm, R. et al (2003). **Case Study Method**. London: SAGE Publications
- Gredler, M.E. (1997). **Learning and Instruction**. Theory in to Practice (3rd ed). New Jersey: Merrill, an Imprint of Prentice Hall.
- Heinch. R et al (1989). **Instructional Media and the New Technologies of Instruction (3rd ed)**. New York: Macmillan publishing company
- (1999). **Instructional media and Technologies for learning (6th ed)**
New York: Mettrill Prentice Hall
- Hersh, R. (1986). **Some Proposals for Revising the Philosophy of Mathematics**. In T. Tymoczko (ed), **New Directions in the Philosophy of Mathematics**. Boston: Birkhauser
- Hiebert, J. and Carpenter, T.P (1992). **"Learning and Teaching Mathematics"**. In Handbook of Research on Mathematics Teaching and Learning. Douglas A. Grouws. Macmillan.
- ICDR (1998). **A Survey on the Teaching Learning of Mathematics**. In Some Selected Ethiopian Secondary School (Unpublished). Addis Ababa
- _____(1999). **Teachers Education Handout**. Addis Ababa: MOE.
- _____(2001). **Mathematics Syllabuses for Grade 9 and 10**. Addis Ababa: MOE.

_____ (2004). **Mathematics Guide for First Cycle Secondary Education.** Addis Ababa

Johnston, S. (1994). "Experience is the Best Teacher, or is it? An Analysis of the Role of Experience in Learning to Teach. *JTE*, 45(3), pp199-208.

Johnson et al. (1991). **Leading the Cooperative School.** Edina, MN: Interaction Book Company

Juijman, A.C (1994). **Cooperative Learning.** In Husen. T, Postlethwaite, T. (ed)

Keppel F (1963). **Goals of School Mathematics.** The Reports of the Cambridge Conference on School Mathematics. Boston: Houghton Mifflin Company

Kilpatrick. J (1994). **Mathematics Education, History of.** In Husen. T, Postlethwaite T. N (ed). *The International Encyclopedia of Education* (2nd ed) . Vol. 6, pp3643-3647.

Knott.M and Mutunga.P(1995).**Method of Teaching and Learning.** In Matiru.B et al,**Teach Your Best. A Handbook for University Lecturers.** Germany: Institute for Social-Cultural Studies University of Kassel

Krantz, S.G (1999). **How to Teach Mathematics** (2nd ed). American Mathematical Society. USA: Providence, Rhode Island.

Larcombe (1985). **Mathematical Learning Difficulties in the Secondary School: Pupil Needs and Teachers Rdes.** Philadelphia: Milton Keynes

Lecompte D and Pressle. J (1993). **Ethnography and Qualitative Design in Educational Research** (2nd ed). Sandiago: Academic Press Inc.

Lee, V. E. and Smith, J.B. "High School Size which works Best, and for whom?" Paper Presented as the 1996 annual meeting of the American Educational Research Association in New York.

Lockheed,M.E et al. (1991). **Improving Primary Education in Developing Countries.** A World Bank Publication.

Manning, B.H, Payne B.D (1996). **Self Talk for Teachers and Students.** Metacognitive Strategies for Personal and Classroom Use Singapore: Allyn and Bacon.

- Matiru, B etal (1995). **Teach your Best**. A Handbook for University Lecturers. Germany: Institute for Socio-Cultural Studies University of Kassel.
- Mccaul, P.A (1994). **Teacher Pupil Interaction in Mathematics Classes: A Study of Current Classroom Practice in Selected Secondary Schools in Addis Ababa**. (Unpublished) M.A Thesis. AAU.
- McCombs, B.L (1993). **Learner-centered Psychological Principles for Enhancing Education: Application in School Settings**. In Louis A. Pnner etal. (ed). *The Challenges in Mathematics and Science Education Psychologies Response*. Washington, DC: American Psychological Association
- McCormick, C.B, Pressley M (1997). **Educational Psychology**. Learning, Instruction, Assessment. New York: Longman.
- Merriam, S.B (1988). **Case Study Research in Education: A Qualitative Approach**. Sanfrancisco: Josey Bass Publisher.
- NCTM(1989). **Curriculum and Evaluation Standard for school Mathematics**. Reston, VA: Author.
- _____(1991). **Professional Standards for Teaching Mathematics**. Reston, VA: Author.
- _____(2000). **Principles and Standards for School Mathematics**. Reston, VA: Author.
- Nigussie. K (2002). **Conception on Teaching**. In the case of Higher Institution Instructors. IER, FLAMBEAU. Vol. 10, No. 1, pp23-26
- Nkuuhe. J (1995). **Instructional Media**. In Matiru. B etal(ed). **Teach Your Best**. A Handbook for University Lecturers. Institute for Socio Cultural Studies. University of Germany: Kassel
- NRC (1989). **Every Body Counts. A Report to the Nation on the Future of Mathematics Education**. Washington, D.C: National Academy of Sciences.
- Orton. A (1992). **Learning Mathematics**. Issues, Theory and Classroom Practice (2nd ed). London: Cassell

- Owen, A and Rousham, L (1996). **Mathematics is that a Kind of Game for Grown Ups**. In David white Bread (ed.). Teaching and Learning in the Early Years. London: Roulledge
- Perrott, E (1982). **Effective Teaching**. A Practical Guide to Improving Your Teaching. England: Longman Group UK limited
- Portman, J. and Richardson (1997). **The Mathematics Teacher Hand Book**. London: Heinemann Educational Publishers.
- Reda, D (2001). Conception of Constructivist Teaching Approaches in Higher Education: A Case Study. IER, FLAMBEA, Vol, No.1, PP 57-63
- Robson, C. (1993). **Real World Research**. USA: Black Well Publishers Inc.
- Romberg and Carpenter (1986). **Research on Teaching and learning Mathematics: "Two Disciplines of Scientific Inquiry."** In Wittrock, M.C.(ed). **Handbook of Research on Teaching**. New York: Macmillan Publishing Company.
- Ross, J.R. (1998). **The Antecedentes and Consequences of Teachers Effectivity**. In Jere Brophy (ed.). Advances in Research on Teaching Expectation in the Classroom Vol. 7, 1998. London: JAI Pressing: pp49-60
- Roskopf and Fey (1972). Mathematics Behavior of Children .In Mitzel, H.E(ed). Encyclopedia of Educational Research. New York: Free Press.
- Sidhu, K. S (1981). **The Teaching of Mathematics**. Revised and Enlarged Edition. New Delhi: Sterling Publishers Private Ltd.
- Singh, B (1988). **Teaching Learning Strategies and Mathematical Creativity**. Delhi: Mittal Publication.
- Slavin, R.E(1991). **Synthesis of Research on Cooperative Learning**. Educational Leadership, 48(5), 71-82
- Smith, T.C (1990). **Introduction to Education (2nd ed)**. Sanfrancisco: West Publishing Company

- Swan. M etal. (2000). **The Purpose of Mathematical Activities and Pupils' Perception of them**. Research in Education. An IIRJ No. 63. pp 11-20. England: Manchester University Press
- Tegene. B, Tsegaye. B (1999). Handout for **Social Foundation of Education**. (Unpublished) AAU.
- Tekalgn Z (2001). **Factors Affecting Teaching Performance of Fresh Teachers**. The Case of Arbaminch Water Technology Institute. IER, FLAMBEU Vol. 9, No.1, pp11-18.
- UNESCO (1979). **The Teaching of Mathematics in Secondary Schools**. International conference on Education. France: UNESCO.
- Van de Walle, J.A. (1995). **Elementary School Mathematics: Teaching Developmentally**. White plains, NY: Longman
- Walklin. L (1990). **Teaching and Learning in Further and Adult Education**. England: Stanley Thornes Ltd.
- Wamahiu, S.p and Karugu, A.M (1995). "Qualitative Research in Education." In Mwiria, K. and Wamahiu, P.S (ed). Issues in Educational Research in Africa. Nairobi: East African Educational Publishers pp.114-130
- Wellington, J.J (1996). **Method and Issues in Educational Research**. London: Impact Graphics
- Whitebread D (1996). **Teaching and Learning in Early Years**. London: ROUTLEDGE
- Wiersman (1995). **Research Method in Education: An introduction**. Boston: Allyn and Bacon
- Withall (1987). **Teacher Centered and Learner-Centered Teaching**. In Dunkin J.J (ed). **The International Encyclopedia of Teaching and Teacher Education**. Oxford: Pergamon Press. pp327-336.

----- (1997). የየካቲት 25/67 ከፍተኛ 2ኛ ደረጃ ት/ቤት ዓመታዊ መጽሔት

Yin, R.K (2003). **Case Study Research. Design and Methods** (3rd ed). Thousand Oaks;
California: SAGE Publications

Ysseldyke, J etal (2003). **Effect of Learning Information System on Mathematics
Achievement and Classroom Structure.** JER, Vol. 96, No.3, pp163-173.

Appendix A

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF EDUCATION
DEPARTMENT OF TECS

An interview for mathematics teachers of Yekatit 25/67 Secondary School

1. For how long you ^{have} been teaching mathematics.
2. How do you feel being : : a mathematics teacher?
3. How do you express the classroom organization of your school in relation to the teaching learning of mathematics?
4. How do you see your teaching experience, qualification and your teaching load for the teaching of mathematics?
5. How is the teaching learning of mathematics going on in your school?
6. How do students learn mathematics in the school?
7. How is your and the TVT approach in teaching the subject?
8. How is the activity and participation of the students in the teaching learning?
9. How is your interaction and relationship with your students in the teaching learning of mathematics?
10. How do you express the availability and utilization of the necessary IM in the school?
11. What is your conception on the problems that affect the teaching learning of mathematics in the school?
12. What do you think is the solution of those problems you have mentioned?

Appendix B

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF EDUCATION
DEPARTMENT OF TECS

An interview for students in the FGD of grade 9 and 10 of Yekatit 25/67 Secondary School

1. How do you express the teaching learning process of mathematics at your school?
2. Express how are you learning mathematics?
3. How do you explain your CRT as well as your TVT in teaching mathematics?
4. How do you see the approach of the teachers in teaching mathematics?
5. How is your interaction with your teachers in the process of the teaching and learning of the subject?
6. How suitable is your classroom organization for teaching and learning of the subject?
7. How is your activity and participation in the teaching learning process of mathematics?
8. How is the experience of your teachers in applying different instructional materials while they are teaching?
9. How is the availability of IM in the school?
 - Text book for students
 - Reference books in the library
10. How is the availability of important reference books in the school library?
11. What are the factors you think can affect the teaching learning of mathematics? How do it affect?
12. What is the solution for those factors that affect the teaching learning of mathematics at your school?