The Evaluation of Grade Ten Mathematics Curriculum and its Implementation in Addis Ababa City Administration

By

Akalewold Andargu

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Mathematics is one of the oldest and most fundamental subjects. Its history can be traced back to the history of human beings. In early civilization, pre historic people used counting as the earliest mathematical activities. They counted their properties by matching object to different body parts mainly fingers and toes (Bochner,1966). Moreover, the concept of number was developed from the relationship of the objects and fingers. For instance, the conceptual meaning of six was a hand and a finger (five plus one); seven was a hand and two fingers...., ten was two hands (five fingers plus five fingers). (Encyclopedia, 1994).

The first advance in arithmetic was the conceptualization of numbers and intention of fundamental operations (addition, subtraction, multiplication and division). Further progress in mathematics had to await the Babylonian and Egyptian of about 3000 B.C. During this time, arithmetic and simple algebra were used to exchange money and merchandise (James,1958).

The Babylonian created calendar reckoning, which was used to determine time for plant and religious events; division of a degree and a minute into 60 equal parts each originated in astronomy; a numeration system that used base ten from number 1 to 59, which lacked zero. However, the numeration system of the Egyptian was also interior to the Babylonian because the Egyptian's used a non positional base ten system with number 1 through 9. That means, it was difficult to distinguish for example, 32 and 23. The Egyptian used the concept of mathematics for setting time of religious, holidays, to predict the annual flooding of Nile and to measure their land.

In addition to Babylonians and Egyptians, the classical Greeks, Indians and Arabians contributed some points on the development of mathematics in early period. The classical Greeks solved equations involving unknown quantities by serious of construction (adding, subtracting, multiplying and dividing of lines). The successor of classical Greeks in the history of mathematics were the

Abbreviations and Acronyms

AAU- Addis Ababa University

EGSECE- Ethiopian General Secondary Education Certification Examination

ICDR- Institute of Curriculum Development and Research

ICT- Information Communication Technology

IPP- Input, Process and Product Model

KAS- Knowledge, Attitude and Skill

MOE- Ministry of Education

ETP- Education Training and Policy

TGE- Transitional Government of Ethiopia

Abstract

The main objective of this study was to evaluate the contents and intents of Grade 10 mathematics in Addis Ababa City Administration. In order to evaluate the contents organization (Coverage, integration and Sequence) in the syllabus and textbook, both quantitative and qualitative data were collected through content analysis and interview. Similarly, the evaluation of the intents were done by quantitative data collecting instruments (questionnaires) from 32 teachers and 224 students from the schools under study. Moreover, the data gathered from syllabus, textbook teachers and students were analyzed quantitatively. Besides, the data gathered through interview and documents were analyzed qualitatively. The result showed that the coverage of objectives (KAS), the integration and sequence of contents were not adequately treated in the communication materials to bring maximum learning on students. Regarding this, the chi-square (x^2,2,N=841) =36.17 $p<0.05$ indicated that there was a very high significant difference between the number of observed frequencies and expected frequencies of the objectives developed in relation to coverage. Moreover, the integration of content did not consider the correlation of scheduling topics. Regarding intents, the result showed that, most of the teachers did not use variety of teaching methods (65% always use explanation). Most of the students were not happy in the mathematics period (68.8%) and 75% of the students did not enjoy learning mathematics through plasma and 72.3% of students were less involved in the teaching learning processes of grade 10 mathematics. In addition, the background mathematics knowledge of students took the first rank from the factor that hinder the implementation. Based on these findings, it is recommended that the coverage, integration and sequence of contents in relation to other subjects, students' psychological and behavioral changes and even the abstract nature of the subject itself should be considered in the preparation of the grade 10 mathematics communication materials in the forth coming edition.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

It is a common standpoint these days that education is an instrument for the overall development of a society. The observance for development certainly necessitates sufficient and quality instrument and that is education. According to Aggarwal (1996:5)

> *Education is the process which draws out the best in the child with the aim of producing well balanced personalities culturally refined, emotionally stable, ethically sound, mentally alert, morally upright, vocationally self sufficient, physically strong, socially efficient and internationally liberal.*

In this context, education helps human beings to have overall development such as language, creative, emotional, intellectual, spiritual, physical, motor, social and aesthetic appreciation developments. It aims to influence man's personal development and process by which he/she transmits his/her experience to strengthen individuals and society's problem solving capacity (Shiundu and Omulando, 1992; TGE, 1994). In general, to bring the developments on an individual, one is educated through formal and informal ways. Education, formally, is a conscious and deliberate process; well planned to modify the behavior of the learner in desirable and socially approved channels; to bring about in the learner specific knowledge and skills. This deliberate process will be managed through an effective plan. The effective plan of education is generally termed as 'curriculum' (Ornstein, 2004; Shiundu and Omulando, 1992).

The purpose of all curriculum planning is to provide opportunities for an individual student or group of students to benefit maximally from participation

in learning activities. Well planned and organized curriculum answers the questions like: Why to learn?, what to learn?, when to learn?, and how to learn? (Derebssa, 2004). Hence, curriculum is one of the requirements in the formal education sector.

The objective of any curriculum in general and mathematics curriculum in particular benefits the society by developing knowledge, attitudes and skills and subsequently use it in solving problems and improving way of life (TGE, 1994). This is realized if and only if the developed curriculum is effectively implemented. Moreover, the Ethiopian Education and Training Policy (TGE, 1994) has given attention to mathematics instruction at all levels of primary and secondary education. Hence, in our education system the level of mathematics as a subject has been very important. According to Solomon (2008:82),

> *Curriculum in Ethiopian context, therefore, is nothing but an educational plan for action derived from a predetermined national education policy, assumed to facilitate the country's development. It is expressed in the form of subject syllabi or curriculum guides prepared at the center and distributed to regions; series of text books span many grades, and teacher's guides.*

In general, it is a plan for an educational program towards the predetermined goals and out comes. Specifically, mathematics curriculum is organized and expressed in the form of mathematics curriculum guides or syllabi at different grade levels. The curriculum guide at each grade level consists of objectives of mathematics learning, different task of students, general hint on methodology and organization, an outline of contents and contents of study. (ICDR, 2004).

Mathematics is one of the oldest and most fundamental subjects. Its history can be traced back to the history of human beings. In early civilization, pre historic people used counting as the earliest mathematical activities. They counted their properties by matching object to different body parts mainly fingers and toes (Bochner,1966). Moreover, the concept of number was developed from the relationship of the objects and fingers. For instance, the conceptual meaning of six was a hand and a finger (five plus one); seven was a hand and two fingers...., ten was two hands (five fingers plus five fingers). (Encyclopedia, 1994).

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all pupils. The core subjects were Amharic, English, Mathematics, History and Geography. Hence, from the above reviewed literature one can understand that the historical development of mathematics curriculum in Ethiopian education was rooted back to the introduction of modern education.

Mathematics is one of the corner stones of our civilization. That means, it has many applications in the real world. For instance, in our day-to-day life we apply the concept of mathematics (telling time, exchanging money, feeding). Moreover, science and technology, physical sciences (Astronomy, Physics, and Chemistry) and social sciences (Economics, Accounting, Psychology, Sociology etc) depend heavily on the concept of mathematics. Most of the above fields use mathematical theory, computational technique, algorithm and the latest computer technology to solve economic, scientific and business problems.

Supporting this idea, Kinfu (2008) stated that the subject has a wide range of application in architectural and engineering projects. It helps industries to design, to develop and to test products and manufacturing processes. UNSCO (2000:5) described

> *Mathematics, the world over has always been considered as a bridge not only between science and technology but also between all the subjects offered in formal education system. Any one who is good in mathematics is presumed to be able to cope with other school subjects.*

This implies that learning of mathematics or the knowledge of mathematics can bring about awareness and growth in scientific and technological thought and activities. It also underlines the central role of mathematical knowledge in the rapid revolutionary activities in science and technology of the modern society.

This study evaluated the revised grade ten mathematics curriculum of 2004, which includes curriculum guides, text books, and teacher's guide in terms of

the criteria of curriculum organization (integration, sequence, scope, relevance, continuity), coverage (KAS) objectives, content, teaching methods, evaluation techniques and the actual teaching learning process. This is because the key focus of curriculum evaluation is to determine whether or not the curriculum as in the master plan is being implemented. That means: Are the objectives being addressed and presented as recommended? Are the students involved in the instructional process? Are the materials recommended for use being used in the way recommended? And are the expected outcomes achieved as desired? (Derebssa, 2004:203-204).

1.2. Statement of the Problem

There are many issues, which hammer our mind in the arena of education. Curriculum development, curriculum organization, curriculum implementation and curriculum evaluation are among the issues which come to our mind again and again. On the other hand, the ETP (TGE, 1994) focuses on developing students' creative, productive, problem solving ability, skills, and address the needs and problems of society. To narrow the gap between the policy objectives, and the teaching learning process, for example, curriculum revision was made at secondary level in 2004 to make the content relevant to students' lives in particular and the needs and problems of the society in general. (ICDR, 2004).

It is believed that mathematics has a very crucial role to play in one's academic life and the life outside the academic environment. For example, a pass in mathematics is a requirement for all students who wish to join a higher learning institution in Ethiopia. It is also a backbone of science subjects such as physics, chemistry, technology, engineering, medicine and the like. Moreover, in the near future the Ethiopian Government will need to implement the new policy where 70% of the total enrollment of the total numbers of students join science and technology faculty in higher institutions, which will depend highly on the knowledge of mathematics. (Source: Conference through plasma about quality of Education, MOE, February, 2009).

Despite its crucial importance in students' academic life, it is curious paradox to observe that there are a large number of students in grade 10 level who do not perform well and achieve good results in mathematics. To show this fact, the researcher was saw the EGSECE students' mathematics result of three schools in 2007/8 (2000E.C) as shown in the appendix –A. As can bee seen from the table, only an average of 2.4% scored "A", 5.6% scored 'B' , 35.7% scored "C" , 35.6% Scored "D" and 20.6% scored "F". As indicated in the table, 56% scored below the standard point or grade 'C'.

In addition, the students are unable to perform different problems in physics, chemistry and other subjects, which need the application of mathematical concepts and principles. This with it, the implication that there is a felt need for information on how mathematics curriculum of this grade was developed? how mathematics is taught at a classroom level? These and the likes are among the problem areas that need to be investigated.

Therefore, the focus of this study is to evaluate the Grade ten mathematics curriculum whether or not it is developed according to the criteria of curriculum organization (continuity, sequence, scope, integration and relevance). It also, attempts to find out, the problems encountered in developing this curriculum and the problems that are faced during the implementation in school environment.

1.3. Objective of the Study

The main objective of this study is to evaluate grade ten mathematics curriculum development in relation to criteria of curriculum organization and its implementation as intended in master plan.

The specific objectives are:

1. to identify and indicate whether or not the curriculum development is organized following the criteria of curriculum organization such as continuity, sequence, scope, integration and relevance.

2. to assess whether or not the student- teacher classroom interaction match with the specification of curriculum guide.
3. to identify and determine the major factors that hinder effective implementation of grade ten mathematics.
4. to identify students' attitudes about learning mathematics.

1.4. Research Questions

To achieve the above objectives, the following basic questions are formulated

1. Is Grade ten mathematics curriculum coherently developed? i.e.
    a. How much are the objectives developed in the syllabus relatively cover the three domains of learning (KAS)?
    b. Is there integration in mathematics curriculum?
    c. Does the mathematics curriculum content follow the logical and psychological sequences?
    d. How relevant are the contents?
2. Is the Grade ten mathematics curriculum implemented as intended?
3. How do the students feel about learning mathematics?

1.5. Significance of the Study

Since mathematics is the backbone of all subjects, the evaluation of the mathematics curriculum at each stage is necessary in order to see what ought to be and what ought not to be. This study is concerned with evaluation of grade ten mathematics curriculum and its implementation. Therefore, this research may help curriculum designers to see the weaknesses or problem of coherency (sequence, integration, scope, continuity and relevance) and to improve in the forth coming edition; to show the weaknesses of producing objectives, contents, methods and assessment techniques of the curriculum guide of grade ten mathematics from the ETP perspective. It may help mathematics teachers to see their weaknesses of implementing as intended; to contribute to decide about curriculum modification or improvement, and it my help also other researcher for further investigation in the area.

1.6. Delimitation of the Study

The evaluation of grade ten mathematics curriculum includes several aspects such as objectives, relevant contents, teaching methods and other curricula issues.

It would be much advantageous if this study covers some more regions of the country. However, due to financial and time constraints, the study is delimited to only Addis Ababa City Administration with specific references to six high schools from three sub-cities. As was tedious and time consuming to conduct the study at all secondary schools, the six high schools were selected using random sampling technique. According to Lyman (1993) in random sampling every different sample of size- n from the population has an equal probability of being selected.

1.7. Limitation of the Study

No one could absolutely handle everything while conducting the research. Hence, the study might be limited up to the sight of the researcher and the data obtained from the study area.

1.8 Definition of Terms

- ***Evaluation***- is the systematic process of collecting, interpreting, analyzing and synthesizing information about mathematics curriculum from curriculum guide, text books, teachers guide and from actual teaching learning process.
- ***Mathematics curriculum***- is a curriculum which comprises syllabus, text books, teacher's guides and the place where teaching learning process takes place.
- ***Curriculum development***- in this study includes collecting information, curriculum planning, organizing the syllabus and other instructional materials of mathematics in line with the educational objectives.
- ***Effective implementation***- is the process of putting the developed mathematics curriculum into practice as intended.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Education and Curriculum

The concept of education is like a diamond which appears to be of different nature when seen from different points of views or philosophies of life. There are four important reasons for these concepts of education: the complex nature of human personality, the complex nature of the environment, the different philosophies of life and the different educational theories and practices (Aggarwal, 1996:Kelly, 2004). Whatever the concept of education, the aims of education comprise education of the mind, which is education of knowledge; education of the hand, which is technical and skill education; and education of the heart, which is moral education. Moreover, according to Delors (1998), '... education can be constructed on four pillars of learning: learning to know, learning to do, learning to be and learning to live together. In line with these pillars of learning,(TGE, 1994) in its NETP expressed that the aims of education are to strengthen individual's problem solving capacity (learning to do), to bring up citizen who can take care of and utilize resource wisely (learning to be), to bring up citizen who respect human rights, stand for the well-being of people as well as for equality, justice, and peace (learning to live together), and to cultivate the cognitive, creative, productive, and appreciative potential of the citizens (learning to know).

The curriculum of any country is described as vital instrument of education and should attempt to achieve the above basic aims of education. In fact, the idea of curriculum is similar with that of the concept of education. That is why different scholars express the meaning of curriculum differently. For instance, curriculum is the sum total of the syllabi of the school, which included what is taught and the reason why it is taught. It is an attempt to communicate the essential principles and features of an educational proposal in such a form

that is open to critical scrutiny and capable of effective translation into practice (Stenhouse, 1975; Shiundo & Omuland, 1992). For Kelly (2004), curriculum at all levels should be concerned to provide a liberating experience by focusing on such things as the promotion of freedom and independence of thought, of social and political empowerment, of respect for freedom of the others, of an acceptance of variety of opinion and of enrichment of the life of every individual in that society regardless of class, race and creed. Furthermore; Derebssa (2004) suggest that the definition of curriculum should at least consist of the four layers such as: 1) intended curriculum, which is the written document. On societal level it can be national curriculum or a regional syllabus, at local level it can be school districts curriculum or textbook. It is what is intended to be taught, how it is intended to be done, and under what intended circumstances; 2) the expressed curriculum, called enacted curriculum or manifested curriculum else where; 3) the hidden curriculum, which is the side effect of the planned curriculum, can not be ignored during implementation and evaluation. According to Seddon (1983) as cited in Derebssa (2004), hidden curriculum, involves the learning of attitudes, norms, beliefs, values and assumption often expressed as rule and 4) the experienced curriculum is the students' actual experience in the classroom which is the combination of the above three layers in which the students are exposed (Derebssa, 2004; Kelly, 2004; Solomon, 2008).

In general curriculum is an organized set of formal education and/or learning intentions. These intentions are about what learning students are to develop, the means of evaluation to assess learning, the materials and equipments to be used and so forth. Furthermore, curriculum articulates the relationships among its elements (objectives, contents, evaluation etc), and integrating them into unified and coherent whole (Amare et.al, 2000). In a narrow sense, curriculum is defined as an outline of the course of study.

The above concept of curriculum does not go alone rather it is related with the educational policy, theories and philosophies. Policy is a course of action adopted by a government. The government of one country might formulate its educational policy in general and the curriculum by considering the educational theories and philosophies. Thus, the Education policy in Ethiopian context is a specification of principles and actions, related to educational issues, which are followed or which should be followed and which are design to bring about a desired goals (TGE, 1994). According to rationalists view, curriculum is the subject matter to be taught and nothing else. For them, the curriculum objectives derived from philosophy and must, thus, be ideal centered. They also believe that the contents of curriculum have to be determined by academic experts who have acquired the necessary skills, rules, principles and made of inquiry (Derebssa, 2004). Above all, for them, the task of the school is fostering intellectual development and character formation and hence, the major stress of the curriculum is the intellectual development skill, which is assumed to develop students' mental powers and increase their abilities to use reasons.

According to TGE (1994), the overall strategy of the curriculum of the country focuses on the following points.

> *The preparation of curriculum will be based on the stated objectives of education, ensuring that the relevant standard and expected profile of students are achieved; create a mechanism by which teachers, professionals from major organizations of development, and beneficiaries. Participate in the preparation, implementation and evaluation of the curriculum; ensure that the curriculum developed and the textbooks prepared at central and regional level, are based on sound pedagogical and psychological principles and are up to international standard, giving due attention to concrete local conditions and gender issues.*

Hence, these strategies of curriculum should be taken into consideration during the curriculum development of any subject in general and mathematics in particular.

2.2. Curriculum Development

There is a valid consensus among policy makers, educationalists, curriculum experts that there is a natural and dynamic relationship between issues and practices inherent in educational policy, curriculum and curriculum implementation process (Solomon, 2008; Derebssa, 2004; Kelly, 2004; Salia, 1989). As a result, the concept of curriculum development depends on the concept of curriculum itself. If we assume curriculum as an outline of a course of study, curriculum development is the process of selecting and organizing the contents of the subjects to be taught. If we assume curriculum as everything that is related to learning experience, curriculum development is the process of considering learners interests and activities, aims, methods, contents, in fact every thing that influences the experience of the learners. In general, curriculum development is the process of making a programmatic decision and for revising the product of those decisions on the basis of continuous and subsequent evaluation (Derebssa, 2004).

The more elaborated and operational meaning of curriculum development in the context of the Ethiopian Educational Policy as given by MOE and ICDR (1994) cited in (Solomon, 2008) reads as:

> *Curriculum development is a comprehensive term that includes collecting of information, curriculum planning, developing syllabus and other instructional materials, trying or testing the materials, improving materials according to the result of the try out evaluation and implementation of the curriculum.*

From the above discussion one can see that curriculum development is a systematic and rationally planned activity that takes into account the child,

society, subjects, assumptions and ideologies about teaching and learning. This means that curriculum development should start from the study of the society, the children, the subject and the philosophical and psychological foundations that can be used as a basis for the course of study. Besides, curriculum organization is considered as one of the important components of curriculum development for it facilitates the fitting of each experience into large whole. Tyler (1950), states that without organization, learning experiences are isolated, chaotic and haphazard. In order for educational experiences to produce a communicative effect, they must be so organized as to reinforce each other, because curriculum organization greatly influences the efficiency of implementation and the degree to which major educational changes are brought in the learner.(Solomon, 2008, Salia, 1989; Tyler, 1950).

The organization and designing of the curriculum in Ethiopia has been divided into two branches: General (1-10) and specialized or vocational (10+ _). A general education fulfils the basic educational needs and includes all aspects of learning and prepares the students for continuing specialized education. On the other hand, the vocational education prepares the students to engage in junior, medium, vocational and higher level education (MOE, 2002). Grade ten is the turning point of Ethiopia educational level in the NETP. It is the place where the students will determine their further learning.

There are two approaches of curriculum organizations namely macro and micro, and vertical and horizontal level of curriculum organization (Derebssa , 2004). The Macro level refers to the relations between educational programs, (vocational and general educations). On the other end the relations between particular concepts, facts and skills with in lesson is referred as micro level of curriculum organization.

Derebssa (2004) is also found that Issues of horizontal curriculum organization would include the meaning and value of interdisciplinary studies. It includes:

integration of subjects (mathematics, physics, chemistry); correlation in scheduling of topics in different subjects so that they complement one another; the need for requests (students must be taken mathematics while taking physics and chemistry); and the value of providing more coherence and relevance of contents through problems oriented curriculum.

Similarly, he expressed that vertical organization, which centers on the concept of sequence and continuity, is concerned with the longitudinal placement of curriculum element.(concepts or knowledge, skills and attitudes). These elements are considered as warp and woof of the fabric of curriculum organization. By warp and woof is meant the vertical and horizontal approach of these elements at different levels and across different subjects. The issue of vertical curriculum organization would include the need for prerequisites ways of providing continuing in curriculum making sure content builds on previous taught content, and ways of sequencing skills or concepts for effective learning. In general, the approaches of curriculum organization are made by considering the criteria of curriculum organizations (Continuity, sequence scope and integration). (Derebssa, 2004; Kelly, 2004; Ragan, 1953; Salia, 1989).

2.3. Curriculum Implementation

In recent years, implementation has become a major educational concern because many of the curriculum projects in the area of language, science and mathematics involving huge costs failed on various counts. Perhaps, the concept of curriculum implementation has been expressed in different ways by different educators, in which all concepts lead to related curriculum meanings. To mention some, Lewy (1977) assumes implementation as the open use of program throughout an entire school system. For stern (1992), curriculum implementation is the translation of curriculum into school reality. Carl (1995) assumes curriculum implementation as the application phases of core syllabi. Still others define curriculum implementation as a stem which involves

extensive action by many parties in which attempts are made to change individual actions, knowledge and attitudes (Marew, 2000).

As mentioned above, all the concepts and definitions given have common sense (agreement) that, curriculum implementation is:

> *a stage at which an innovation is changed into practice in school environment as well as a process of behavioral change in the direction suggested by the innovation occurring in stages overtime. Shortly, it is the process of putting the developed curriculum into effect*
>
> *Moreover, Ornstein and Hunkins (1998:297), viewed implementation as essential part of curriculum development that brings the proposed change into reality.*

2.3.1. Factors Hindering Effective Curriculum Implementation

There are different factors which affect the curriculum implementation. These are factors related to: teachers, schools, students and school administration.

2.3.1.1. Factors Related to Teachers

2.3.1.1.1. Teachers Interest to the Profession and Subject Matter Knowledge

Some may ask questions like, who becomes a teacher? To answer this question, it is essential to search varieties of reasons why people become a teacher. Because it is obvious that complex and serious of events are involved in the decision to spend one's working life as a teacher. The process of becoming a teacher involves more than a purely professional socialization. While we can start from the notion of the acquisition of values, knowledge and skills, the process has to be seen as contingent upon a whole range of psychological and social factors (Lynch and Plunkett, 1973).

No one will choose a life's career on the spur of the moment. Some agreed that many people choose teaching as a spring board, to gain knowledge of a field that they will never leave but will continue to reshape. According to Nelson

(1998), there are various reasons why people become a teacher. He explained some of them as follows: 1)Sometimes a young people will use teaching to escape to being social. He/she may be shy and feel more comfortable speaking and interacting with children than with adults and 2) Many people enter teaching because their relatives have been teachers or because they are among the first in their families to graduate from college.

On the other hand, the teacher is the important human factor, which strongly affects curriculum implementation. Regarding the vital roles played by teachers in curriculum implementation, Shiundu and Omulando (1992:213) stated that "in curriculum implementation various personnel are involved, but perhaps the one whose role is most important in seeing that the programs are successfully implemented is the teacher." Because teachers are those who organize learning experiences and manage the learning environment for the benefit of the learners.

Furthermore, teachers are capable of transforming the knowledge required by the program and also important in translating the planned curriculum. In this regard, Ornstein and Hunkins (1998) noted that teacher with knowledge and competence are and must continue to be central to any curriculum activities. Thus, there is no doubt that teachers' role in teaching learning activities influence students learning and better teacher bring about better learners.

In general, from the above reviewed literature one could justify that the interest of the teachers toward the teaching profession and their capability and competence of subject matter knowledge may affect the successful curriculum implementation.

2.3.1.1.2. Teachers' Instructional Planning and Teaching Methods

Like any process, the teaching learning process is a system process involving inputs (Curriculum, teachers, students, technology), process (interaction of curriculum, teachers, student, technology), and outputs (KAS of students)

(Amare, 2000:77). To organize these three elements of teaching learning process, the teachers should have a deep knowledge on the instructional planning. Instructional planning is a guide line for the teacher what he/she will do and aware him/her self, what material he/she will use during teaching learning process. So that the ineffective instructional planning could affect the successful implementation of curriculum.

Moreover, the teaching method that should be selected by the teacher for a single lesson should focus on the inquiry approach which demands learners to discover things for themselves. However, by giving lectures after lectures, the traditional teacher has discouraged the development of student skills, and critical minds. Analytical skills are developed by encouraging learners to generate questions and answer for themselves. Thus, the teaching methods, which are developed by teacher should focus on the Andragogy (the art and science of helping adults learn) (Amare, 2000). Above all the teacher should have a power of selecting the appropriate teaching method for the particular lesson. If the teacher fails to use the appropriate teaching method, implementation may fail under question mark.

2.3.1.2. Factors Related to Organization

Teachers' lack of sense of ownership of the policy and their attitudes to their profession, their knowledge and skills to implement the proposed curriculum, the physical environment of the schools added with politicization of teachers practice are among the factors which have limited or influenced the practice of teaching and learning and thus curriculum implementation (Solomon, 2008). In addition, there are various aspects of organization that are directly related to implementation process. These aspects are the quality of the principals to manage the organization, the quality and quantity of staff development program, computability of school for innovation, the communication channel that would allow continuous flow of information among people involved in the implementation and the availability and use of instructional materials Pratt (1983).

Schools' human resources and material resources are very important for effective curriculum implementation. However, without good management on the part of school principals, these human and material resources would not bring any important change. It is obvious that even the best designed curriculum which is supposed to be practiced in a resourceful environment brings about nothing if it is not supported by a good leadership.

Educators have different views on the role of school principal during curriculum implementation. For instance, (Fullan, 1991; Kroemer and Crawford, 1973) expressed the role of the principal as "shaping the school environment and facilitating the implementation process." Bradley (1985), added that the curriculum process (development, implementation and evaluation) is the 'heart' of the principals work. The curriculum world is full of planners, and initiators. The place where the curriculum development ineffective is in the implementation process, which is highly need the task of the principal and therefore, the principal is an effective leadership if he/she able to explain the innovation to teachers and other communities in terms of classroom implementation; able to coordinate teacher in the participation of the implementation of new innovation and able to facilitate the whole school environment for implementation.

The quality of the principal may affect the effectiveness of curriculum implementation and thus the role of principal in either initiating or promoting the new program and facilitating or making decision when needed is crucial during implementation.

The cooperation among the staff members (teachers, principals, and other concerned body) is also very crucial for curriculum implementation because curriculum implementation is a team work. If all members actively participate in curriculum development and implementation, it is likely that implementation would be effective. Moreover, communication channels must be open so that

the program does not come as surprise to the people. Frequent discussion about a new program among teachers, principals, and curriculum workers is a key to successful implementation. (Derebssa, 2004).

Instructional materials make the work of teachers simple and effective. So the availability and usage of instructional materials are also important organizational factors influencing the implementation of curriculum plan. It refers to any kind of media which was expressed by Edger Dale as 'cone of experience', started from the concert at the base of the cone and abstract at the top of the cone. It consists of direct purposeful experience(real object, models, dramatized experience), demonstration, field trips, exhibits, television/video, radio /recordings/ still pictures, visual symbols and verbal symbols. Moreover, instructional materials also constitute curricular materials such as well organized syllabus, text books and teachers guides. Therefore, those instructional materials are useful in curriculum implementation for they provide guideline for teaching learning process. (Solomon, 2004; Amare, 2000).

Furthermore, one of the human factors in school (Organization) that influences implementation are students. Posner (1995) as cited in Kinfu (2008) remarked that "the extent to which students' possessing academic skills and background knowledge is a major determinant of the success or failure of curriculum. Fullan (1991) also further mentioned that the students participation in designing of new curriculum determine the success or failure of it because implementation comprises a role relation ship between teachers and students. Students should actively participate in the school where the curriculum actually put into practice.

Their active participations have been realized in the school when they are motivated, interested and have positive attitudes towards learning the specific subject matter in the classroom. According to Amare (2000), learning to be

mediated by student's previous experiences, needs, predisposition etc. Learning now is unequivocally accepted by educators' to be much dependent on the learner's Amount of Investment of Mental Effect (AIME). Students learn more when they have "internal commitment" and the "will" to learn as the process of learning is an active process not a passive one. It is the learners' activities and not the activities of their instructors that results in learning (.p. 74). Concerning this, Orstien and Hunkins (2004:242) suggest that:

> *Just as a teacher must accept a new program for it to be successful; so students must also be willing to participate in the program. If students see little relevance in the curriculum activities planned, they are not going to be motivated to learn or participate. Ideally we want students to react with heightened interest with enthusiasm.*

2.3.2. Learner Centered Instruction and Plasma Instruction

For the first time, television for instructional purposes was used in the United States. In 1958, a project entitled as continental classroom started instructional for the whole USA. It telecasted a programme 'physical of the atomic age" for science teachers. Later on, several programs such as modern chemistry, contemporary mathematics and new Biology were also telecast by this project (Aggarwal, 1996).

According to (Tewodros, 2006) the goal for educational technology (plasma) may be: supporting learning, improving the effectiveness and productivity of teaching learning and of the resource used in this process, transforming relevant theoretical information into practice and supporting the instructor. Moreover, educational technology provides common experience to all students when they all see the same basic ideas or techniques on television, provides the teacher an opportunity to observe the instructional methods and ideas of their experts and to increase his own knowledge of teaching method and stimulate new ideas; and provides technical advantages not readily available in normal classroom for illustration and demonstration (Aggarwal, 1996).

with a view to action (Dessalegn, 2000; Kahsay, 1999; Derebssa, 2004). Evaluation may be carried out for one or more purposes. According to Andorson and Ball (1978) as cited in Kahsay (1999), the purposes of curriculum evaluations are: to contribute to decision about curriculum continuation and expansion; to contribute to decision about curriculum modification or improvement; to obtain evidence to rally support for curriculum for fulfillment of research study and so forth.

In fact, educational research and evaluation research are both similar and different. In practice evaluator make substantial use of the research designs, measurement tools, and data analysis techniques that constitute the methodology of educational research. For this reason, evaluation studies are referred as educational research.

There is usually marked difference in content, presentation, and often method between research inspired by scholarly interest or an academic requirement and an evaluation undertaken with a definite practical problem in mind. Research typically aims at producing new knowledge which may have no specific reference to any practical decision, while evaluation is deliberately undertaken as a guide to action (Gall, Borg, 1996 as cited in Desalegn, 2000, Solomon, 2003). Moreover, an evaluation study is usually initiated for policy management or political strategic decisions and the purpose of the evaluation study is to collect data that will facilitate decision-making. In contrast, the purpose of research study, broadly stated is to develop an understanding of particular phenomenon of course, the finding of a research study also can be used to guide decision making; and evaluation data can be relevant to developing an understanding particular phenomenon (Desgalegn, 2000). In general, curriculum evaluation refers to the study of curriculum design and development. Mainly it focuses on the inherent characteristics such as worth of goals and objectives, appropriateness of the contents (coverage, accurancy, integration, sequence and significance) and the types of learning experiences. (

(Michael in Ornsten and Hunkms (2004), Marew, 2000). Moreover, the pay off evaluation model is related with such concepts because it focuses on the evolution of the effects of the teaching instruments (syllabus, text books , plasma instruction, teaching aids, teaching methods etc) on the students (Ornstein , 2004).

On the other hand, curriculum implementation evaluation deals with the question of whether what is planned in the curriculum documents to put in to actions; to what extent the intended plan is translated in to work. Alexander and Lewis (1981) as cited in Solomon (2004) indicated that curriculum implementation evaluation as evaluating the merits of all the administrative arrangements, practice and the structure within which the educational institutions it self operates. Hence, curriculum evaluation and curriculum implementation evaluation are two different but interrelated educational activities.

In line with these purposes, curriculum evaluation takes into account the Philosophical basis of curriculum development model (Situational model, objectives model and process model).

As a result of differences in curriculum development models, educators have identified different models of curriculum evaluation. Behavioral objective model, which concerned on that education should be judged according to the stated objective; IPP model, which concerned on the situation in which curriculum implemented, the resource needed to implement the curriculum, the process of implementation and finally the out put; goal free model, which concerned about why things happened than measuring what has happened through the data gathered by subjective assessments; and stake's countenance model are among the model of curriculum evaluation (Solomon, 2003; Derebssa, 2004). .

The stake's countenance model is preferable in this research which involves evaluation of curriculum materials because one of its helpful aspect is that it

distinguishes between descriptive and judgmental acts of the evaluator according to three phases of an educational program: its antecedent, transaction and outcome phases. Stake's perceived antecedents as condition existing prior to teaching learning process that may relate to outcomes. There are several inputs of particular innovation such as students and teachers characteristics, curricular contents, instructional materials, schools organization and community context are considered as input (antecedents). Transaction as "the succession of engagements" that constitutes the process of instruction and the outcomes are considered to be the effect of instructional program. Teachers communication flow such as teachers classroom instructional performances as intended in the syllabus and the kind of communication existing among teachers and teachers, teachers and students, teachers and directors, directors and the community are considered as transaction variables to be evaluated. The variables such as students' achievement and attitudes developed as a result of the process of the effect of innovation, the effect of teachers on the program are considered as the outcomes.

Stake then divided descriptive acts according to whether they refer to what was intended or what actually took place must be fully described. He then divided judgmental act according to whether they refer to the standards used in reaching judgment or to the actual judgment themselves (Derebssa, 2004; Solomon, 2003). Stake combined these several distinctions in a graphic representation of the statements and data needed to be gathered by an evaluator.

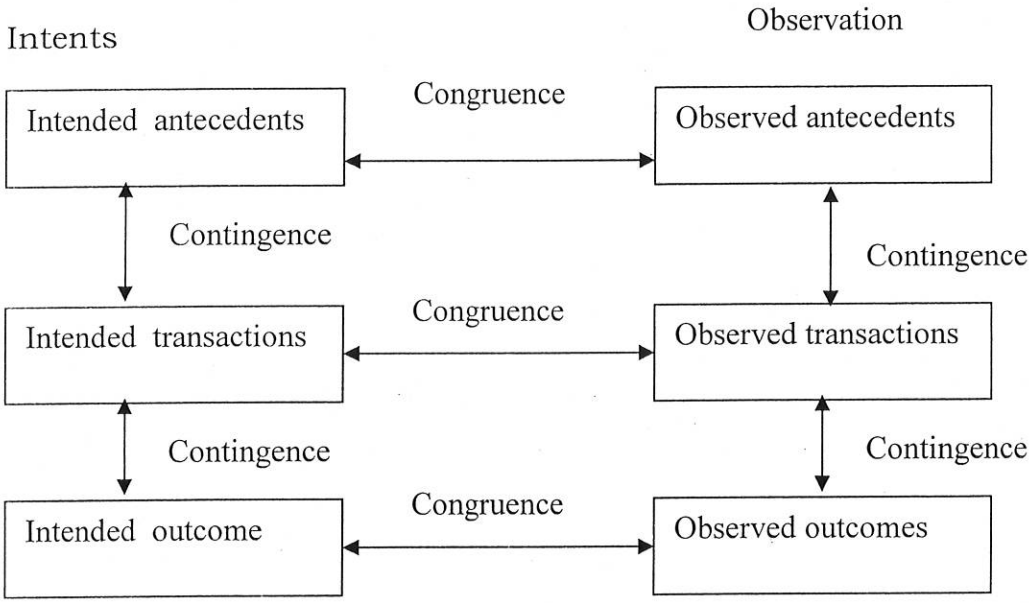


Figure-1 Stake's congruence contingence evaluation models of descriptive matrix. (Stake, 1967:533). In McCormick. R and James. H, 1983:178).

Stake data matrices help us to see how his model inclines the evaluator to engage continually in description and judgment at the beginning, during, and at the end of educational program. His distinction between intents and observation reminds us that the aspirations of educators are often not realized in the antecedents, transactions, and the outcomes that actually occur.

2.5. Mathematics Curriculum

Mathematics, one of the most useful and fascinating division of human knowledge, which is "inclined to learn." According to Struick (1984) It is a way of thinking (organizing and reasoning); a language (communication through carefully designed symbolic representation) and an organized structure of knowledge.

Furthermore, 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. It is a growing subject and all students should be made aware of these facts. (Kinfu Tasachew, 2008).

In the advancement of science and technology, in this rapidly changing world, the role of mathematics is highly pronounced. On a more fundamental level, according to Travers (1991) as cited in McCaul (1994), mathematics is needed in every day life. Emphasizing the importance of mathematics, Meec, Wigfield, & Eccles (1990:340) noted that "a strong background in mathematics is critical for many career and job opportunities in today's increasingly technological society."

Similarly, Krutteskii (1976) as cited in Benbow and Arjmand (1999) posited that "the development of science has been recently characterized by the tendency for them to become more mathematical....Mathematical methods and mathematical style are penetrating every where." This means we can not understand our computerized world without the knowledge of mathematics.

Moreover, Adeleke (1998) goes to confirm the above view points by saying that "mathematical techniques are constantly being developed to meet the changing requirements of physics, chemistry, Biology, social and Behavioral science, Engineering, and computer science." In line with this, Stidisho (1961) as cited in Adeleke (1998) also indicate that no other subject form a strong binding force among various branches of sciences as mathematics.

From the above literatures, one can understand that mathematics is becoming increasingly significant due to the technological development of our era and becoming an inseparable part of contemporary life. Therefore, mathematics curriculum has to be developed and/or will be developed in terms of the need of society, the teaching methods, and the contents should be well organized in order to keep in line with these cultural and technical change of our world (Sarama, 2004; Kinqu, 2008 Andelek, 1998).

The traditional views regarding mathematics as the acquisition of computational skills is no longer sufficient or accepted. Every individual in particular, society in general facing social and economic problems that can be expressed in terms of mathematical forms which require a deep knowledge of mathematics. Students particularly need to recognize the learn to understand the new mathematical knowledge so that they can establish the link between the content of mathematics curriculum and its application in the real life.

Now a days, Ethiopia needs to implement the new curriculum, which focuses on 70% of science and technology and the rest on social science in higher institution. Thus, the knowledge of mathematics is very crucial to handle this scientific and technological investigation. Moreover, the mathematics curriculum in secondary school level requires a high degree of attention because it is the base for the higher learning.

There was no clear evidences, which shown us when and where the mathematics was taught as a subject matter and when it has been started in Ethiopian modern education. However, there were some indicators in literatures. For instance, according to Tekeste (1990) as cited in Solomon (2008:39), Regent Teffari Mekonnen, later Emperor Hailessilassie invited the missionaries of Addis Ababa to a dinner at a palace on November, 1923, expressed gratitude and his views, which were indicators of the attitude of the period on education as follows: ' .... You are not teach them solely how to read and to write, how to calculate..." Moreover, the period 1920-1935 saw the opening of many primary schools in different cities. The curriculum also varied from school to school and the subjects studied include mathematics, physics chemistry language etc. According to Maaza (1996) as cited in Solomon (2008), the first curriculum which was made in 1974 consisted of the subjects such as Amharic, English, and Arithmetic's and so on. From those literatures one can express that

teaching mathematics as a subject matter in Ethiopia modern education took over three-fourth of a century.

Whatever the time at which mathematics has been taught as a subject matter, there are still problems in teaching learning of it. Hence, the teaching learning of mathematics in schools require due attention on the part of the teachers, students, school administrators and the community at large. Nacaro Brown and his associates (1982) as cited in Solomon (2004) described the teaching embraces many kind of process, behavior, and activities that no single theory can explain it adequately. They defined teaching as "an attempt to help some one to acquire some skills, Knowledge, attitudes, ideas or appreciation. This kind of approach to the meaning of teaching implies that the teacher's task is to create or influence desirable changes in behavior or in tendencies towards behavior in his students.

As in the case of mathematics teaching, Dossey (1992) cited in Solomon (2004) described his view as:

> *The conception of mathematics held by the teachers may have a great deal to do with the way in which mathematics is characterized in classroom teaching. The subtle message communicated by students about mathematics and its nature may, in turn, affect the way they grew to view mathematics and its role in their world.*

Regarding teaching mathematics, Blenkin and Kelly (1994) added that mathematics should focus on practical and problem solving issues. It must be used in the day to day life of the learners for the societal need and activities at large. For mathematics to accomplish this task, it is of course necessary to change the traditional role of mathematics teachers. That means, teacher should adopted new methods and strategies in mathematics instruction in order to facilitate the teaching learning of mathematics. Because teaching of mathematics should promote the ability to apply what is taught at school to all

field of social life and should lay the basic foundation for vocational and technical education for students.

There are different methods of teaching to facilitate teaching learning process of mathematics lesson. Accordingly, lecturing methods, group work method, questioning and answering method and demonstration method are some of them as stated in the mathematics curriculum guide. So that as much as possible the teacher should treat all methods to bring the effect on his students.

To sum up, it is clear that mathematics, though one of the most important subject in the curriculum of most of the countries, it also commonly seen as one of the most difficult subject by most of students and adults. Moreover, many students have mistaken impressions about mathematics and dislike mathematical activities; and fear, even hate mathematics (Yoseph 1997).

2.5.1. Types, Selection and Gradation of Mathematics Curriculum Contents

Selection of contents in any subject area should consider the validity, comprehensiveness or scope, suitability or appropriateness, pattern (horizontal and vertical integration), relevance to life and readability of the contents (facts, principles, theories, rules etc) (Derebssa, 2004, Salia, 1989).

Thus, if contents are well unified and satisfy the above criteria, then they form the units and the combination of these chapters will form a syllabus. To develop a syllabus of a school subject and certainly before beginning to teach it, the curriculum developer or the teachers should decided the value and place of the subject and ask themselves question like, 'why should we teach mathematics? What kinds of mathematics should we teach? And what part can it play in the learner's development?' A deep and critical study of these

questions may greatly influence the approach of the educators to the subject (Content) and teaching method (learning experience) (James, 1958).

Furthermore, the reason why mathematics is included in school curriculum is because of its functional and cultural values. Functional value refers to the need for simple mathematical ideas and processes in the immediate every day life. Mathematics is a tool of many other subjects (physics, chemistry, engineering, Geography etc) and in these fields we find another extension of the functional aspects of the subject. Thus, it is then fulfilling a major educational aim, reaching for beyond the aim of the subject itself (James, 1958; Williams; et al, 2005).

On the other hand, the contents of mathematics curriculum should reflect the cultural values of the society in which the learners live. Therefore, as much as possible, the contents, examples and exercises should revolve around the elaboration of the cultural values. To indicate the functional and cultural value, most of mathematics contents fail broadly under algebra (that uses letters to represent numbers and quantities) and geometry (way of measurement and construction) at all secondary school level, in general and of grade 10 in particular. These two types of mathematics contents should be coherently organized so that they can bring a behavioral change upon the learners. The concept of coherence is used in different ways. One term used to describe a particular type of coherent is "alignment" , by which it meant the degree to which various curriculum elements (KAS) available according with each other and with school practice. This implies for a set of contents to be 'coherent' they must involve from particular (simple mathematics facts) to deeper structures (mathematical logics and proofs) (Smith and O'Day, 1991, Williams, et.al, 2005).

In fact, no curriculum can contain all of the mathematics items (facts, principles, rules, proofs etc) at a time. These need careful selection of them at

study is to evaluate the contents and intents. The qualitative design supports the researcher to triangulating finding.

3.3. Models used in the Research

There are different types of curriculum evaluation models used, as stated in the reviewed literature, which were related to the concept and meaning of evaluation itself. Since the main objective of this research is to evaluate the contents and implementation of grade ten mathematics, the pay off evaluation model and stake's contingence model, were used. The pay-off evaluation focuses on an examination of the effects of the teaching instruments (teachers guides, text books and the materials (teaching aids, teaching methods, figures etc) on the students (Solomon, 2003). On the other hand, stake's congruence contingence evaluation model was found to be the most appropriate model to evaluate the successfulness of the actual teaching learning process. This model was selected due to the objective, process and product aspect of the study (McCormick and James, 1989).

3.4. Data Sources

To achieve the objective of this study, students, teachers, grade ten mathematics curriculum guides, and student's textbook, were the main source of the study.

Moreover, ICDR mathematics experts, physics and chemistry curriculum guides, teachers professional experts, physics and chemistry teachers, and school directors were interviewed for further information.

3.5. Sampling Techniques

The domain of the study includes all governmental secondary schools (inclusive of grade 10) in Addis Ababa City Administration. In order to choose a representative sample of the target population a random sampling technique was employed (William and Dennis, 1994).

According to the statistical information from the Addis Ababa Education Bereau (AAEB) a total of 144 secondary schools were actually functioning in 2007/8 academic year. In these secondary schools, a total of 93,511 students were enrolled in grade 10.

There are ten sub cities namely Yeka, Arada, Lideta, Kirkos, Gulilie, Akaki, Lafto, Bole, Addis Ketema. Out of these sub cities three are sampled at renadom namely Yeka, Arada, and Kirkos.

Out of these sub cities a total of six high schools, two from each were selected randomly as sources of information. There are numerous suggestions about the necessary size of the sample. One is that the sample should be a regular proportion (often put at 5%) of the population. Another is that an increase in sample size will increase the precision of the sample result, which is difficult for management of the sample (Nachmias, 1992). Moreover, Babbie (1973), advised a researcher can select his/her sample based on his own knowledge of the population, and nature of his research aims. Therefore, the main focus must be to ensure the representative of the sample. For this reason six schools were randomly selected. These were Meskerem Secondary School, Yekatit-66, Kokeb Tsibah, Karallo, Misrak Gohi and Shimelis Habte. The data obtained from each school indicate that there are 79 total numbers of mathematics teachers who taught in grade 10 in 2008/9 and 6226 total numbers of students were enrolled in grade 10 in 2008/9. From these schools a total of 32 mathematics teachers and a total of 224 grade ten students were randomly selected. These sample was believed to be adequate and representative of the target population.

3.6. Data Collecting Instrument and Procedures

Coding sheet, questionnaires, observation and interview were used to obtain the necessary information from the samples and informants.

3.6.1. Content Analysis

Content analysis is a research technique for the objective, systematic and quantitative description of the apparent content as they appear in the curriculum guides and/or students' text books etc (Amare, 1998). Moreover, he mentioned four methodological issues stand in content analysis: selection of unit of analysis, category construction, sampling of contents and reliability of coding.

- **The unit of analysis**- is made by taking units that are related with the contents of other subjects (physics and chemistry).
- **Category construction**- In curriculum evaluations, the concrete-abstract dichotomy can be used as two categories for study. In order to assess the extent to which communication materials are balanced in the coverage, the researcher used the categories such as knowledge, attitude and skills (testing among the competent of the KAS models) (Amare, 1998).

Moreover, categories created by other professionals are helpful if attention to three important points is given: categories must be pertinent to the objective of the study, should be functional and must be manageable (Amare, 1998).

3.6.2. Questionnaires

To collect data about how teachers understand the concepts, objective, and teaching methods of mathematics curriculum both open and closed ended questions were developed by the researcher. Similarly, to see the attitude of students towards learning mathematics, both open and closed ended questions were developed.

The questionnaire for teacher contains background information of the teacher, the teachers' activities, availability and utility of instructional materials, and teachers' attitude about organization of mathematics curriculum about teaching learning process.

Similarly, the questionnaire for students contains the students feeling about mathematics learning and this questionnaire was translated into Amharic to make the idea clear for students or to avoid the students' mis-understanding.

3.6.3. Observation

To cross check the data that were obtained through teachers and students questionnaires, observation checklists were prepared and the teaching learning process and the schools compound were observed. Morris and Gibbon (1987) support that: "Because of the richness and credibility of the information, it can provide on site observation is a desirable part of implementation evaluation."

For classroom observation, ten teachers were randomly selected from three sampled schools; namely Yekatit -66, Shimelis Habte and Kokeb Tsibah. Three teachers for Yekatit -66, three teachers from Shimelis Habet and Four teachers from Kokebe Tsibah and Each of them were observed two times.

3.6.4. Interview

To elicit the needed information from the expert who developed and monitored the curriculum materials of mathematics curriculum, semi structured interview was prepared. This includes guiding questions about the contents, objectives and teaching methods that confirm to mathematics curriculum such as syllabus and students textbooks. Schools' principals and department heads were also interviewed about their technical, academic, material and financial supports to make the teaching learning process effective in line with our current educational philosophy (Problems solving and the needs of our society) (Solomon, 2008)

3.7. Procedures of Data Analysis

Based on the research methodology employed, the data obtained were expressed in percentage in table and descriptive statements were used to give answer to the basic questions set in the study. Thus, each basic question

raised in the study was answered based on the data obtained through the data collection instrument.

Regarding the first basic question, the data obtained through coding sheet from communication materials, through questionnaire from teachers and students, through interview from curriculum experts, physics and chemistry teachers and department heads were analyzed. Similarly, the data collected through classroom observation and questionnaires were analyzed to answer the second basic question. The last basic question was addressed by the data obtained from students.

Moreover, the data obtained from teachers, students, and documents were substantiated with the data obtained through interview and from curriculum. Experts, teachers and school directors.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

The objective of the General Education Quality Improvement Program Project (GEQIP) for Ethiopia is to improve the quality of general education throughout the country. The program will be monitored closely through a set of key performance indicators. The first phase of GEQIP consists of: i) curriculum, text books, assessment and inspection; ii) Teacher Development Program (TDP); including English language improvement program; iii)School Improvement Program (SIP); iv) Management and Administration Program (MAP), including Education Management and Information System (EMISO), and v) program coordination, including implementation and evaluation activities Ethiopia Herald 1/ 4/2009).

The above quotation indicates that the quality of education was highly dependent on the organization of curriculum materials (syllabus, text book, teacher is guide), the place where the curriculum is implemented (schools and its administration); the owner who implements the curriculum (teachers) and the situation/ commitment/of the stockholders (students). The quality of education is to be gauged through the knowledge, attitudes and skills that are observed in students. This background serves as a context to the analysis of my data.

This part of the thesis deals with presentation, analysis and interpretation of data. The data obtained through coding sheet, questionnaires, observations, interviews and documents were presented, analyzed and interpreted so as to answer the three basic research questions raised in chapter one.

The data obtained from respondents and documents were presented, analyzed and interpreted under the following major themes. These themes are: i) the

organization of contents in the syllabus and textbook; ii) the actual use of the instructional guidelines set in the syllabus; iii) the actual instructional activities and classroom environment ; iv) the attitudes of students towards the subject; and v) the factors that hinder effective implementation.

4.1. The Organization of the Objectives and Contents in the Curriculum Materials of Grade Ten Mathematics

Talyr (1950) states that in order to produce educational experiences to make a communicative effect, contents and learning experiences must be so organized as to reinforce each other, because curriculum organization greatly influences the effectiveness of implementation and the degree to which major educational changes are brought in the learner .

The data obtained from syllabus and text book would furnish a base for analyzing the relationship between the objectives and contents. An educational objectives will have a greater chance of being achieved if suitable educational contents are made available. Looking at it from the other side, it can be argued that an effective educational content is that which caters for the attainment of set goals (knowledge, attitudes and skills). Then, the taxonomy of educational objectives gives a perspective to an educational effort which sets out to examine the relationship between objectives and contents.

According to Bloom (1956); Orstein (2004), when making curricular decisions, especially when generating objectives, educators ideally consider all domain of learning: the cognitive, the affective and the psychomotor and these three domains of learning should be given relative emphasis. The condensed version of the educational objectives of the domains of learning were stated as follows.

1) Cognitive domain: knowledge as defined, here involves the recall of specifics and universals, the recall of methods and processes or the recall of pattern,

structure or setting. The knowledge of objectives emphasize mostly on the psychological process of remembering.

In general the cognitive domain focuses on the recall of isolate bit of information such as symbols with concert referents; knowledge of terminology which includes recall of words, terms, expressions, formulas, principles and definition of them; knowledge of facts which include the recall of major facts about particular idea (culture, economy, or societal issues); knowledge of ways and means of dealing with specifics which include the method of inequity, the chronological sequences (steps my word) and standard of judgment with in the fields as well as the pattern of organization through which the area of the fields are determined and internally organized; knowledge of classifications and categories which include knowledge of classes of sets, divisions and arrangements which are regarded as the fundamental for the given subjects, fields, purposes, argument or problems. For instance, point, line, ray and angles are fundamental for geometric constructions (my world); and knowledge of criteria and methodology which focuses on knowledge of criteria by which facts, principles, opinions and conducts are tested but the knowledge of methods include inquiry, techniques and the procedures employed in a particular subject.

Operationally, the objectives in each domain should be specific, measurable, achievable, realistic and time bounded (SMART). Specifically, the objectives concerned to knowledge are expressed using the words such as name, recall, define, list, state, explain, classify arrange etc.

For example:

Topics: logical connectives

Objective: The students should be able to:

- define statements
- define open statements

each grade level. That means, the curriculum designers should consider the reason why the students need to learn mathematics and students' interests. Regarding to this Mellese (1992), stress that content of the course must be suited to the learner's own culture, age and aspiration so that it would become of optimum interest and relevance. Hence, the content selection of mathematics curriculum in all grade levels in general and of grade 10 in particular should coherently be organized and bring the optimum interest of the learners and relevant to their life.

According to ICDR (2004), grade 10 mathematics curriculum consists of seven chapters, of which four chapters (Introductory Logic, Numeration system, exponential and logarithmic functions, descriptive statistics and introductory probability) are classified under algebra and the rest three chapters (congruence and similarity, solid geometry and trigonometric function) are classified under geometry.

Specifically according to ICDR (2004), learning mathematics in grade ten has to develop the students' knowledge on fundamental mathematical notions, theorems, rules and procedures and to work continuously towards developing the students mathematical capacities. Furthermore, it has to contribute towards the students power of reasoning after studying logics. Students should also be familiar with different numeration system by giving special emphasis to the place value system. It should also develop the students' capability in working with variables, and the use of exponential and logarithmic functions and trigonometric functions for describing phenomena in nature.

Above all, it has to contribute towards educating the students to be active citizens and has to enable them able to play their role in the social progress of their community. That means, mathematics studied at this grade level has to contribute to the development of personalities not only characterized by high

knowledge and capabilities, but also by positive attitudes and a high activity in social fields, of scientific view a life and high moral qualities.

2.5.2. What Researchers Say about Mathematics

The decade of the 1980s produced many calls for changes in mathematics education in United States. These calls resulted from at least three factors: growing awareness that the explosion of technology is radically altering the kind of mathematical thinking that will be needed by future workers and citizens in the heterogonous global economy; the cognitive revolution in psychology and education that indicate children construct developmental sequence of conceptual structures for various mathematical topics and disillusionment with the results of present mathematics education focus on computational skills because national and international assessment have indicated serious short coming in the mathematics performance of children (Alkin, 1992).

There are consensuses which are arrived by USA Mathematical Sciences Educational Community on the need for reform and the direction that reform must take (MSEB, 1990, as cited in Alkin, 1992). This consensus is best summarized in terms of six principles presented in reshaping school mathematics. These are 1) mathematics education must focus on the development of mathematical power; 2) Calculators and computers should be used throughout the mathematics community; 3)its relevant application should be an integral part of the curriculum; 4)each part of the curriculum should be justified on its own merits; 5)curricular choice should be consistent with the contemporary standards of school mathematics; and 6) mathematics instructions at all levels should foster active students' involvement.

Locally, I found researches that have been done on mathematics subject at different grade levels which have focused on different problems. For instance, Yoseph Shumi (1997), conducted a research on "The Relationship between

Attitudes and Achievements in Mathematics among Boys and Girls in Grades 6, 7 and 8." He concluded that:

> *Pupils attitudes towards mathematics and their achievement in mathematics are closely related variables that play important roles in the learning of the subject. A positive attitude towards the mathematics is a necessary condition for developing favorable attitudes towards mathematics achievement.*

Here, the researcher did not indicate how the attitudes up on the students could be brought about in order to up grade the mathematics knowledge of the students. He added that:

> *pupils attitudes towards mathematics grow less favorable with increasing in grade levels. (Students of grade 6 have high attitudes to wards mathematics than that of grade 7 and 8). That is, as pupils progress through schools, their attitudes towards mathematics appear to become increasingly less positive.*

Still here there is also unanswerable question which comes into our mind. What is the reason behind for decrease of the attitudes towards mathematics as the grade level increase?

Solomon Areaya (2000), conducted a research on "The Evaluation of the Implementations of Mathematics Syllabus of Grade8," He concluded that:

> *There is no cooperation and frequent Communication between teachers and principals to discuss about some implementation issues regarding the teaching of mathematics. Moreover, with regard to the contents of the subject more than half (55%) of the respondent teachers rated that the contents as complex. According to the researcher, as measured by the achievement tests the expected outcomes of the syllabus covered during the first semester are not well grasped by the majority (71%) of the students. From among seven instructional objectives, it is only two of them that the majority (63% and 79%) of the students to have acquired some*

basic knowledge. Moreover, only 29% of the respondent students have scored a pass mark, at or about 50% which is stated on NETP as a minimum achievement requirements to pass from one grade level to the other.

There are also some questions raised here. For instance the following questions can be raised: In what regards are the contents complex? (Continuity, sequence, relevance or scope etc). What measures should be taken in order to alleviate the problems regarding the achievement of the students? What was the cause for low achievement of students in this subject matter and the likes?

Solomon Deressa (2004),also conducted his thesis on "The Evaluation of the implementation of Mathematics Syllabus of Grade 9." He concludes that:

Most of the teachers do not encourage the students to participate in discussion and to solve problems by themselves, rather the teachers were found doing the traditional teaching method (lecture). The students' involvement in the process of teaching of mathematics was found to be minimal. As a result, students' feeling of learning mathematics does not Seem to have properly been developed. Moreover, he concluded that lack of commitment on the part of the teachers to implement the syllabus as intended; poor communication system among schools community and absence of the involvement of the teachers in curriculum activities may have also contributed to the in-effectiveness of the implementation of the syllabus.

Finally, I came across Kinfu Tasachew's (2008), research work. His research was on "The Evaluation of the Implementation of the Preparatory Mathematics Syllabus." And he justified the following findings.

The majority of the respondent students (62.3%) reported that mathematics teachers evaluate the students' performance based on mid semester and final examination. However the syllabus suggested that the students should be evaluated through continuous assessment. According to

respondent teachers, the reason why they did not use continuous assessment is that insufficient time, lack of instructional and curricular materials, unfavorable environment of the institutions and classroom. He added that teachers were not motivated to teach the mathematics in the institution because of low background of knowledge of the students, the students are not interested to learn mathematics, principals gave little attention for mathematics instruction and lack of support from the administration.

Most of the above research findings are seen focusing on the way in which the syllabus of mathematics has been implemented. In fact, evaluation is highly related with the implementation as if the developed curriculum is good and appropriate. However, what will happen on the implementation part if the developed curriculum faces some problems or becomes inappropriate? What will happen on the implementation part if the curriculum is not organized as per criteria of curriculum organization?. These and other related questions should be justified through further studies, and these and related issues are the major concern of this research.

CHAPTER THREE

RESEARCH METHODS, DESIGNS AND MODELS AND PROCEDURES

3.1. Methods Used

The primary objective of this study was to evaluate grade ten mathematics curriculum contents and implementation. To achieve this objective the methods employed were content analysis and descriptive survey. The curriculum materials (teachers guides, syllabus, textbook, and plasma guide) were evaluated b y content analysis, and the actual teaching and learning process was evaluated using descriptive survey.

Berelson in Amare (1998:3) defines content analysis as a research technique for the objective, systematic and quantitative description of manifest content of communication materials. krippndorff (1980:21) also defined it as "research technique and it involves specialized procedures for processing scientific data and its purpose is to provide knowledge, new in sights, a representation of 'facts', and practical guide to action. It is a tool". Moreover Fracnke and Wallen (2000:470) state that content analysis as "methodology which is often used in conjunction with other methods". They further discussed that content analysis is used to analyze curriculum materials likes syllabus, textbook, essays, novels and so forth. Content analysis requires selection of unit of analysis and development of categories (Amare, 1998; Krippendorff, 1980, Fraenkel and Wallen, 2000).

In research study, the first step that can be preformed as content analysis has to be defining a series of relevant categories based on consistently applied rules to eliminate analysis in which only materials supporting the researcher's hypothesis are admitted as evidence (Lewy, 1977). Moreover, categorization is perhaps the most important part of the analysis because it is a reflection of the

theory or the hypothesis tested. In regard to this, Amare (1998) discussed that many curriculum evaluators have often used categories that demand descriptive inferential or evaluative coding system. Moreover, the categories created by other professionals are also helpful if attention to three important points is given: the categories must be pertinent to the objective of the study, categories should be functional and categories must be manageable.

Some of the most frequently used categories are content (relevance of ideas, methods and materials), coverage (knowledge, attitudes and skills), integration (horizontal or vertical) and so forth. Based on this evidences, the following categories were developed in relation to the research questions.

1. the objective developed in the syllabus in relation to coverage (KAS)
2. Types and frequencies of teaching methods suggested in the syllabus
3. Evaluation techniques developed in syllabus in terms of KAS.

Furthermore, to code the right data using the categories developed above, the researcher needs to specify the unit analysis. Words, sentences, phrases, statements, programs or books can serve as unit of analysis (Amare, 1998). In line with this, the researcher chose words used to state specific objectives in curriculum guide and students' textbook.

Besides, descriptive survey was employed to collect information about the success of the program or to evaluate the effectiveness of the teaching learning process in the schools. (Creswell, 2003; Fraenkel & Wallen, 2000).

3.2. Research Design

Now days, there are three major research approaches: quantitative, qualitative and Mixed (Creswell 1994, 2003).To him, the choice of one from the other depends on three major factors: the research problems, personal experience of the researcher and the audience. In line with these factors, the researcher chose quantitative and support it with the qualitative. As the purpose of this

- explain the difference between statement and open statements
- list types of logical connectives (see appendix C)

Therefore, the above objectives need students ability of remembering which leads to knowledge.

2. Psychomotor domain: This aspect of the learning outcome includes the objective which deals with manipulative or skill development and expressed through acting or doing. It is classified as motor skills, which consists of the coordination of muscular movements, and intellectual skills include discrimination, classifying object and ideas using rules and formulas. Abilities and skills refer to organizing modes of operations and generalized techniques for dealing with materials and problems. The materials and problems may be of such nature that little or no specialized and technical information is required. Such information as is required can be assumed to be part of the individual general fund of knowledge (mental effort, my word). It generally involves the development of mental and physical skills, techniques and ability of the learner.

Operationally, the objectives developed concerning skills are expressed using the words such as compute, perform, solve, determine, manipulate, convert, draw and derive.

For example:

Topic: Logical connectives

Objectives: The students will be able to:

- determine the truth value of a statement
- find the truth value of compound statement.
- draw the truth table for compound statement (see appendix C).

3. Affective domain: This domain is primarily concerned with the development of attitudes and values and deals with feelings, likes, and dislikes. We can have

attitudes about educationally unimportant things or more educationally important things.

Like most aspects of human behavior, attitudes are learned and resulted on experience. For example, students typically develop some type of attitudes towards the subject (mathematics). If their experience with subject (mathematics) has been pleasurable, with opportunities for growth and reward, then their attitude will be positive.

On the other hand, if they constantly encounter boredom and frustration of subject (mathematics), then their attitudes about the subject will tend to be negative. Positive attitude towards the subject (mathematics) are related to achievement and success, while negative attitudes related to failure. The fact that the attitudes are formed through experiences is good in the sense that the objectives allow the teachers to influence positively the attitudes of their students.

In general, as discussed above the objectives developed in the curriculum materials should give a relative attention for the three domains (knowledge, skills and attitudes). Moreover, according to FDRE(1994) the outcomes of education are expected to develop students whole personality having the right cognitive ability, skills typically problem solving and positive attitudes towards the subject they are taught in particular and real-situation of their life in general.

The three domains some times overlap. For example, handwriting incorporates all three domains of learning. However, the objectives in the three domains are not water-tight or mutually exclusive but are interdependent. For instance, interest and attitude (affective domain) can affect the quality of performance in both cognitive and psychomotor domains.

However, there are great distinctions among the objectives of the domains. Basically the objectives of knowledge emphasize on the psychological process of remembering, the objectives of skills concerned on action (doing), in which the action may be of such nature that little or no specialized or technical information is required and the objectives of attitudes should be influence the teachers to bring positive attitudes upon their students regarding the subject (mathematics).

Hence, the contents and objectives developed in any curriculum material should elaborate the above issue. As a result, to identify whether the specific objectives developed in grade ten mathematics curriculum guide are balanced the coverage or not the syllabus was assessed in terms of the operational definition knowledge, skills, and attitudes. The frequency of the objectives of knowledge, skills and attitude in the syllabus (see appendix C) were presented in the following table.

Table 1. Total specific objectives developed in the syllabus.

Total specific objectives developed		**The total no of objectives which focused on**					
		Knowledge		**Attitudes**		**Skills**	
No	**%**	**No**	**%**	**No**	**%**	**No**	**%**
84	100	44	52.4	2	2.4	38	45.2

As can be seen in table 1, the objectives developed in the syllabus covered 52.4% of knowledge, 45.2% of skills, where as 2.4% of attitudes which get the least attention. As indicated in the reviewed literature and the syllabus, mathematics studied at this grade level is expected to contribute to the development of personalities not only characterized by high knowledge and capability but also by positive attitudes and high activity in social fields, scientific views of life and high moral qualities (ICDR, 2004). However, the objectives developed in almost all units depict that attitudes are forgotten. On

the other hand, according to ICDR curriculum experts, the three domains of learning are included in the newly revised curriculum guide.

Generally, to evaluate the difference in number of observed and expected coverage in relation to the objectives developed in the curriculum guide, chi-square goodness of fit test (x^2) was employed

Table 2. Chi-square goodness of fit test for coverage of the objective developed in syllabus.

Coverage of objectives related to	**Observed frequencies**	**Expected frequencies**	**Chi-square (x^2)**	**Degree of freedom (df)**
Knowledge	44	28	36.17	(c-1)(r-1)= (3-1) (2-1)=2
Attitudes	2	28		
Skills	37	28		
Total	84	84		

Null hypothesis: There exists a significant relation between the observed and expected frequencies of objectives developed in the syllabus in relation to coverage (knowledge, attitudes, skills).

NB: the critical value of X^2= 5.99 at 0.05 level of significance and x^2=9.21 at 0.01 levels of significance.

As shown in table -2, the computed values of X^2=36.17 are much higher than both critical values of X^2 at 0.05 and 0.01 levels. Hence, it is quite significant. Consequently, the null hypothesis is rejected and then there is a very high significant difference between number of observed and expected frequencies of objectives developed in the syllabus in relation to coverage.

Generally, the objectives developed in the syllabus indicated that the three domain of learning: cognitive (knowledge), psychomotor (skills) and affective (attitudes) are not given a relative attention. The objectives developed in the

syllabus relatively focus on knowledge (52.4%), skills (45.2%) and least attention is given to attitudes (2.4%).

4.1.1. Content Integration, Sequence and Relevance in Grade-10 Mathematics

According to Taba as cited in Derebssa (2004) the content integration refers to the horizontal relationship of subjects and that of developing ways of helping individuals in the process of creating unity of knowledge. Moreover, as indicated in the reviewed literature it includes interrelation of subjects (mathematics, physics and chemistry); correlation in scheduling of topics in different subjects so that they complement one another; the need for requests (students must take mathematics while taking physics and chemistry) and the value of providing more coherence and relevance of contents. In general, integration implies coherence, unity; inter relatedness, and connectedness of different subjects.

To asses the integration of contents, the researcher tried to take two units which were entitled "exponential and logarithmic functions, and trigonometric function" These were purposefully taken since they are highly integrated with other subjects such as physics, chemistry and Geography.

The exponential and logarithmic functions are the most important portion (contents) which are applicable in other subjects.

> *For instance, the half life radio active element is the time it takes a given quantity of radioactive element to decay one half of its original mass. The mass M(x) at a time X is given by the formula of the form of exponential function i.e.* $M(x)=c(1/2)^{x/h}$ *where h is the half- life and c is the original mass of the element (Radioactive decay). This application of exponential function (radioactive decay) is used to predict how much amount of element will remain after thousands of years and to recommend the nuclear waste disposal in such a series problem. This example shows that the integration of exponential functions contents with the contents of chemistry. Moreover, to calculate the PH-values of the solutions in order to state whether the*

solutions are basic acidic or neutral (chemistry) the specialists need to use the concept of logarithmic function.

Similarly, to express scientific notation (to add, to subtract, to multiply, to divide) in chemistry and physics, to predict the population growth after certain periods of time (Geography), to calculate the compound interest after depositing a certain amount of Birr in a bank after certain periods of time (Banking) are needed the concepts, rules principles and knowledge of exponential and logarithmic functions (Source: grade 10 mathematics text book pp. 53-76). (ICDR, 2004).

Ancient people used trigonometric functions to reckon the direction of stars and to measure their lands. Now days, it is a very important concept in science and technology. Hence, it needs high attention in the formal education. At this grade level, the concept of trigonometric function is more applicable in physics and geography. The following examples are taken from grade 9 physics textbook and grade 10 physics textbook to show the integration of this unit.

A. Resolving force into component

1. In the fig.3 a car is pulled by concurrent force F_1=100N at an angle of 37^0 and a force F_2= 150N at angle of 53^0 above horizontal, what resultant force F_R has the same effect as F_1 and F_2 on the car? (p.77, grade -9).

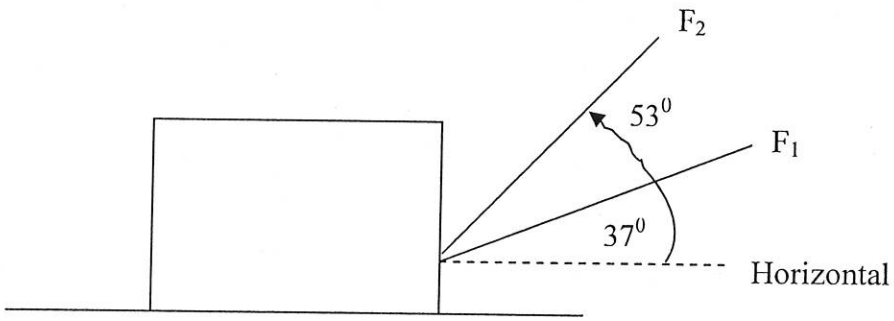


Fig 3.

2. *In Fig 4 F_1= 10N, F_2=20N what are the magnitude and direction of resultant force?*

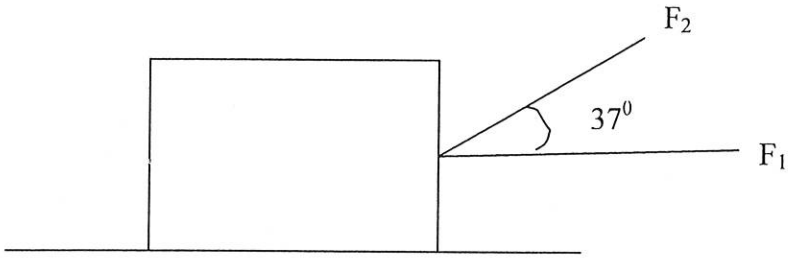


Fig 4.

B. first condition of Equilibrium

1. *In –fig- 5 a traffic light which weight 150 No is suspended by two cables. It the angles A1 and A_2 are 37^0 ad 53^0 respectively. Find the force that stretches the two cables (grade-9, physic text book, p-75).*

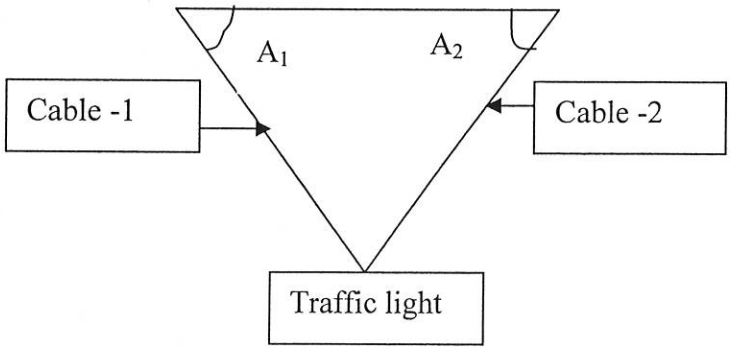


Fig 5

2. *In fig- 6 W is in equilibrium if the stretching(tension) force in string 2 is 200N. what is the value of W and tension T_1 in string 1)grade-9, physicsp.,p. 84).*

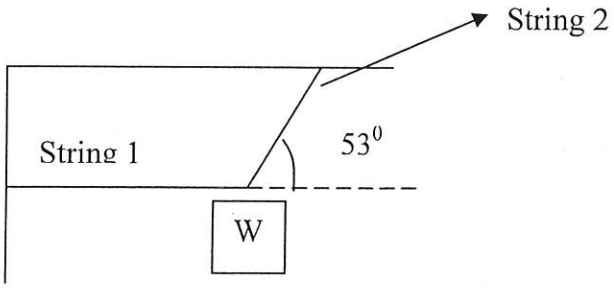


Fig .6

C. *Motion in two dimension*

1. *A man throws a ball to a table with a velocity of 13m/s at an angle of 30^0 above the horizontal. Assume that the table is at the same horizontal level with the hand of a man. What is the maximum height and the range of the ball ($hmax=v^2sin^2\theta/2g$, $R= V^2 \sin 2\theta/2g$) (grade - 10 physics text book, p. – 158).*

D. *Compass bearing (Geography)*

2. *A ship leaves the harbour D after being repaired. It sails 1 km out of the harbor on a bearing of S 55^0W to a buoy B and then changes direction to a bearing of S75^0E. after it has covered 5 km, it develops engine trouble and so turns to head back to the harbor. How far must it travel to the harbor and what will be its bearing.(Source grade .10 mathematics plasma manual (p-597).*

The above examples indicate that there are contents of mathematics which have been integrated with some of the contents of physics, chemistry, geography and banking.

Even though there are the integration of contents, the integration does not consider the correlation in scheduling of topics and this has bring negative impact upon students because the need for requests (students take mathematics while taking physics and chemistry) given the least attention. To elaborate this issue, the researcher interviewed two teachers, one from physics department and the other from chemistry department. They were asked. About the contents in the subjects they teach that their respective subjects require the concept and knowledge of mathematics and the problems they have encountered during the teaching-learning process. The physics teacher, Ato Tasew, answered that:

> *Yes, I agree that there are contents in grade nine and ten physics which need the concepts and knowledge of mathematics in order to teach the students effectively. For example, scientific notation (addition, subtraction, multiplication and division), resolving of forces into components, simple pendulum, motion in two dimension, first condition*

of equilibrium ....need the concept of exponential function and trigonometric function. He further tried to explain that I usually face the problem during the teaching learning process because the student are not familiar with exponential and trigonometric functions while they learn the above concepts. (23/3/2009).

Similarly, the chemistry teacher, Ato Biniam, answered the same question by saying, I agree that there are contents of chemistry lessons that need the direct application of mathematical concepts and knowledge such as the PH- values of the solutions, the electron movement in circular path,....He explained further by saying "I often encounter the problems while I am teaching these contents because the students are not familiar with the concepts of logarithmic functions to calculate the PH value of the solutions. (25, 3, 2009)

Therefore, it is possible to deduce from the two interviewees that the correlation in scheduling the topics, the need for requests have not been given much attention by curriculum experts of mathematics of Grade 10 at the time of the curriculum development of the target grade.

On the other hand, curriculum experiences can be sequenced interms of contents and learning experiences. Contents are usually sequenced by means of logic of the subject matter while the psychological approach is used to determine the sequence of learning experience. According to (Derebssa, 2004) logical sequencing puts the contents and materials into some sort of orders of succession and deals with the question "what is to follow what?" The central role of sequencing in any contents is additive in the sense that later set of information is established on the earlier content which simultaneously bind together the earlier information in the attainment of new levels of understanding and competence. However, most of the chapters and their contents in grade ten mathematics were new concepts. That means, they are not developed on the earlier information which the students learned in grade nine. To show such chapters: chapter as an example, one (introductory logic),

chapter three (exponential and logarithmic function), chapter four (Descriptive statistics and introductory probability) and chapter six (solid Geometry) each of which are not built on the earlier information. Hence, it is simple to see from these chapters that the logical sequence has not taken into account.

The psychological sequencing of learning experiences is believed to give that much more attention to the learning activities and students reactions to the learning rather than the content coverage. It should consider different age groups, abilities, interests and the social backgrounds of the learners. In line with these the attitudes of the teachers towards the grade 10 mathematics curriculum organization was analyzed in terms of integration, sequence and relevance in the following table.

Table-3 Teacher's responses towards integration, sequence, and relevance of contents

Items	**Respondents having**									
	Favorable attitudes				**Neutral attitudes**		**Unfavorable attitudes**			
	1	**2**	**Total**	**%**	**3**	**%**	**4**	**5**	**Total**	**%**
W_1	3	6	9	28.1	4	12.5	15	4	19	59.4
W_2	9	18	27	84.4	-	-	3	2	5	15.6
W_3	4	8	12	37.5	3	9.4	11	6	17	53.1
W_4	5	16	21	65.6	4	12.5	5	2	7	21.9
W_5	6	9	15	46.9	7	21.9	8	2	10	31.3
W_6	2	8	10	31.3	52	6.2	15	5	20	62.5
W_7	2	7	9	28.1	4	12.5	14	5	19	59.4
W_8	5	13	18	56.3	1	3.1	9	4	13	40.6
W_9	6	12	18	56.3	3	9.4	6	5	11	34.4
W_{10}	3	6	9	28.1	2	6.2	13	8	21	65.5
W_{11}	6	16	22	68.8	2	6.2	5	3	8	25
W_{12}	3	10	13	40.6	3	9.4	11	5	16	50
W_{13}	4	45	19	59.4	4	12.5	5	4	9	28.1

Key 1= strongly agree 3= undecided 4=disagree
2= agree 5= strongly disagree

W_1= I believe that mathematics curriculum organization of this grade enables teachers to make their teaching relevant to the lives of their students
W_2= In my view, mathematics is a core subject in and out of the schools
W_3= I believe that the curriculum elements (knowledge attitudes and skills) are highly organized in the syllabus that the teachers can easily understand them.
W_4= I believe that the contents of grade 10 mathematics are horizontally organized (with other subject such as physics, chemistry etc) that the students are able to perform any problem which needs the application of mathematics.
W_5= The objectives of grade 10 mathematics which are written in the syllabus and text book are appropriate
W_6= In my view, the organization of contents and learning activities in the syllabus are appropriate for teaching students.
W_7=I believe that the application of grade 10 mathematics to other subjects is not significant.
W_8= I believed that most of the contents of grade 10 mathematics are beyond the ability of the students
W_9= In my view, the syllabus contains variety of teaching methods that maximize students' participation
W_{10}= I believe that the contents of the syllabus are vertically (continuous with grade-9, logically sequenced within the content) organized that students can easily understand the concepts, principles and rules
W_{11}= In my view, there are adequate examples and exercises at the end of each topic of the lesson in the textbook.
W_{12}= In my opinion, mathematics is of little importance in the real life
W_{13}= I believe that most of the contents focus on knowledge acquisition

As can be seen in table -3, 59.4% of the respondent teachers were found having unfavorable attitudes on the organization of grade 10 mathematics contents for making teaching relevant to the real life. Nearly, one third (28%) of the respondent were believed that the organization of the contents enable teachers to make their teaching relevant to students' day-to-day activities.

On the other hand, 84.4% of the respondents viewed that mathematics is the core subject in and out of the schools. Mean while, 50% of the teachers believed that mathematics was very important subject in the real life of the students, where as 40.6% of the respondents believed that it has less significance in the real life. The curriculum developed and the textbook prepared are based on sound pedagogical and psychological principles and giving due attention to concrete local conditions (TGE, 1994). However, one could understand from the above analysis that even though mathematics is very important and core

subject in and out of the schools, the organization of the contents are not comfortable for teachers to teach it by relating to the real life of the students.

The curriculum elements (knowledge, attitudes, and skills) are considered as warp and woof of fabric of curriculum organization (Derebssa, 2004). Regarding the building of curriculum elements, 53.1% of the respondents were found to have unfavorable attitudes but 37.5% of the respondents believe in a way elements are well unified in the syllabus that the teachers can understand them to teach their students.

However, 59.4% of the respondents believed that most of the contents focus on knowledge acquisition, where as 28.1% of the respondents do not believe that the contents focus on knowledge. Nearly above one-third, (31.3%) of the respondents were found having unfavorable attitudes towards the objectives written in the communication materials, while 46.9% of the respondents believe that the objectives written in the syllabus and textbook are appropriate that teachers can easily understand them.

On the other hand, scholars like Bloom (1956), the three domains of learning (KAS) should be given relative emphasis. As one could observe from the above analysis, the curriculum elements do not seem to be well unified and organized so as to bring the change upon the learners.

Table 3 item 4 depicts that 65.6% of the respondents believed that the contents of mathematics for this grade level are integrated with the contents of other subjects so that students are able to solve different problems which need applications of mathematics. Similarly, 59.4 of the respondents believed that the knowledge of mathematics was very important to learn different concepts in other fields.

However, 65.6% of the respondents did not believe that the contents in the communication materials as well as the principles, facts, and ideas with in the content follow the logical sequence. Moreover, 56.3% of the respondents believed that most of the contents were beyond the abilities of the students. This indicates that the psychological sequences (considering) of ages, abilities, interests) seem to be a little bit ignored during the organization of these curriculum materials.

All curricula, irrespective of their particular design, contain not only a statement of objectives and selection of contents but also indicate same selection of curriculum experiences, which it is through these experiences that students learn and attain the educational goals. Learning experiences refers to the interaction between the learners and the communication materials (textbook, plasma), and the teacher and the external environment to which learners react (Derebssa , 2004). Regarding this, 62.5% of the respondents believed that the learning activities in the textbook are not appropriate in building the learning experiences of the learners. However, 68.8% of the respondents believed that there are adequate examples and exercises at the end of each topics. In addition , 56.3% of the respondents felt that there are varieties of teaching methods which maximize the participation of students towards learning activities. Finally, it is possible to say that even though there are adequate examples, exercises and varieties of teaching methods which are used to maximize the participation of students towards the learning activities , they are not constructed in the way that the learning experiences of the students are maximized.

In general, to understand the respondents' outlook towards the contents, objectives, scope and coverage, the researcher was put an open-ended questions. This was "do you think that the contents in the syllabus and text book organized in the way they have to be organized? State your opinions. The

reaction of the respondents to this question are summarized in the table below.

Table -4. Opinion of Respondents to the Open Ended Question

Respondents	Their opinions
1	No, because some of the contents are irrelevant and they do not fit with this grade level.
2	No, because the contents are bulky and hence, difficult to cover the whole chapters in the given periods
3	Yes, the contents are well organized but vast.
4	To some extent there need adjustment. For example trigonometric function should come to the front page so as to help students to use it in other subjects
5	The organization of the content must be consistent with plasma instruction (does not fit with plasma topics)

The above table shows that some of the contents are irrelevant, balky, and does not fit with plasma topics. Hence, to some extent they need adjustment and should be consistent with plasma instruction.

4.2. The Actual use of the Instructional Guide Lines Set in the Syllabus

It is obvious that even the best designed curriculum which is supposed to be practiced in a resourceful environment bring nothing if the instructional guide lines are not interpreted as intended. Hence, the actual use of these guidelines is very significant.

4.2.1. Teaching Methods

To achieve the objectives stated in the syllabus, it needs the choice of appropriate teaching methods and the actual usage of those appropriate teaching methods in classroom to maximize the students' learning. The

following two tables show the types of teaching methods suggested in the syllabus and their actual use in the classroom situation.(see appendix C).

Table 5- Types and Frequencies of Teaching Methods Suggested in the Syllabus.

(N=148)

Types of teaching methods suggested in the syllabus	**No of usage (Frequencies)**	**Percentage**
Lecturing/Explanation/	21	14.2
Student centered (discovery learning methods)	58	39.2
Discussion	19	12.8
Demonstration	18	12.2
Question and answering	6	4.1
Problem solving	14	9.5
Proof and reasoning	12	8.1
Total	148	100

* Mean percentage= 14.3

As can be seen in table -5, 39.2% of the total teaching method suggested in the syllabus are covered by the student centered approach and 14.2%, 12.8% and 12.2% almost around the mean percentage (14.3%) are given for lecturing, discussion and demonstration respectively. However, the problem solving (9.5%), proof and reasoning (8.1%) and question and answering (4.1%) have been given the least attention even in the syllabus. As observed from the data the syllabus suggested that the student-centered method is the most important method which maximizes the students' learning.

Regarding this, Teferi (2005) as indicated in the reviewed literature, suggest that it is understood that the learner-centered instruction is critical to the creation of optimal learning climates at all levels of the education system.

Therefore, the instructional guide lines in the syllabus insist that the teachers should try to use the learner centered approach during teaching -learning processes.

Table -6 Classroom observations to what extent the teachers use the teaching methods suggested in the syllabus

No	Teaching methods suggested in the syllabus	Extent to use								Total no of session observed
		1		2		3		4		20
		No	%	No	%	No	%	No	%	20
1	Lecturing/explanation/	13	65	4	20	3	15	-	-	20
2	Discussion	2	10	4	20	8	40	6	30	20
3	Student centered (discovery learning)	5	25	-	-	4	20	11	55	20
4	Demonstration	-	-	3	15	3	15	14	70	20
5	Problems solving	3	15	2	10	5	25	10	50	20
6	Proof and reasoning	2	10	8	40	1	5	9	45	20
7	Question and answering	3	15	5	25	12	60	-	-	20

Key 1= always 3= some times

2= frequently 4= Not at all

Table -6 depicts that 65% of the teachers whose classes were observed use lecturing method during teaching learning process. On the other hand, 70%, 55% and 49% of the total teachers whose classes were observed did not use demonstration, student-centered, problem solving proof and reasoning methods during teaching learning processes, respectively. Regarding this, Fullan (1992) stated that using different teaching methods in classroom provide opportunities for active involvement of the students in the teaching learning process.

However, most of the teachers as indicated in table 6 were found to use explanation by ignoring the other methods.

In general, from table 5 and table 6, one could understand that the methods suggested in the syllabus and the actual usages of them by teachers were found to be contradicting to each other. This contradiction might be the result of lack of training regarding teaching mathematics, classroom situations, or may be lack of syllabus. To investigate the problem behind the improper usage of teaching method, the researcher brought the questions about the availability of instructional resource in the following table and the table summarizes the problems regarding the teaching learning process in relation to the availability of instructional resources.

Table -7 Responses of teachers on the availability of the instructional resources in their schools.

No	Items	Responses				
		Yes		No		Total
1	Do you have any access to grade ten mathematics syllabuses?	7	21.9	25	78.1	32
2	Do you prepare weekly lesson plan?	29	90.6	3	9.4	32
3	Do you have plasma instructional manual?	10	31.2	22	68.8	32
4	Do you feel conformable in school environment?	11	34.5	21	65.6	32
5	Do you have any training opportunities to improve your teaching learning process?	9	28.1	23	71.9	32

As can be seen in table -7, 90.6% of the respondent teachers responded that they prepare weekly lesson plans which will be the guideline of their work in the classroom. However, 78.1% and 68.8% of the respondents were found that they did not have access for syllabus and plasma instruction manual respectively. Regarding this, ICDR, (1993) as cited in Solomon (2008) indicated that syllabus is the basis for all educational and instructional activities and

as such serve as the sole point of reference. All educational materials, teaching aids, teaching methods, evaluation and implementation activities derive their purpose from the syllabus. Similarly, the plasma instruction manual supports the classroom teacher what he/she will need to do before coming to the classroom and will help the teacher if there is plasma disruption due to light and other factors.

On the other hand, the school environment and lack of training to use instructional guide lines have their own impact on the teaching learning process. Regarding this, 65.6% and 71.9% of the respondent teachers did not conformable with their school environment and were not take training in order to improve their teaching learning process respectively. Finally, even though almost all respondent teacher were preparing weekly lesson plans, above three fourth of the respondents did not have access to syllabus as well as above two third of the respondents did not have plasma instruction manual which are very important to understand and apply the instructional guide lines suggested in them.

4.3. Teaching-Learning Process

Teaching learning process is a means where by the society trains its young ones in selected environment (usually schools) as quickly as possible to adjust themselves to the world in which they live. According to Aggarwal (1996), It has four aspects: teachers, students, learning process and learning situation.

4.3.1. Teachers: The Key Actors

Since the communication materials (syllabus, textbooks,and plasma instruction manual) have their own inherent weaknesses such as homogeneity of teaching and learning approach that does not cater for the variety of learning domain and over easiness that the teacher follow textbook uncritically. Teachers have great responsibilities to address such short comings of communication materials to achieve the objectives developed in them. They can accomplish these responsibilities when they get the appropriate training. Regarding this

as indicated in table 7, two –third of the respondent teachers responded that they did not take training. Almost all teachers participated in the discussion on the education quality packages such as SIP (school Improvement program) CPD (continuous professional development, ICT etc). Here, there is a big question that 'why those respondents did not consider their participation in the package as training The following table summarized and analyzes teachers responses towards teaching learning process.

Table -8 : Teachers' response towards the teaching learning process

Items	Respondents having										Total
	Favorable attitudes				Neutral attitudes		Unfavorable attitudes				
	1	2	Total	%	3	%	4	5	Total	%	
M_1	4	6	10	31.3	5	15.6	13	4	17	53.1	32
M_2	9	8	17	53.1	3	9.4	9	3	12	37.5	32
M_3	3	5	8	25	6	18.8	13	5	18	56.3	32
M_4	7	14	21	65.6	2	6.3	7	2	9	28.1	32
M_5	15	9	24	75	2	6.3	4	2	6	18.1	32
M_6	7	13	20	62.5	-	-	9	3	12	37.5	32
M_7	3	11	15	46.9	9	28.1	5	3	8	25	32
M_8	4	8	12	37.5	7	21.9	9	4	13	40.6	32
M_9	7	6	13	40.6	10	31.3	7	2	9	28.1	32
M_{10}	4	12	16	50	7	21.9	6	3	9	28.1	32
M_{11}	7	14	23	71.9	4	12.5	2	3	5	15.6	32
M_{12}	11	15	26	81.3	1	3.1	4	1	5	15.6	32
M_{13}	8	9	17	53.1	2	6.3	8	5	13	40.6	32

Key: 1= strongly agree
2= agree
3= undecided
4= disagree
5= strongly disagree

M_1= In my view, a teacher should be a source of knowledge in the classroom.
M_2= I enjoy by using variety of teaching methods in a given period
M_3= I believed that the students enjoy the plasma teacher for using variety of teaching methods
M_4= I do not think that the students should be recipient of knowledge, from classroom teacher or plasma teacher
W_5= In my opinion, most of the students have too little background of mathematics so that they do not fit with the plasma instructions
M_6= The major roles of the teacher should be to encourage students to memorize all definitions, theorems, rules and axioms instead of worrying about their proofs
M_7= I use different teaching aids to make the teaching learning to be tangible
M_8= I believe that my role is facilitating my students' learning not imparting knowledge
M_9= I believe that the plasma instructions are more of student- centered
M_{10}= In my view, the students learn better from the plasma teacher than the classroom teacher
M_{11}= I believe that plasma instruction ignore the psychological and behavioral change of learning
M_{12}= As individuals, teachers are responsible for helping their students how to learn mathematics in and out of the classroom
M_{13}= In my opinion, students should be taught mathematics to score good grades not how to apply it into real life

As shown in table -8, 65.6% of the respondents were found that the students are not the only receipting of knowledge from their teacher. Moreover, 53.1% were believed that the teachers are not the only sources of knowledge in the classroom. However, 62.5% of the respondents responded that they encourage their students to memorize definitions, theorems, rules, and axioms instead of worrying about their proofs. Besides, 53.1%were believed that the students should be taught mathematics to score good grade rather than to apply it in their real life. These two figures (62.5% and 53.1%) indicate that the students were considered as knowledge receipting Hence, even though the teachers ideally believe that the students are not knowledge receipting, the teachers impart the knowledge and students receive it. Regarding this, Amare (2000) indicated that student learn more when they are involved in the teaching learning process rather than recipient of knowledge from their teacher.

On the other hand, 40.6% of the respondent teachers believed that they did not play the role of a facilitator to their students learning other than imparting knowledge. However, 37.5% agreed that they have been facilitating their

students' learning. On the contrary, 81.3% of the respondents were found to be responsible to help students on how to learn mathematics in and out of schools. Accordingly, 53.1% have tried to use variety of teaching methods to maximize students learning as well as 46.9% responded that they use different teaching aids to make the lessons tangible. Regarding this, Aggrawal (2004) and Amare (200o) indicated that the teaching -learning process is a three way communication: teacher, communication materials and students. Hence, these three way communication will be fruitful if supported by teaching aids.

Now a days, the teaching learning process of science subjects including mathematics and English are taking place though plasma instruction in Ethiopian high schools.

As table 8 depicts, 40.6% of the respondents agreed that the grade 10 mathematic plasma instructions are more of student-centered, but 31.3% and 28.1% of the respondents were found to have unfavorable attitudes and neutral attitudes respectively that the plasma instructions are more of student-centered.

In addition, 56.3% and 50% believed that most of the students do not enjoy with plasma instruction and that they learn more from plasma teacher than that of the classroom teacher respectively.

In the contrast, 75% of the respondents believed that the students' background knowledge of mathematics do not fit with the mathematics plasma instruction. Similarly, 71.9%believed that the plasma instruction ignored psychological difference (age, ability, social background) and behavioral change of the learners during teaching learning process.

In general, from the above information one can understand that the plasma teacher presents the lesson much more than that of classroom teachers. However, most of the students did not enjoy with plasma instruction due to their background knowledge of mathematics for it was very low as well as the plasma instruction did not consider the psychological differences and behavioral change of the learners.

Regarding this, educational technology provides common experiences to all students, opportunity for the teachers to observe the instructional methods and ideas of their experts, technical advantages not readily available in normal classroom for illustration and demonstration. Moreover, it is cool medium contrary to print (Aggrawal, 1996; Simsek as cited in Tewodros, 2005, Mcluhan in Amare, 1998).

On the other hand, educational technology (plasma) is the communication medium that effortlessly transmits huge quantities of information not thought about the time exposure. Furthermore, it is deskilling teachers, antithesis of learning with hard work and is not available for conscious analysis, understanding or learning (Mander in Amare, 1998, Tewodros, 2005).

To bring about an effective teaching-learning process the teachers have the right to participate in the curriculum developments. The attitudes of teachers and their roles in developing mathematics curriculum are presented and analyzed in table-9.

Table -9 Teachers' response and their role in Developing Mathematics Curriculum

	Respondents having										
	Favorable attitudes				Neutral attitudes		Unfavorable attitudes				Total no respondents
	1	2	Total	%	3	%	4	5	Total	%	
A_1	13	9	22	68.8	3	9.4	5	2	7	21.9	32
A_2	4	7	10	31.3	5	15.6	9	4	13	40.6	32
A_3	16	8	24	75	3	9.4	3	2	5	15.6	32
A_4	-	4	4	12.5	3	9.4	16	9	25	78.1	32

Key: 1= strongly agree 3= undecided 4= disagree
2= agree 5= strongly disagree

A_1= In my view, mathematics curriculum development is effective if teachers are involved in the development
A_2= I believe that mathematics curriculum development is effective if only the curriculum experts develop it and bring to teachers for discussion.
A_3= I believe that mathematics curriculum development is effective if both the curriculum experts and teachers participate in the development.
A_4= I do not think that there is an opportunity for teachers to be involved in the development of mathematics curriculum

As shown in table -9, 68.8% of the respondents were believed that the mathematics curriculum development is effective if teachers have been participated in the development, 75% agreed that the curriculum should be developed in collaboration of curriculum experts and the teachers. On the other hand, 78.1% believed that they had been on opportunity for teachers to take part in developing the curriculum. However, according to ICDR experts, selected teachers were given the chance to participate in the curriculum development of school subjects.

4.3.2. Students

As shown in the reviewed literature one of the human factor in school that influences implementation is the student. The extent to which students posses academic skills and background knowledge are a major determinant of the success or failure of a curriculum. in addition to this, the students

participation in designing a new curriculum determine the success or failure or it because implementation comprises the role relationship among teachers, curriculum, and students (Posner, 1995; Fullan 1991).

Table 10: The responses of Grade 10 Students towards Teaching Learning Process of mathematics

Items	Respondents having											
	Favorable attitudes				Neutral attitudes		Unfavorable attitudes				Total no of respondenta	
	1	2	Total	%	3	%	4	5	Total	%	No	%
T_1	44	45	89	39.7	10	45	56	79	135	60.3	224	100
T_2	97	56	153	68.3	7	3.1	26	38	64	28.6	224	100
T_3	119	47	165	74.1	7	3.1	36	35	71	31.7	224	100
T_4	53	44	97	43.3	12	5.4	63	52	115	51.3	224	100
T_5	64	51	115	51.3	26	11.6	56	46	102	45.5	224	100
T_6	47	37	84	37.5	22	9.8	82	36	118	52.7	224	100
T_7	70	62	132	58.9	28	12.5	41	23	64	28.6	224	100
T_8	44	59	103	46	15	6.7	81	25	106	47.3	224	100
T_9	18	41	59	26.3	2	1	98	53	161	67.2	224	100
T_{10}	99	70	169	75.4	14	6.3	32	9	41	18.3	224	100
T_{11}	30	46	94	42	25	11.2	43	62	105	46.9	224	100
T_{12}	89	27	116	51.8	9	4	63	36	99	44.2	224	100
T_{13}	78	58	136	60.7	29	12.9	35	24	79	26.3	224	100
T_{14}	108	70	178	79.5	13	5.8	16	8	24	10.7	224	100
T_{15}	46	42	88	39.3	6	2.7	94	46	150	62.5	224	100
T_{16}	15	23	38	17	18	8.0	107	61	168	75	224	100
T_{17}	73	39	112	50	11	4.9	65	36	101	45.1	224	100

Key 1= strongly agree 3= undecided

2= Agree 4= disagree 5= strongly disagree

T_1= In my view, the classroom teacher introduces and summarizes the lesson before and after plasma instruction

T_2= The teacher always gives us related questions, class work and homework related to the lesson.

T_3= I think that learning mathematics is highly advantages when the teacher guides and the students solve the problems by themselves

T_4= I believe that I do class works and homework effectively

T_5= I believe that mathematics instruction through plasma is learner-centered

T_6= In my view, there are instructional materials in the classroom

T_7= I believe that there are enough reference mathematics books in the library so that they help me to do different problems

T_8= In my view, the preparation of grade ten mathematics textbook is attractive for students to deal with.

T_9= I enjoy learning mathematics in classroom because my teacher check my work every time

T_{10}= In my view, the teacher often gives us quiz, exams and assignments

T_{11}= I feel that learning mathematics through plasma is better than that of the classroom teacher

T_{12}= I believed that learning mathematical concepts, rules, principles, ideas, and formula are helpful to solve different questions in other subjects (e.g. physics, chemistry etc)

T_{13}= In my view, without the knowledge of mathematics, it is difficult to learn other subjects

T_{14}=I believe that learning grade-10 mathematics has increased my mathematical knowledge

T_{15}= I believe that the mathematics teacher relates mathematics lessons to our real life situations.

T_{16}= In my view, the time given for each exercise during plasma broad casting is adequate.

T_{17}= I believe that my school environment (library, playing space, classroom size etc) is favorable for the teaching learning process

Students should have close relationship with their textbooks, and the only communication material at hand with them at any time in and out of the classroom is their text book. Therefore, textbooks are prepared with the assumption that it will be read and understood by all students. Students have often found the textbooks being hard and less interesting. Regarding this, as can be shown in table 10, 47.1% of the respondent students believed that the preparation of grade 10 mathematics text book is not attractive and readable. On the contrary, 46% of the respondents felt that it is some what attractive and readable. Though 46% of the students reported that the textbook is attractive and readable, almost above half of the respondents were found to say that it is hard and less attractive.

On the other hand, as can be shown in table 10 74.1% of the respondent students responded that learning mathematics is highly possible when the teacher guides and the students do problems by themselves. Moreover, 67.2% believed that their teacher do not check their works in the classroom. Regarding this, according to Amare (2000) students learn more when they have "internal commitment" and the "will" to learn as the process of learning is an active process not a passive one. However, from the data shown above one could understand that even though nearly three fourth of the respondents were found to have learn mathematics through discovery teaching method, most of the time their teachers do not check their works.

Table 10 also depicts that 68.3% and 75.4% of the respondent students responded that their teachers have given class and home works at the end of each lesson and often give them tests and assignments respectively. Students should do their class work and home works (internal commitment). However, 51.1% did not perform the given class works and home works by themselves effectively. The reason might be mathematics is full of abstraction so that it may need supplementary references and the students should try to refer to different books if they face any challenging problem in the textbook. Therefore, their libraries should be equipped with different references to help the students. Regarding this, 58.9% of the respondent students believed that there are enough mathematics references in the library. To crosscheck this, the researcher tried to observe the library of some schools under study and found that there were references which are limited in types.

Today, many countries around the world use some from the technological media in education. In a few countries, the use is fairly widespread. Most technological devices and programs, however, are structured around the needs of the teacher and are employed as teaching aids in classroom. In particular, in our country, the teacher should try to make the teaching learning process tangible by using different teaching aids and put them in the classroom.

However, concerning this , 52.7% of the respondent students believed that there are no any teaching aids in their classrooms. Similarly, the researcher did not find any teaching aids in the classroom during the observation time. The teaching aids help the students to relate different mathematical concepts to the real life and increase their mathematical knowledge. Furthermore, teaching aids make the work of the teacher simple and effective.

As can be seen in table-10, 62.5% of the respondent students were found to admit that their teachers do not relate mathematical concepts to their real life situations during the teaching leaning- process. Similarly, 60.7% and 51.1% of the respondents believed that it is difficult to learn other subjects without the knowledge of mathematics and it is more applicable in other subjects respectively.

In particular, 79.5% believed that the contents of grade 10 mathematics increase their mathematical knowledge. Therefore, from the above analysis of data one could understand that most of the teachers focus on the concept and knowledge part of the contents rather than relating them to other subjects and the real life of the students.

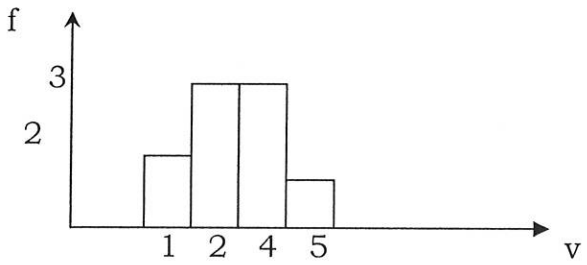
In most of the Ethiopian high schools, students learn mathematics through plasma. To see the problem that the students face during learning mathematics through plasma, the researcher brought different questions related to the teaching-learning process through the plasma. Table 10 depicts that 46.9% of the students believed that classroom the teacher has been found better than that of the plasma teacher. In the contrary, 42% believed that the plasma brings better information than the classroom teacher. Moreover, 51.1% were found that the plasma instructions are students' participatory Hence, nearly half of the respondent students have chosen the classroom teacher to learn mathematics. However, 42% and 51.1% prefer plasma instruction because it provides them with better information and it is enables them to participate.

As can be shown in table-10, 60.3% of the respondent students believed that the classroom teachers do not introduce and summarize the lesson before and after the plasma broadcasting. This is true as the researcher observed in the classroom during the observation time. The time allowed for the classroom teacher was very short and the teacher came to the classroom without the plasma manual. Moreover, 75% believed that the time given for each exercise is was too short that students could not do the exercise with in the given time some of them even could not jot down the problem from the screen in the given time.

To support this idea, the researcher took some examples shown below from the screen during observation.

1. Unit -4, lesson-14, exercise-2

   1. *Use the histogram to find the mean, mode, median, range mean deviation, variance, and standard deviation of the population function*



   ***NB**: Time given for students= 5 minutes, the plasma teacher took 6 and half minutes to solve it. It took me 3'26" to copy down from the screen (the researcher)*

   2. *Unit-6, lesson -5, exercise -6: The total surface area of right circular cone is 14pi and the slant height is 5cm, calculate the length of the radius of the right circular cone*

   ***NB**: time given for students =2', plasma teacher took =3'3"*
   The researcher took 1'49" to copy down.

   3. *Unit -7, lesson-22, exercise-3: A ship leaves the harbour after being repaired. It sails 1km out of the harbor on a bearing of S 55^{0}W to a bouy B and then changes direction to a bearing of S 75^{0}E. After it has cover 5km, it develops engine trouble and so turns to head back to the harbor. A) How far must it travel to the harbor and b) what will be its bearing?*

***NB**: Time given for students= 3 minutes*
Plasma teacher took= 4'37"
The researcher took= 2'06" to copy down from the screen

Regarding school environment, 50% of the students believed that their school environment is comfortable for the teaching-learning process. However, 45.1% were found to say that they have unfavorable attitudes towards their school environment.

4.3.2.1. Students Attitudes towards Learning Mathematics

Schools are set to make students to learn and all the efforts of the teachers are devoted to their learning. Learning is the acquisition of knowledge, attitudes, habits and skills.

On the other hand, learning can be affected by the total situation. This total situation depends upon a number of factors (external and internal) (Aggarwal, 2006). Among external factors to the classroom situation are heredity, which the classroom can neither change nor increase, and the status of the home such as bodily weakness, malnutrition, unhygienic living, bad light, over crowding, and distance of school from home. The internal classroom factors that affect learning are goal and objectives, motivation, interest, age, learning activities provided by teachers and attitudes. The following table summarizes the attitudes of students towards learning mathematics.

Table -11 Students' Attitudes Towards Learning Mathematics

Items	Respondents having											
	Favorable attitudes				Neutral attitudes		Unfavorable attitudes				Total no of respondent	
	1	2	Total	%	3	%	4	5	Total	%	No	%
H_1	100	56	156	69.6	18	8	28	22	50	22.3	224	100
H_2	60	113	173	77.2	12	5.4	23	16	39	17.4	224	100
H_3	89	34	123	54.9	22	9.8	28	59	87	38.8	224	100
H_4	77	54	131	58.5	15	6.7	32	51	83	37.1	224	100
H_5	49	62	111	49.6	12	5.4	29	72	101	45.1	224	100
H_6	32	69	101	45.1	9	4	55	54	109	48.7	224	100
H_7	115	37	152	67.9	15	6.7	33	24	57	25.5	224	100
H_8	33	77	110	49.6	14	6.3	61	38	99	44.2	224	100
H_9	35	63	98	43.8	17	7.6	67	42	109	48.7	224	100
H_{10}	45	93	138	61.6	6	2.7	53	37	90	40.2	224	100
H_{11}	60	94	154	68.8	16	7.1	32	22	54	24.1	224	100
H_{12}	47	71	118	52.7	12	5.4	61	33	94	42	224	100
H_{13}	74	88	162	72.3	6	2.7	39	17	56	25	224	100
H_{14}	30	42	72	32.1	8	3.6	101	43	144	64.5	224	100

Key 1= strongly agree 3= undecided

2= Agree 4= disagree 5= strongly disagree

H_1= I like mathematics because it is practical
H_2= In my view, mathematics is an important subject in and out of the school so that I follow it attentively
H_3= Mathematics is dull and boring
H_4= I feel a sense of insecurity when attempting mathematics
H_5= I approach mathematics with a feeling of hesitation, resulting from fear of not being able to do mathematical problems
H_6= I have seldom liked studying mathematics
H_7= I believe that mathematics helps in mental development and teaches the way to think
H_8= Mathematics is not essentially important in every day life
H_9= I detest mathematics and avoid using it all times
H_{10}= I do not get upset when trying to work mathematics problems
H_{11}= I am happy in mathematics periods
H_{13}= I am not motivated to work mathematics problems
H_{14}= I like trying to solve new problems in mathematics

As can be seen from table 11, 69.6% and 77.2% of the respondent students believed that mathematics is a practical subject as well as important in and out of the schools respectively. Similarly, 54.9% were found to say that it is not

attractive. However, 38.3% were found to believe that it is attractive. This might emanate from either the external or internal factors that affect learning.

On the other hand, in the same table, 68.8% of the respondent students were not happy in mathematics periods but 67.9% felt that mathematics helps them for critical thinking. Moreover, 72.3% did not try to solve new mathematical problems and 52.7% needed motivation in order to do new problems. According to Aggarwal (1996), motivation arouses interest. Interest is the mother of attention and attention is the mother of learning. 49.6% need motivation because they approach mathematics problems with a feeling of hesitation resulting from fear, 58.5% felt sense of insecurity when attempting mathematics problems. 48.7% detested to study mathematics and 48.7% did not even upset when they fail to get the right answer (internal emotion, which means they do not have positive or negative reaction).

Lastly, 64.3% of the respondent students were found to respond that the plasma mathematics instruction is not enjoyable for them. Even though mathematics is a practical and important subject in and out of schools, students have had negative attitudes towards learning it due to the internal and external factors. Hence, the teacher should try to understand those factors and as much as possible try to alleviate or minimize them in order to increase the attitudes of students' towards leaning mathematics.

4.3.3. Learning Process/Learning Situation

Learning process is the interaction among teachers, learners and the communication materials in school environment. Regarding this, Aggarwal (1996) and Amare (2000) show that learning is a three way communication. However, the learning process, most of the time occurs in the classroom situation. The following table summarizes the instructional consideration observed in the classroom.

Table 12. Classroom Observation About the Teaching Learning Process

No	Instructional consideration	Rating scales						Total no of session observed	
		1	%	2	%	3	%	Total	%
1	The teacher lecturing through out the period	13	65	7	35	-	-	20	100
2	Students listen and write from the screen/black board while the plasma instruction takes place/the teacher	7	35	9	45	4	20	20	100
3	Teacher facilitates students learning while plasma instruction braod costing	3	21.4	6	42.9	5	35.7	14	100
4	The teaching learning process through plasma focuses on facts, rules and formulas written in the text book	9	64.3	2	14.3	3	21.4	14	100
5	Plasma teacher present the lesson by relating to students life	3	21.4	2	14.3	9	64.3	14	100
6	The time given for exercise during broadcasting is sufficient	1	7.1	2	14.3	11	78.3	14	100
7	The classroom teacher performs the exercises given from plasma by himself	4	28.6	8	57.1	2	14.3	14	100
8	Most of the students perform the exercises given from plasma with in the given time	-	-	2	14.3	12	85.7	14	100
9	The teacher introduces the lesson before the plasma instruction	2	14.3	3	21.3	9	64.3	14	100
10	The teacher attempts to use different instructional methods	3	15	6	30	11	55	20	100
11	The classroom situation is attractive for teaching -learning purposes (example, blackboard, clarity of plasma screen class size etc)	13	65	6	30	1	5	20	100
12	The teacher gives class work, home work and check their work	14	70	3	15	3	15	20	100
13	The teacher makes summary of important concepts after plasma broad casting	3	15	9	45	8	40	20	100
14	The students are fully involved in teaching learning process	2	10	15	75	3	15	20	100
15	Teaching aids are hand on the wall of the classroom		-	-	-	20	100	20	100
	Mean of percentage		28.8		30.2	-	41	20	100

Key: 1= Frequently 2= Rarely 3= Not at all

As table 12 depicts 65% of the observed sessions, teachers presented the daily lesson through explanations and 55% did not attempt to use different teaching methods. Nevertheless, 45% of the observed sessions students were seen rarely taking notes from the screen and 35% were observed frequently copying down notes from the screen, but the plasma teacher was so fast that the students were not able to finish the notes.

On the other hand, in 75% of the observed sessions the students were seen rarely involve in the teaching -learning process. What was amazing was that some of them were sleeping while the teaching-learning process was taking place. Regarding this, Amare (2000) indicated that students learn more when they have "internal commitment" and the "will" to learn. After the observations, the researcher asked some teachers' about the reason why some students did not participate in the class. Most of the teachers reasoned out that it was due to the students' background knowledge of mathematics, the fast rate of plasma, and the students' way of living standard (they come from poor family). In 70% and 65% of the observed classrooms teachers gave class works and homework and the classroom situation (class size, black board usage, and table and chairs) were appropriate for the teaching-learning process except sometimes the discontinuity of plasma.

While the plasma was broadcasting, the researcher tried to observe the activity of the classroom teachers, the contents taught though plasma, the way the plasma teacher related the contents to the real life of the students and how much the students were involved in the learning process. Accordingly, in 64.3% of the observed classroom the plasma instruction focused on facts, rules and formulas written in the textbook as well as in 42.9% of the observed sessions the classroom teachers did not facilitate students' learning during the plasma broad casting. Similarly, in 64.3%, 64.3% and 45% of the observed classrooms, the plasma teacher did not relate the contents to the real situation, the classroom teacher did not introduce the

lesson before the plasma instruction and did not summarize the important concepts after broad casting respectively. In 78.3% of the observed sessions the time given for exercises was not sufficient and in 85.7% of the observed sessions, the students did not perform the given exercises with in the given time. Moreover, in 57.1% of the observed classrooms, teachers rarely clarified the exercises for students. However, in 100% of the observed classrooms there were no teaching-aids hanged on the walls of the classrooms.

In general, during the classroom observation, the classroom teachers were not seen using different teaching methods (65%), did not facilitate the students while the plasma broadcasting (42.9), did not introduce the lessons before broadcasting (64.3%), and did not summarize after broadcasting (45%). Moreover, the time given for each exercise from the plasma was not sufficient (78.3%). For this reason, it seems, most of the students were seen rarely involving in the teaching learning process (75%).

4.4. Factors that Hinder the Implementation of Mathematics Curriculum

There are different factors (internal or external), which affected the implementation of grade 10 Mathematics. Regarding this, the researcher tried to put some selective possible factors that affect the implementation in the rank order. The factors were presented and analyzed in the following table.

Table- 13: Factors that Affect the Implementation of Grade 10 Mathematics

No	Possible factors	Mean rank	Rank	Total no of respondent teachers
1	Poor supply of students' textbook by the schools	6.19	14	32
2	The maximum loads the teacher teaches per week	3.40	7	32
3	Teacher disinterestedness towards teaching mathematics	4.25	9	32
4	The less supportiveness of school administration	4.81	10	32
5	Absence of in-service training for teachers related to mathematics subject	3.09	6	32
6	Large class size	5.31	12	32
7	Students' background knowledge of mathematics	1.8	1	32
8	Inadequate copies of syllabus and plasma manual in the schools	2.65	4	32
9	Absence of teaching aids in the pedagogical center	5.16	11	32
10	The low quality of mathematics syllabus and text book preparation	2.78	5	32
11	The irrelevance of contents which do not move in line with the maturity level of the students	2.4	2	32
12	Students' traditional beliefs of the subject as difficult	2.46	3	32
13	Students' misbehavior in classroom	3.91	8	32
14	Availability of teaching materials in the schools	5.63	13	32

As can be shown in table 13, the respondent teachers have put the factors that affect the implementation of grade 10 Mathematics curriculum in order of their influence. The data obtained displays that the students' background knowledge of mathematics, the irrelevance of contents in the syllabus, students' traditional beliefs of the subject as difficult, in adequate number of copies of the syllabus and plasma manual, the low quality of syllabus and textbook preparation, and lack of in-service training regarding the mathematics curriculum have taken the first six ranks among the factors that hinder the implementation of grade 10 mathematics.

On the other hand, supply of students' textbooks by the schools, availability of teaching materials, class size, teaching aids in pedagogical centers, and supportiveness of school administration took the lowest five ranks denoting the minimal influence they have on the implementation of mathematics curriculum.

The background of the students are the critical issue in the teaching learning process. Regarding this, the researcher observed that most of the students were not seen involving in the teaching learning process during the classroom observation. This might be due to lack of knowledge or lack of confidence to participate in doing problems Concerning this, Amare (2000) indicated that learning to be mediated by students previous experiences, needs and predispositions.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The main purpose of this study was to evaluate the contents and implementations of grade 10 mathematics curriculum. The quality of mathematics curriculum in any grade level in general and in grade 10 in particular depends upon the contents (integration, sequence, relevance, scope), the way the curriculum elements (knowledge, attitudes and skills) are unified and its intents such as the interaction of teachers, students and communication materials in the school environment. Therefore, the organization of grade 10 mathematics curriculum materials (syllabus and text book), the place where they are implemented (schools and classroom), and the way they are implemented (teaching learning process) should be investigated in relation to the outcomes..

As a result, this study attempted to achieve the following objectives.

- to identify whether the three domains of learning are treated in the syllabus or not
- to identify and indicate whether the curriculum materials are organized as the criteria of curriculum organization (continuity, sequence, integration and scope) or not.
- to assess whether the teacher students classroom interaction match or not with the specification in the curriculum guide.
- to identify the extent to which the teachers are applying the teaching methods and strategies suggested in the curriculum guide.
- to identify the major factors that hinder the implementation of grade 10 mathematics curriculum
- To understand students' attitudes towards learning mathematics.

To achieve these objectives the data collected through coding sheet, questionnaires, interviews and classroom observations were analyzed and interpreted under the themes: the organization of contents in curriculum materials, the actual use of instructional guidelines, the teaching learning process in the classroom situation and the factors that hinder effective implementation.

Without the well organized curriculum materials, implementation will be unthinkable as well as the well developed curriculum materials can not be implemented in the vacuum. Therefore, the contents and intents are interrelated and interlinked. Curriculum organization is an essential component in curriculum development because curriculum organization greatly influences the effectiveness of implementation and the degree to which the major educational changes (knowledge, skills and attitudes) are brought up in the learners.

Educational objectives will have a greater chance of being achieved if suitable educational contents are made available. In the contrary, it can be argued that effective educational contents are those which provide what is desired for the attainment of set goals (learning to know, learning to be, learning to do and learning to live together (TGE, 1994; Derebssa, 2004; Delars, 1998). Then the taxonomy of educational objectives give a prospective to an educational effort which setout to examine the relationship between the contents and objectives. Hence, Bloom (1956) argued that the three domains of learning (KAS) should be given a relative emphasis during the development of contents and its objectives of particular subject (example, grade 10 mathematics).

Regarding the contents and intents of grade 10 mathematics to achieve the stated objectives, the researcher raised three basic research questions. First, Is Grade 10 mathematics curriculum coherently developed? That means, do

the domains of learning are relatively treated in the syllabus?; How much are the contents integrated with other subjects (ex. The correlation in scheduling topics with different subjects)? How much do the sequential and continuity of contents are taken in to account (logical and psychological sequence)? And how much do the contents are relevant to students' real life? Secondly, do grade 10 mathematics curriculum implemented as intended? That means, how much do teachers follow the instructional guide lines (if any) stated in the syllabus? (ex. Teaching methods, teaching aids and evaluation techniques)? And thirdly, how do the students feel about learning mathematics? That means, the internal commitment, needs, predisposition of students to learn mathematics. Finally, what are the factors that hinder the effective implementation of grade 10 mathematics curriculum

The interpretation and analysis of the obtained data to answer the above questions are summarized below.

First, the objectives developed in the syllabus focus on knowledge acquisition (52.4%), little emphasis on skills (45.2%) and the least attention for attitudes (2.4%). Regarding this, the chi-square also indicated that there was a very high significant difference between the number of observed frequencies and the expected frequencies of the objectives developed in the syllabus in relation to coverage (knowledge, attitudes and skills). X^2 2, N=84)=36.17) P*<0.05.

Moreover , 65.6% of the respondent teachers believed that the students are not considered as the receiving of knowledge. Similarly, 59.4% of the respondent teachers believed that most of the contents of grade 10 mathematics focuses on knowledge acquisition.

Secondly, content integration refers to the horizontal relationship of subjects and that developing ways of helping individuals in the process of creating unity of knowledge. It includes interrelation of subjects, correlation in

scheduling of topics in different subjects so that they complement with one another, the need for requisites, and the value of providing more coherence and relevance of contents.

Regarding this, the researcher chose two chapters (Exponential and logarithmic functions, and Trigonometric functions) from grade 10 mathematics purposefully. As indicated in chapter -4 p 53-55 of this research, the examples showed that the contents of grade 10 mathematics have been integrated with contents of physics, chemistry and Geography as well as the two interviewees (physics and chemistry teachers) supported this ideas. Moreover, 84.4% of the respondent teachers believed that mathematics subject is the core subject in and out of the schools as well as 65.6% agreed that contents of this grade level have been integrated with other subjects. Similarly, 60.7% of the respondent students believed that it is difficult to learn other subjects without the knowledge of mathematics.

However, the integration of contents do not consider the correlation of scheduling the topics, which are very important for the need for request (students learn mathematics parallel with that of physics, chemistry).

Thirdly, vertical organization which centers on the concept of sequence and continuity, is concerned with the longitudinal placement of curriculum elements (KAS). Curriculum experiences can be sequenced interms of contents and learning experiences. Contents are usually sequenced by means of logic of the subject matter while the psychological approach (age, abilities, interests) are used to determine the sequence of learning experiences. Therefore, the central role of sequencing in any content is additive in the sense that the later set of information can be established on the earlier contents which simultaneously bind together the earlier in the attainment of new level of understanding and competence.

However, most of the chapters such as, unit -1 (introductory logic), unit -3 (Logarithmic and exponential functions), unit 4 (descriptive statistics and introductory probability) and their contents are new concepts. That means, they are not developed on the earlier information which the students learned in grade -9. According to Amare (1998) learning is mediated by students previous experiences, needs, and pre dispositions. Regarding this, 65.6% of the respondent teachers believed that the contents in the communication materials as well as the facts, principles and ideas within the contents do not follow the logical sequence and 56.3% of the respondent teachers agreed that some of the contents beyond the ability of the students (Psychological sequence). Similarly, according to students responses to the open-ended questions, most of them suggested that logarithmic and trigonometric functions are difficult portions to them. Some of them even added that they dislike logarithmic function very much. 47.3% of the respondent students also believed that the preparation of grade 10 mathematics text book is not attractive to read and most of the contents are new concepts to them.

Fourthly, learning experience refers to the interaction between the learner and the external conditions in the environment to which the learner react. It indicates that the students should be highly involved in the teaching learning process through learning activities and the students' predispositions . Moreover, the teachers should try to use varieties of teaching methods to maximize the learning experiences of the learners. Concerning this, 68.8% of the respondent teachers believed that there are adequate learning activities (examples, exercises, and class activities) at the end of each topic in the text book. However, 62.5% of the respondent teachers agreed that these learning activities are not appropriate (not related to students' real life).

Similarly, 39.2% of the total teaching methods suggested in the syllabus have been given priority to student-centered (discovery learning) to maximize the learning experiences of the students. 74.1% of the respondent students

supported that learning mathematics is highly possible when the teachers guide them how to learn and when they solve the problem by themselves (Students centered). Furthermore, 56.3% of the respondent teachers believed that there are variety of teaching methods in the syllabus which are used to maximize the participation of students in learning.

In contrast, 62.5% of the respondent teachers encouraged their students to memorize definitions, theorems, rules, formulas and axioms in steady of worrying about their proofs and 53.1% of the respondent teachers taught the students how to score good mark in mathematics rather than how to apply it in the real life situation (reaction with their environment). Similarly, 65% of the observed session teachers presented the lesson through explanation and 75% of the observed session student were rarely involved in the teaching learning process.

Fifthly, the mathematics curriculum organization is effective when different parties (curriculum experts, teachers and psychologists) participated in the development of grade 10 mathematics curriculum materials. According to the ICDR curriculum experts, the selected mathematics teachers and the mathematics educators from different colleges, have participated in the preparation of grade 10 curriculum materials (syllabus, textbooks and teachers guide). Regarding this, 68.8% of the respondent teachers believed that grade 10 mathematics curriculum is effective if the teachers have participated in its development as well as 75% of the respondent teachers agreed that the development should be better when it is done by curriculum expertise collaboration with the mathematics teachers. However, 78.1% of the respondent teachers did not have an opportunity to participate in curriculum development of grade 10 mathematics.

Sixth, it is obvious that even the best designed curriculum which is supposed to be practiced in a resourceful environment bring nothing if the instructional

guide lines are interpreted as intended in the syllabus. The teaching learning process comprises the teachers (plasma), the students, the communication materials (syllabus, textbook and plasma manual) and the interaction of teachers (plasma), students and communication materials in school environment. With regard to the availability of syllabus and plasma manual, 78.1% of the respondent teachers were found to say that they did not have access to get the syllabus and 68,8% did not have the plasma manual. Regarding this, Solomon (2008)indicated that syllabus is the basis for all educational and instructional activities and as such serve as the sole of references. Similarly, some of the department heads supported that there is a limited number of copies of syllabus and plasma manual in the schools (in some school there are not available at all) and they added that the schools' administration is not willing to copy the syllabus and plasma manual for teachers due to limited resources such as papers and printing materials. Moreover, 71.9% of the respondent teachers did not take any training related to mathematics in order to improve the teaching learning process. 65.6% of the teachers were not comfortable with their school environment.

Seventhly, with regard to plasma instruction, 50% of the respondent teachers believed that the students learn more from plasma teacher than that of the classroom teacher. The rests (28.1%) had unfavorable attitudes whereas (28.1%) and neutral attitudes. Moreover, 48.6% of the respondent teachers believed that it was more of student centered. The rests had unfavorable attitudes (31.3% and neutral attitudes (28.1%) about the method used by plasma.

On the other hand, 75% of the respondent teachers believed that the students' mathematics background knowledge do not fit with to plasma instruction and 71.9% of the teachers agreed that the plasma instruction ignores the psychological differences (age, abilities, interests and societal problems) and behavioral changes of the learners . 65.3% of the teachers

believed that most of the students do not enjoy the grade 10 mathematics plasma instruction.

On the other hand, 46.9% of the respondent students pointed out that the classroom teachers are better than that of the plasma teacher. However, 42% believed that learning mathematics through plasma is better. The rest have neutral attitudes (11.2%).Similarly, 75% of the respondent students believed that the time given from plasma teacher for each exercise is too short that they could not do the exercises within the given time.

During observation time, in 64.3% of the observed sessions the plasma instruction was seen focusing on facts, rules, and formulas written in the text book. In 78.3% and 85.7% of the observed classrooms, the time given from plasma teacher did not sufficient and the students did not perform the exercises given from plasma with in the given time respectively.

Generally, regarding the plasma instruction, according to mathematics teachers and as observed in the classrooms the problems in the plasma instruction are the high speed of the plasma teacher, shortage of time to do activities and exercises in the classroom, lack of interaction that make students and teacher passive listeners, using lecturing dominantly and difficulty of language for the students to comprehend ideas.. In short, according to their responses, there are interrelated problems and beliefs on the teaching -learning the process through plasma TV.

Eighthly, the average number of students in a class was around 48 as shown in table17 (see appendix B) , relatively good as well as the researcher checked this during observation in the classroom. Therefore, the classroom was conducive to accommodate the students. However, in 100% of the observed classroom there were not any teaching aids which are hanged on the wall of the classrooms to facilitate the teaching-learning process. Similarly, 52.7% of

the respondent students agreed that there have not been any teaching aids in their classrooms.

Ninth, the students' attitudes, internal commitment, and predispositions towards any subject in general and mathematics in particular was very crucial in the teaching-learning process. Further more, the students should have a close relationship with their textbook in and out of the classroom. But students have often found that the textbook is difficult to comprehend and less attractive. Regarding this, 47.1% of the students believed that grade 10 mathematics text book is less attractive and hard.

With regard to their attitudes towards grade ten mathematics, 79.5% , 77.2% , 69.6% and 67.9% of the respondent students were respectively believed that grade 10 mathematics increases their mathematical knowledge, very important subject in and out of the schools, practical subject and helped them for critical thinking. According Aggarwal (1996) motivation arouses interest. Interest is the mother of attention and attention is the mother of learning.

On the other hand, 68.8% of the respondent students were not happy in the mathematics periods. Moreover, 72.3% of the students did not try to do different mathematical problems and 52.7% needed motivation to do mathematical problems related to the contents.

Tenth, there are different factors which hinder the implementation of grade 10 mathematics. The students background knowledge of mathematics, the irrelevance of contents in the syllabus, students traditional beliefs of the subject as difficult, inadequate copies of syllabus and plasma manuals, the low quality of syllabus and text book preparation and lack of in-service training for teachers regarding mathematics curriculum took the first six ranks among the factors that affect the implantation of grade 10 mathematics curriculum.

5.2. Conclusions

The following conclusions are made based on the summary above.

1. The objectives and contents developed in the syllabus and textbook of grade 10 mathematics have not been treated in accordance with the three curriculum elements (KAS) which are considered as warp and woof of the fabric of curriculum organization. Curriculum organization greatly influences the efficiency of implementation and the degree to which major educational changes are brought in the learners. Regarding this, ICDR(2004) states that mathematics learning has to contribute towards educating the students to be better citizens and enable them to play their role in the social program of their community. That means, mathematics studied at this grade level has to contribute to the development of personalities of the students not only characterized by high knowledge and capacities but also by positive attitude, a high activity in social fields, a scientific view of life and high moral qualities. However, as the data indicates that the objectives related to attitudes take the least attention (2.4%). Moreover, the value of chi square ($x^2N=84$, $df=2$)= 36.17, $P<0.05$, indicates that there is a very high significant difference between the number of observed and expected frequencies of objectives developed in the syllabus in relation to coverage. Hence, the objectives developed in the syllabus do not give a relative attention for the three domains. Regarding to integration of contents, the data obtained from documents (see chapter 4 and questionnaires show that most of the contents of grade 10 mathematics are integrated with the contents of other subjects. But the physics and chemistry teachers have faced problems during teaching their respective subject which need the concept, rules, principles and formulas of mathematics. As they suggested the problems arise from the students unfamiliarity with such mathematical concept (ex. Logarithmic and trigonometric functions) before they come to learn the concepts (PH-

value, motion in two dimension). Therefore, even though there were contents of grade 10 mathematics which are integrated with other subjects, correlation in scheduling of topics in such subjects so that they do not complement one another. This which has an impact on the need for requests (students must taken mathematics while taking physics or chemistry).

Similarly, curriculum organization is also made by considering continuity (sequence), scope and relevance. However, as indicated in the summary and in chapter-4 of this study, the preparation of grade 10 mathematics has not taken into consideration the logical and psychological sequence of contents and facts, principals and ideas within the contents.

2. Curriculum experiences are expressed in terms of contents and learning experiences. Learning experiences of students are maximized when teachers use variety of teaching methods. Most of the teaching methods suggested in the syllabus have given priority to discovery learning (student centered approach) (39.2%). It is understood that learner centered instruction is critical to the creation of optimal learning climates at all level of the system. In contrast, in 65% of the observed sessions, grade 10 mathematics teachers and plasma instructor use explanation (Lecturing) methods. In 75% of the observed sessions students were rarely involved in the teaching learning process. Hence, the teachers' practices and the teaching methods suggested in the syllabus are found mismatching. Moreover, the students were seen passive learners and they felt discomfort in the classroom. These problems have appeared because of various interrelated reasons shown above.
3. The teaching learning process comprise teachers (plasma), students, communication materials and their interaction. The communication materials (syllabus and plasma manual) are the basis for all educational

and instructional activities. According to Solomon (2008) the syllabus is the basis for all educational and instructional activities and as such serve as sole point of reference. However, 78.1% and 68.8% of the respondent teachers did not have access to get the syllabus and the plasma instruction manuals. Hence, the absences of those materials in the hand of teachers have its own impact on applying the instructional guide line in syllabus and plasma manual.

4. Plasma provides common experiences to all students technical advantages not readily available in the normal classroom for illustration and demonstration. On the other hand, the grade ten mathematics plasma instructions bring a huge amount of contents at a speedy motion at a time without considering the psychological and behavioral change of students.
5. according to the data gathered, the classroom situations (class size, desk, chair and others) relatively were not seen affecting the teaching learning process of the grade 10 mathematics. However, there were not any teaching aids hanged on the wall of the classrooms observed so far. Besides, the students background knowledge of mathematics, their internal commitment to do different problems have negative impacts on the teaching learning of grade 10 mathematics.
6. The students' background knowledge of mathematics, the irrelevance of contents in the syllabus, the students' traditional beliefs of the subject as difficult, inadequate number of copies of syllabus and plasma manuals, the low quality of syllabus and textbook preparation and lack of in-service training to teachers regarding the mathematics curriculum have taken the first positions that influence the effective implementation of grade 10 mathematics.

5.3. Recommendations

The preparation of any curriculum in general and the grade 10 mathematics curriculum in particular is not an easy task. It needs the coordination of the policy makers, curriculum experts, mathematics teachers, psychologists and

sociologists. Hence, in line with the above point and the results of the study, the researcher recommended the following points.

1. The MOE in general and ICDR in particular should take a greatest responsibility in developing the objectives and contents of grade 10 mathematics. in particular. The objectives and contents should be produced in the manner that they treated the pillars of education. (Learning to know, learning to do, learning to be, learning to live together)
2. The integration of contents of grade 10 mathematics should be made by considering the correlations of scheduling of the topics. Here, the teachers from different fields of study (physics, chemistry, mathematics) should participate to alleviate the problems of scheduling the topics.
3. The curriculum experiences must be sequenced by considering the logic of the subject and the psychological evidence. In doing so, the curriculum experts, teachers, psychologists and sociologists should participate in the development of grade 10 mathematics. In preparing mathematical materials, it is better to assess the contents of the previous grade levels (example, grade -9 , grade 8...)in order to bring the continuity of contents and facts, principles within the contents
4. The ICDR experts should distribute the syllabus and the plasma manual to the schools in order to alleviate the problems related to these materials. Moreover, the principals of schools should ask the concerned body if there are shortages of such materials.
5. The concerned body should readjust the plasma instruction by giving equal time for the plasma teacher and the classroom teachers in order to avoid the problems regarding time, psychological and behavioral changes of the students (particularly for mathematics subject).
6. The mathematics teachers should used different teaching methods and teaching aids suggested in the syllabus in order to maximize the learning of their students. The teaching aids should be displayed on

the walls of the classrooms to make the learning tangible. The principals, department heads and teachers should take initiatives to visualize the teaching aids on the classrooms.

7. The teachers of mathematics should motivate and encourage their students in order to bring up on them positive attitudes towards learning mathematics. They should also initiate their students to have internal commitment and need to learn mathematics.
8. The background knowledge of mathematics of the students should be taken into account by different parties (curriculum exerts, teachers, parents) to alleviate the problem of traditionally feeling the subject as difficult. Moreover, mathematics teachers and their respective department heads should design various mechanisms to develop a better behavior in students towards learning mathematics. For example, motivating students to work in the classroom, and making them aware of the role and application of mathematics in the real life.
9. Teachers of mathematics should be given workshops to acquaint them with the syllabus and modern teaching methods by Addis Ababa City Administration Educational Bureau.

BIBLIOGRAPHY

Abebe Bekele (1991). Principles of Curriculum enquiry: Teaching Material, Department of Curriculum and Instruction AAU (unpublished).

Adeleke A.Y. (1998). **Teachers' attitudinal variables in the implementation of the further mathematics curriculum as correlates of students learning outcomes**. Zimbabuwe. Journal of Educational research V-110, 1-32.

Aggarwal J.C. (1996). **Principles, Methods and Techniques of Teaching** . New Delhi . Vikas. Publishing House Pvt. LTD.

Amare Asgedom (2000) Communication and media in curriculum studies (Educ.l 678). Distance learning program AAU

Amare Asegdom (2000). **An Androgogic Approach to teaching Learning**. IER Flambeau V-8, No-1

Amare Asegdon, Nardos Abebe, & Mekuanent Kelemd (2000). Framework for curriculum Design in Higher Educaiton IER, Flambeau V-7, No. 2

Amare Asgedom & Temechegn Engida (2002): **Education in Ethiopia: Development prospective**. The Ethiopian Journal of Education V-22, No1,.

Amare Asgedom (1998). **Content Analysis methodology and application to Curriculum Evaluation**., IER Felambeau. V-6, No-1

APA (2001), **Publication Manual of the American Psychological Association**. Washington . DC.

Babbie. E. (1973). **Survey Research**. Belmont. Wads Worth Publishing Company.

Bechner. S (1966). **The role of mathematics in the rise of science**. Princeton, New Jersey. Princeton university Press.

Benbow C.P. & Arjmand .O (1990) . **Predictors high academic Achievement in mathematics and science by mathematics talented students**. Journal of Educational Psychology. V_82 , pp-430-441.

Blekin. E.M. and Kelly. A.V. (1994). **The National Curriculum and Early Learning. An Evaluation**. London. Paul Chapman Publishing Limited.

Bloom . B. (1956). **Taxonomy of Educational Objectives**: The Classification of Educational goals, aims and objectives. Committee of college university examiners. New York.

Carl E.A. (1995). **Teachers Empowerment through curriculum Development**. Cape Town Jute Co. Ltd

Clarke S.H.& Russell. A (1997) **Interdisciplinary High School Teaching: Strategies for integrated learning**. University of Vermont.A Viacom Company.

Cohen. L & Manion. L (1994). **Research Method in Education** London. Routledge.

Creswell. J.W. (1994): **Research design: Qualitative and Quantitative. Approaches London**. SAGE publication International Educational and Professional publisher.

Delors. J. (1998) **Education for the twenty- first century**. Issues and perspectives. France. UNESCO publishing.

Dessalegn Chalchisa (2000). **Basic concepts of Evaluation research**. IER Felambeau, V-8 N-1.

Dessalegn Chalchisa (2005): Comparative study of students' achievement in English and Mathematics in Addis Ababa, Oromia, and Amhara regional states. Ethiopia. (Unpublished) . PH.D. Thesis Andhra University.

Desselagn Chalchisa (2000). Basic concept of Evaluation Research IER, Flambeau, 8(1), 39-70.

Deway. J. (1897). My Pedagogic creed. The school Journal. V-LIV, No. 3 p. 77-80.

FDRE (1994). **Education and Training Policy**. Addis Ababa. St.George Printing press.

Fliegler. L.A (1964). **Curriculum Planning for the gifted**. Prentice –Hall Inc.

Fraenkel. J & Wallen. N(2000). **How to Design and Evaluate Research in Education**. New York , McGraw . Hi

Freire . P. (1972). Pedagogy of the oppressed. Harmondsworth. Pengin.

Friend. H. (1984). The effect of science and mathematics integration on selected seventh grade students attitude towards and achievement in science. New York. New York city Board of Education.

Fullan M. (1991). The New meaning of Educational Change. New York Teachers College Pres. Colombia, University Principles of Curriculum & instruction. Chicago and Condon the university of Chicago press.

Gagen. R.M, Briggs. L.J.& Wager. A. W (1992). **Principle of Instructional Design** (4th ed) Holf, Rinehart and Winston, Inc.

Gagne. R.M.< Brigg. L.J. & Wager, A.W. (1992). Principle of Instructional Design (4th ed). Holt. Rinchart and Winston Inc.

Gizaw Tesissa (2003). **Situational Analysis of Ethiopian Education**. IER flambeau Vol-10, No-2

ICDR (1993). "Basic Concept in Curriculum development: Getachew G/Tsadik , 1980 E.C (Unpublished).

ICDR (2004) Grade 9 and 10 Chemistry curriculum guide

ICDR (2004). Grade 10 Mathematics curriculum guide

ICDR (2004). Grade 9 Mathematics curriculum guide

ICDR (2004). Grade 9 and 10 Physics curriculum guide

ICDR (2005) Grade 9 and 10 chemistry Students text books. Addis Ababa.

ICDR (2005) Grad -9 and 10 Mathematics students text books, Addis Ababa. Mega Publishing enterprise

ICDR (2005). Grade 9 and 10 physics students textbook. Addis Ababa Mega Publisher Enterprise.

James E.J. (1958). The teaching of modern school mathematics. Bristol, Redland Training college oxford university Press.

Kehsay Gebre (1999). An overview of curriculum evaluation IER Flambeau. Vol-6 No-2

Kelly A.V. (2004) . **The curriculum Theory and Practice** (5th edition). SAGE publication limited Inc.

Kinfu Tasachew (2008). Evaluation of the Implementation of preparatory Mathematics Syllabus in Assela TVET Institution. M.A. Thesis, AAU, (unpublished).

Kroppendorff (1980). Content analysis. An introduction to its methodology. London SAGE Publicati ons. Beverly Hills Grade 10 Mathematic Plasma Manual.

Lewy . A (1977). Hand book of curriculum Evaluation. Paris, UNESCO

London Ministry of Education (1958). Teaching mathematics in secondary schools. London. Her Majesty stationary office.

Luna. E, Sara, G, David R., Sandura. C and Rechard . W. (1995). Improving the teaching and learning of mathematics in the Domenican Republic. Journal of Curriculum Studies V-27, No. 1.

Lyman O. R (1992). **An introductory to statistical method and data analysis** (4th ed). USA. PWS- KEN- Publishing company.

Lynch. J and Plunkett. H.D. (1973): Teachers education and cultural change. England, France, west Germany. London George Allen and Unwin LTD.

Marew Zewude (2000). Curriculum Implementation Evaluation. (Educ 676, Unpublished Teaching Materials) AAU

Martha C. (2006) One method for teaching graduate students the procedural and conceptual approaches to curriculum design. University of Texas of EL pose James Nicholas Publishers Vol-21 No-2 Page 91-101

McCaul . P.A. (1994). Teacher- Pupil Interactions in Mathematics Classroom. A study of current classroom practices in selected secondary schools in Addis Ababa city (Unpublished) M.A. Thesis AAU

McNeil. J (1996) . Curriculum: A comprehensive Introduction (5th ed). University of California, Los Angles John Willey & Sons. Inc.

Meece. J. Wigfield, A, & Eccles J (1990). **Predictors of Mathematics anxiety and its influence on young adolescents course enrollment intentions and performance in mathematics**. Journal of Educational Psychology, V-82, pp. 60-70.

Mellese Bedanie (1992). An Evaluation of grade 9-12 English Curriculum and its implementation of schools of Addis Ababa city A.A. thesis . (Unpublished) AAU

Miller. R.I (1967). **Prospective on Educational change**. New York University of Kentucky, Division of Meredith Publishing Company.

MOE (2002). **Educational Sector Development Program (ESDP)**. Consolidated National Performance Program report. 2000/01 (1993 E.C, Ababa.

MOE (2007). Education Statistics . Annual Abstracts 1998E.C Addis Ababa.

Morris & Gibbon (1987). **How to measure program effectiveness** sage publication Inc.

Mwiria K. & Wamahiu S.P. (1995). **Issue in Educational Research in Africa. Nairobi**. East African Education Publisher.

Nachmaias. D (1992). Research method in the social sciences: New York: St. Martin's.

Nelson .M.R (1998): **Children and Social studies; creative teaching in elementary classroom**. USA Harcourt Brance College Publisher.

Nili . P. &Zecharia.D. 5 (1995) .**The Influence of the "Real Curriculum" in pedagogy on the achievement of Teacher Education students**. Studies In Educational Evaluation V-20 , N-2

Orstein A.C. & Hunkins (1998): **Curriculum Foundations principles and Issues** (3rd ed). Boston. Allyan and Bacon

Parker S. (1997). **Reflective learning in the post modern world a manifesto for education in post modernity**. Backinghan, Philadelphia open university press.

Pratt. D (1983). **Curriculum Design and Development** New York HbJP

Rogan. W.B. (1953) **Modern Elementary curriculum**. university of Oklaboma. The Dryden Pres Inc.

Roland .C. D (1974) **Curriculum Improvement decision making and process** (3nd ed). Richmond College of the city university of New York.

Salia K.B. (1989). **Curriculum Development and African Culture**. London, British Published INC.

Shannon. C & Weavor. W. (1947). **The mathematical Theory of communication**. Urban: University of Illinos Press.

Shiundu . J.S 7 Omulando S.J. (1992) curriculum theory and practice in Kenya Nairobi. Oxford University Press

Shiundu. J.S. & Omulando . S.J. (1992). **Curriculum theory and Practice in Kenya**. Nairobi. Oxford University press.

Solomon Areaya (2000) The evaluation of the implementation of G-8 maths syllabus in SNNP region with specific reference of Sidama Zone. AAU, MA Thesis, Unpublished,

Solomon Areaya (2003) Policy Evaluation, compiled material (Unpublished) AAU

Solomon Areaya (2008). **Policy formulation, curriculum development and curriculum Implementation in Ethiopia:** Published by the book store, AAU.

_____(1994): World Book of Encyclopedia. V-123

Solomon Deressa (2004): Evaluation of the implementation of Grade Nine Mathematics syllabus in Addis Ababa city MA. Thesis (Unpublished) AAU.

Stenhouse. L. (1975). An Introduction to Curriculum. Research and development London Helneman.

Stern. H.H. (1992) : Issues and Options in Language teaching. Oxford, Oxford university Press.

Struick A. (1948) A concise history of mathematics

Tekeste Negash (1996) **Rethinking Education in Ethiopia**: Reviewed by Belete Kebede, Lecture, Addis Ababa University IER Flambeawu Vol- 5, No.1

Teferi Bellow (2007). Community Participation in improving quality of education. The case of Bole Sub-city. M.A. Thesis (unpublished) AAU.

Tewodros. (2005) . The role of information communcaiton technology in the teaching learning process: case study on plasma instruction in Addis Ketema Secondary school M.A Thesis

Tilaye Kasahun (2004). Girls Achievement in Mathematics in the Upper Primary schools of Addis Ababa. The Ethiopian, Journal of Education V-24, N-2

Tyler R.W. (1950). Curriculum Theory. Chicago University pres

UNSCO (2000). International science, Technology, Environmental Education News letter. V. 25, No. 3-5).

William, H. S, Wang H.C. & Mcknight C.C. (2005) Curriculum coherence: an examination of US mathematics and science content standards from an international prospective. Journal of curriculum studies Vol-35 Vol-35 , No -5 pp. 525-559.

William, W. & Dennis. E. (1994). **Applied Statistics for the Behavioral science** (3rd ed). University of Toiwson State and Toledo. Houghton Mifflin Camp.

Yanan . T.(1967) **Statistics**: An Introductory Analysis New York . Harpere and Row Publishers.

Yoseph, Shumi (1997). The relation between attitude and achievement in Mathematics among boys and girls in grade 6,7 and 8 . The case of Arsi Zone (unpublished) M.A. Thesis AAU

Appendix- A

Table 14. Total numbers of teacher and student in the samples schools (grade-10)

Schools	No of mathematics teachers			No of grade 10 students			No of sections
	Male	Female	Total	Male	Female	Total	
Kokeb Tsibah S.S.S	13	5	18	878	871	1749	31
Karallo S.S.S	9	2	11	521	562	1083	21
Misrak Gohi Secondary school	11	1	12	322	383	705	14
Shimelis Habite S.S.S	23	1	24	991	1020	2011	40
Yekatit – 66 S.S.S	6	1	7	194	202	396	9
Meskerem S.S.S	5	2	7	132	150	282	5
Total	67	12	79	3038	3188	6226	120

Table 15 2000 E.C/2008 grade 10 EGSECE Results of three schools

Schools	Number of students who scored										Remark	
	A's		B's		C's		D's		Fs			
	No	%	No	%	No	%	No	%	No	%	Total	%
Yekatit 66 S.S.S	28	3.6	68	8.8	286	37.1	254	32.9	136	17.6	772	100
Misrak Gohi S.S.S	10	1.7	25	3.4	250	34	284	38.6	166	22.6	735	100
Kokebe Tsibah SSS	24	1.9	58	4.5	476	36	457	35.5	281	21.5	1296	100
Average	21	2.4	50	5.6	337	35.7	332	35.7	194	20.6	934	100

Appendix- B

Table 16 Personal profile of Respondent teachers

Items	Alternatives	Respondent teachers		
		Male	Females	Table
Qualifications	1. M.Sc/M.Ed	3	-	3
	2. B.Sc	9	2	11
	3. B.Ed	15	3	18
	4. other	-	-	3
	Total	27	5	32
Total service in teaching	1. 1-5 yrs	11	3	14
	2. 6-10 yrs	8	-	8
	3. 11-15 yrs	3	2	5
	4. 16-20 yrs	3	-	3
	5. above 20 yrs	1	-	2
	Total	27	5	32
Load per week	Less than 10 periods	-	-	-
	10-15 periods	3	1	4
	16-20 periods	11	1	12
	21-25 perids	13	3	16
	26-30 perids	-	o-	-
	Total	27	5	32

Table 17 total number of students in a class

Intervals	Mid points	Frequency of respondent students	Percentage
40-45	42.5	44	19.6
46-50	47.5	136	60.7
51-55	52.5	30	13.4
56-60	57.5	14	6.3
61-65	62.5		-

Appendix C

Grade 10 Mathematics Curriculum Guide

Unit 1. Introductory logic

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to ▪ Recapitulate what they have studied about "statement" and "open statement" ▪ Explain the difference between "statement" and open statement" ▪ Determine the truth value of a statement. ▪	1. Introductory logic 1.1 Revision on concepts " statement" and "open statement"		The teachers is expected to initiate and facilitate a class discussion on statement" and "open statement" Various examples of statements and open statements such as: X+2=3 - He is a 9th grade student X+3=x+5 -2+7>8etc. should be given . Guide students to determine the truth values of statements. Students should give different examples of "statements" and" Open statements" from their daily life.	- Flashcards on which some statements, open statements and sentences that are neither statements nor open statements are written	- the teacher should asses how far the students recall the concepts of "statement" and "open statement" by asking oral questions.
▪ Describe the rules for each of the five logical connectives ▪ Recognize and use the symbols ⇨ and ⇔	1.2. introduction to the fundamental connectives. (Negation, conjunction, Disjunction, Implication, and Bi-Implication) and the symbols		The teacher introduces the logical connection, using different statements specially using statements that reflect good ethical and civic, values such as patience, obedience, love of work, productivity, etc. such as; let P=corruption is a social evil. q-smoking is good for health	- flash cards with the different connectives and mathematical	- Ask students to give more example of compound statements from their day to day activities.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
			Represents " if corruptions is a social evil then smoking is good for health. Students are motivated to give different similar examples for their day to day practical activities		- Written class work exercises should be given.
▪ Determine the truth values of compound statements	1.2. Applications of the five fundamental connectives		After demonstrating how to determine truth values of compound statements, by suing different examples students are assisted and motivated to exercise on determine truth values of compound statements (statements should involve POP/FLE essence, good ethnic values, civic rights, hard work development , etc). facilitate so that students exercise on determining truth values of compound statements in different ways including tables.	- truth tables of some compound statements	- Ask students to determine the truth values of compound statements and to check whether they are tautology or contradiction or neither.

Unit 2 Numeration System

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to: - realize the existence of numeration system other than the decimal numerations system. - Express decimal numeral in their standard notions and vice-versa.	2.Numeration systems 2.1. Revision on number, the decimal system and introducing other numeration system		Some ancient numeration systems such as Egyptian, Babylonian, Sabanm etc. numeration systems will be introduced with their numerals. Examples of expanding decimal numerals such as $2567.7=2\times103+5x10^{2}+6x101+7x100+710-1+1x10-2+6x10^{-3}$ will be given by the teacher and students are given problems to exercises on	-charts showing different numerals and their decimal equivalents (Saban, Roman, Egypltian, etc) - Chart showing the expansions of some decimal numerals	-The teachers can ask different questions: such as "what is the advantage of decimal numeration system over the other ancient numeration systems? - class and home work exercise problems on the expended forms of decimal numerals and vice-versa should be given.
▪ Determine the truth values of compound statements	1.2. Bases other than base ten. - conversion of numerals of different bases to base ten and vice-versa.		Showing the method of expressing decimal numberals in other bases (repeated division) and vice-versa. The teachers is expected to show the method by taking different example, such as changing 256 into base two, base three, etc. motivating and assisting students in exercising using the conversion methods	-charts illustrating the conversion methods - charts showing groupings in different bases.	-students should be given enough exercise problems as class activity, home work, etc. to develop and stabilize the knowledge and skills acquired

	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
			Students should be encouraged to check their answers by reconverting the obtained numerals, for examples $(567)_{ten}=(4301)_{five}=(576)_{ten}$ Assist students to change from given base to another base Eg. Change $(112)_{three}$ into base four.		- the teacher should employ different means to see how far the students have grasped the concept and developed the skill of converting numerals from any bases to base ten and vice-versa, corrective measures should be taken accordingly.
The students should be able to : - Carry out the four fundamental operations (Addition, subtraction, multiplication and Division) in any base	2.3. computations in different bases.		Students should be encouraged to follow the principles used in the decimal systems for adding, subtracting, multiplying and dividing numerals for operating numerals in other bases Checking the results obtained by using conversion method will help them develop confidence. Finally students should exercise performing operations on numerals given in different bases such as $(134)_{five}$ x(245)six by first changing each numeral to a base ten numeral		- different oral questions have to be asked to get feedback on how far the students grasped the concept. - different written exercises should be given and solutions should be checked to see how for they have managed computing with numerals given in different bases. Remedial measures have to be taken accordingly.

Unit 3 Expositional and Logarithm Function

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to: -	3. Exponential and logarithmic functions, Logarithms and their applications.	28			
	3.1. Exponents and exponential fountains	7			
Use the definition and the laws of exponents in simplifications and in solving simple exponential questions. - realize that the laws of exponents are valid for real exponents.	- Revision on the notion "power" and on laws of powers.	2	- Revise the notion "power" in a form of class discussion. Students should be assisted to recall power, bases, exponents. Assist students to show the validity of the laws of exponents for real exponents such as $a^x . a^y = a^{x+y}$ $ax/ay = a^{x-y}$ $(ax)y- a^{xy}$ $a^x b^x - (ab)^x$ $(a/b)x = ax/bx$ $a^{-x} = 1/a^x$ using different examples.	- chart showing powers with positive, negative, zero integral exponents, - Numerical tables and tables of values	- Oral questions should be asked to get feedback on how far students remember about powers, and revision is made accordingly. - Letting students solve simple exponential equations appropriate to the content.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- define an exponential function. - Represent exponential functions graphically. - List the prosperities of exponent –tial functions from their groups. - Write the formula of functions from their groups (in simple cases).	-exponential functions of the form $y = a^x$, a>o and a#1.	3	- Revise the notion function and the types of functions with appropriate examples. - After demonstrating a simple group, students should be encouraged and assisted in drawing and enlisting the properties of graphs of the functions . Y= f(x)=2x and y=f(x)=(1/2)x y=f(x)=10x and y=f(x)=(1/10)x as representatives of the functions . y=f(x)=ax (a,xr, a>o)	- Wall charts showing graphs of exponential functions of form y=ax(a,x, R, a>0 and aŐ≠1)	- Students should be motivated and assisted in sketching and listing properties of exponential functions as class activities and home work. - Ask different oral questions and check the answers books, etc,. the teacher is expected to get feedback from students so that he/she can take remedial measures

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
-can apply their knowledge of exponential functions to describe some phenomena of practical life (processes of growth, work product-vity, compound interest, etc.	- examples of applications of exponential functions .	2	- Illustrate the application of exponential functions to describe processes of nature and society using examples (eg. Compound interest, population growth, etc). - Encouraging and assisting students to exercise on problems of applications of exponential functions For example, let students exercise can calculation of among, principle rate and time using the formula $A(t)=p(1+r/100)^t$	- Charts of graphs of exponential functions.	- The teachers should assign different application problems (that can be done at the level) on applications of exponential functions as class and home works.
- define logarithmic function. -determent the logarithm of a given number to a given base.	3.2. Logarithmic functions - definition of logarithms and their graphs		-Define the notion logarithm with the active participation of students that is log y=u, if and only if bu=v. Demonstrating how to compute logarithms using example and reasoning the results gained by involution		- after defining logarithms, students should be asked orally and as exercises to change exponential forms to logarithmic forms and vice-versa.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
List the properties of logarithmic functions from the graphs.	- Graphs of logarithmic functions	3	Eg. Log21/2 = x 2x=1/2 2x=2-1 X=-1 Discuss the following functions with their graphs. Y=f(x) = $\log_2 x$ and Y=f(x) = $\log_{1/2x}$ Y=f(x) = $\log_{10x}$ Taking as Examples of logarithmic functions with active participation of students. Asset students to exercises on sketching graphs of logarithmic functions. Help Students to realize that the properties enlisted for the logarithmic functions y=log2x and y=long ½ x hold true for all logarithmic functions y=logax and y=log1/a x where a > 1 respectively.	- Charts of graphs of y=log2x and y=log 1/2x - Y=logx and - Y=log1/10 x	- Exercises on drawing graphs of logarithmic functions and enlisting their properties should be given as class and home works.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- recognize that exponential functions and logarithmic functions are inverses of each other.	- the functions y=2x and y=log 2x as examples of inverse function.	2	- sketching the graphs of these functions using the same coordinate system and discussing the properties of each function and making comparisons and introducing the notion inverse functions.	- Charts on which graphs of y=2x and y=log 2x are sketched using the same coordinate axes.	- Students should be asked to recognized and state the properties of both functions by looking at the graphs. Exercise on drawing graphs of similar functions to those taken in the examples such as y=(3/2)x an y=log3/2x and stating properties of both functions from the sketched graphs should be given to students as class and homework.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to: - solve problems of exponentiation and finding the logarithm. - derive the laws of logarithms from the laws of powers. - apply the laws of logarithms in simple propels - compute with logarithms to the bases two.	3.3. Logarithms and computations with logarithms Extracting the root and finding the logarithm as inverse operation of exponentiation	15	- the teacher can start this lesson by discussing the relationship between exponentiation, extracting root and logarithm there by revising the concept of inverse operations. If $2^3=8$, then $8=\sqrt[3]{8}=2$ and vice versa and also if $2^3=8$, then $3=\log_2 8$ and vice-versa. - Assisting and motivating students to generalize the laws for logarithms to base 2 for any given base (with proof). That is log xy=logx+loby Logx/y=logx-logy	- Chart showing the relationship between the three operations by using examples - charts showing laws of logarithms. - a chart showing the graph of y=log2x	- asking different oral questions concerning the three operations by using expels. - giving various exercises problems as class/home works on application of exponentiation. - Oral questions concerning laws of logarithms. - Different exercise problems assigned as class/home work.

			Logxk=k.logx Logcb=logb/lobc		
Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- recognize the advantage of the logarithmic system to the base ten. - Identify the characteristic and mantissa of any given common logarithm - Recognize the structure of the table of common logarithms. - Use the table for finding the logarithm of a given positive number	- common logarithms and the table.	4	- discuss with students the possibility of using difernt bases in computing with logarithms and facilities for students to realize and list the advantages of using logarithms to the bases tem. - introducing the concept "common logarithms:" and its notations lob b. - Discussing the composition and the properties of common logarithms. - explaining the structure of the table and showing how to read the logarithm of a positive number and vice versa Illustrating how to compute products, qotients, powers and radicals using examples such as Log (xy)-log x+logy Log=logx=logy Logxk=k.logx Log $\sqrt[n]{x}$ =logx1/n=1/nlogx	- table of common logarithm - chart showing steps in computing common logarithms	- Give exercise problems as class and home works on determining the characteristic and mantissa of a given logarithm. Eg. Determine the characteristics and mantissa of log 576. -oral question on the structure of the common logarithm table. -exercises problems on reading the logarithms of different positive numbers

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
-determine the number whose logarithms is given. - apply the laws of logarithms in computations with common logarithms			- assisting and motivating students to solve problems involving several operations.		And vice- versa as call sand home works. - Getting feedback on how far students have grasped the lesson by checking their exercise books, asking oral questions, etc. and take remedial measures accordingly.
- apply their knowledge on laws of logarithms and on computations with the help of common logarithms for solving practicable word problems of different fields	- application of logarithms in solving world problems		- Demonstrating methods of using logarithms in solving problems of different fields (population growth compound interest, depreciation of value, savings, insurance, etc) involving extensie computations by giving special attention to clearness, exactness and carefulness in the calculation process.	- table of common logarithms - Chart showing laws of logarithms	- Various application world problems should be given as class and home works and solutions should be checked to take remedial measures accordingly. -

Unit 4. Descriptive Statistics and Introductory Probability

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to: Define descriptive statistics - define the notions "population" and "population functions" table for a given popuaiton function and draw histograms of given population functions.	4. Descriptive static's and introductory probability 4.1 Descriptive statistics - populations and functions on populations (examples on HIV/AIDS, Taxation, water resource usage, etc, include) - Distributions and histograms (using examples on HIV/AIDS - its present status - its implications on the economy	33 15 2	- Familiarizing the contents and purpose of descriptive statistics. - introducing the notions "population" population functions" and "descriptive statistics " with the help of examples . - Considering different functions on a given population. (Eg. Age, Height Weight, Test score etc, on a group of students) - Assisting students in drawing graphs of population functions. - Defining the notion "distribution of a population function "and applying the definition using examples. -showing how to draw histograms as victual representation of distributions according to a given algorithm.	- Charts with graphs of population functions - Charts with histograms	- As students to identify population and population functions - After defining disturb –union and using examples to illustrate it, the teacher can ask students what advantage they observe in presenting data in this form

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
	Of the society - risk groups - harmful tradition practices		- Assisting students in making distribution tables and drawing histograms for distributions. You can begin with the distribution Which could be drawn as follows		- Different observations with list of dates should be given to students so that they can from distribution tables and then draw histograms for the given data. -Drawing histograms on the EGECE result of their school could be given as an assignment dividing students in different groups.
- define means, mode(s) and median of a pupation function and determine them for give population functions. - realize that mean, and median of a population function and determine them for given population functions. - realize that mean,	Measures of location(the mean, mode(s) and median) of population function		- showing population issues by histograms. -defining means of a population functions (using examples on HIV/AIDS - its present status - its implications on the economy of society. - Risk groups -On harmful traditional Practices)	- charts showing properties of means, mode(s) and median of population functions	- Class discussions on the measure of central tendency or measures of location (their definitions and how to determine them). - Various exercise

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Mode (s) and median are 'measures of central tendency" or " measures of location" - Identify the properties of the mean of a pupation function.			- Assisting students to generalize the properties of mean of population function (mean of sum or difference of pupation functions an d means of a constant times a population function). Facilitating to students to so that they exercises computing means of population functions from their distributions. Introducing and defining the notion 'mode" (s) - Facilitating for students in calculating mode(s) of populations functions. Introducing and defining the notion "median". Assisting students in determining medians of various population functions. Introducing mean, mode(s) and median as measures of location of central tendency.		Problems on the measures of central tendency or measures of location, as calls activities, and home Works. - Oral questions and answer to get feedback how far students grasped the concept and mastered the skills to determine the measure so central tendency for given population function.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- realize that there are modern auxiliary means that satisfy science and technology but involve expense - get general idea on the development and use of some modern auxiliary means such as slide rule, calculating machines and computes.	- survey of some further auxiliary means for calculations; their development and use.		Word problems of the following types should be given to students to be solved using logarithms. The popuaiton of twon was 10250. if the popuation increases at the rate of 22%, every year, what would be the population after 8 years?" - Giving survey one the development of calculating machines and computers. -Providing some information on their structures and their methods of working.	- Calculating machines, computes,	- ask students to list some modern auxilitayr means that satisfy science and technology - Ask students to explain the development and use of some modern auxiliary means.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
-define "variance" "standard deviation" and "range" and determine these values for a given pupation functions - realize standard Deviation and range as "measures of spread" or " Measure of dispersion" and use them properly .	-measures of dispersion (Variance, Standard deviation and range)		Introducing the notions" variance" and standard deviation" by means of examples and defining these measures. Facilitating for students so that they exercise deviations of various pupation functions. Introducing and defining the notion "range" -Directing students in determining the ranges of population functions. - Assisting students to realize "Standard deviation and Range" As measures of spread or measures of dispersion. - Facilitating for students in strengthening their knowledge on fundamental nations of descriptive statistics and their applications in different fields. Assisting students to generalize properties of variance and standard deviation. (Eg. When each value of the population is multiplied by a constant)	-Charts showing step of computing standard deviation. - Chart showing properties of variance and standard deviation of population functions	- Class discussions -Different exercises problems from the text as well as from out side the text as class and home works. - Students can be given a project work to collect some limited data of their own and use descriptive statistics methods to : - organize - present - analyze - Interpret the data collected

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to: - define the notions "experiment" and "possibility set" - define "event" - Make a distinction between an impossible event and a sure event.	4.2. Basic ideas concerning "probability" - Possibility set of an experiment - event of an experiment	14 2	- Discussions on examples of experiments having uncertain outcomes. Introducing the notion" possibibility ' with the help of simple experiments like tossing a coin throwing a die etc., Defining the notion" possibility set" using examples and let the students perform their own experiment (like, ossing, two coins or a pair of dice) and use tree diagrams to list the elements of the possibility set. -introducing and defining the notion event as a subset of a possibility set. -Facilitating class discussions on impossible and sure events.	- coins of different denominations. - Marbles of same size but different colors - Pack of playing cards _ Dice - Wall charts demonstrating tree diagrams - coins - Drawing pin	- Ask students to define the notions "experiment" and "possibility set" - Students can be asked to give examples of impossible events and sure events from their life experiences.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- Define "observed relative frequency of an outcome" and compute the value for a given outcome of a given experiment - define "probability" - determine the probability of a given event. - Illustrate their probability by using different means such as tree diagram.	- observed relative frequency of an outcome Probability of an event		- Introducing " observed relative frequency of an outcomes in an experiment", defining and computing (You can ask students to throw a 100 times and list the number of times head/tail appears and let them compute the observed relative frequency) - Introducing the notion "probability with the help of examples, using equally likely outcome". - Defining probability of an event and facilitating for students to exercise computing probabilities of different events and use tree diagrams for lustrating the probabilities of different events.	- Coins - Dice - Chart with tree diagrams	- Ask students to observe outcomes of different experiments. - give various exercise problems on determination of probabilities as class and home works

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
-State the principles of counting and permutations - determine the number of elements in the possibility set and in a given outcome of a given experiment - State the principles of combinations and selections. - apply the principles for determining the number of elements	- The fundamental principle of counting and the principle of permutations. - Principles of combination and selection.	3	- using three diagram for deriving the principle of counting. You can take an example like: A girls has four different shirts and five different dresses. In how many ways can shoe make an outfit. - Showing the advantages of this principles for shortening and simplifying computations. -facilitating so that students exercise on the applications of the fundamental principles of permutations of can give an example like: In how many ways can five students sit using chairs - introducing the principle of combination by means of examples. You can given an example like. In how many ways can two persons be elected our of four committee members?	- charts with formula of principles of permutations and principles of combinations	- Class and home work exercises problems from the text and from outside the text. - Oral questions to get feedback and take remedial measures accordingly. - Ask students to state principles of combinations - Give various exercise problems on principles of combination.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
In the possibility set and in a certain outcomes of a given experiment - staste the binomial theorem in their own words - apply binomial the theorem for determining the expanded form of a	4.3. The binomial theorem		Defining the principles of combinations and using it for computations - Facilitating and assisting students so that they can effectively use the principle of combinations for computed ions. -Introducing the selection principles as a second form of the principle of combinations -Facilitating in depending students acknowledge on the introduced basic nations of probability by means of adequate exercises problems. - introducing PASCAL's triangle and assisting and facilitate in so that students use if for expansion. - Discuss the relationship between the pascal's triangle and the binomial theorem.	- Charts with Pascal's triangle and the binomial theorem	- Give various exercise problems as class activites and home works on applications of the binomial theorem.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Given expression or the coefficient of any given term in the expansion of a given expression.			- Asisting and facilitating so that students generalize the binomial theorem step by step, first application of the Pasca's traing and then to using the knowledge gained on the principle of combinations and factorial notation. - Facilitating and assisting so that students practice using the theorem for expansion.		- Follow up and checking of exercise books so as to get feedback and take remedial measures accordingly - Class room test on the unit. 8

Unit 5. Congruency and Similarity

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able : - define congruence of line segments, angles and triangles - State the side-angle side congruence postulate for triangles. - apply the SAS postulate for proving the congruence of triangles.	5. Congruence and similarity of triangles 5.1. Revision on congruence of line segments, and triangles. 5.2Postualte and theorems on congruence of triangles - The "side angle –side" congruence postulate for triangles		- Revising the notion 'Congruence of plane figures" in a form of discussion - Discussing the "side-angle –side" congruence postulate for triangles by comparing triangles with given to sides an include angle drown by different students	- Mathematical instrument set. - tracing paper - Hollow templates - Mathematical instrument set	- ask students to define congruence of line segments. - Students can be asked what they remember about congruence. - -Students can be given class activity to draw triangles whose two sides and included angles are given and compare the triangles drawn by different students using tracing paper - Home work exercises problems

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
-state and prove the angle-angle- side congruence theorem. - State and prove the l side-side-side, congruence theorem. - Prove Hypotenuse Leg (RHS), Leg- Leg and Hypotenuse Acute angle theorems for right triangles. - State and prove the isosceles triangle theorem and its converse.	- Theorems on congruence of triangles 5.3. Isosceles triangle theorem and the converse of isosceles triangle theorem		- Proving the angle - angle- side congruence theorem by using the SAS postulate. - Facilitating so that students can prove "side-side-side" congruence theorem. - Proving hypotenuse-leg theorem for right angled triangles and assisting students to prove leg-leg, hypotenuse- acute angle congruence theorems for right angled triangles - Facilitating and assisting students to solve related problems - Stating and proving the isosceles triangle theorem - Facilitating for students to that they can prove the converse of the isosceles triangle theorem. Facilitating and assisting students in solving problems on Isosceles triangle theorem and its converse.	- Charts on which the congruence theorems are written and examples of congruent triangles are drown	- Class activity exercise problems - Home work exercise problems - Questions and answer - Cass activity exercise problems - students can be asked to prove the converse of the isosceles triangle theorem after it has been stated for them.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- State and prove the AS, SAS and SSS similarity theorems on triangles - Solve practical word problems leading to congruence and similarity of triangles.	5.4 Theorems on similarity of triangles 5.5. Miscellaneous exercises. Practical word problems included.		- Revising similarity of triangles using discussion method. - Proving AA similarity theorems and facilitating for students so that they can prove SAS, and SSS similarity theorems likewise. - Assisting students to exercise on solving problems of similarity.		- Different related problems can be given as class work and home work exercises. - Students can be asked to define similarity. - class activity exercise problems can be given, for example to prove SAS similarity theorem. - Different exercise problems on the similarity theorems can be given as class and home works.

Unite 6. Solid Geometry

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to: Write formulae for calculating surface areas and volumes of solids such as prisms. Cylinders, cones, pyramids, spheres. - Apply these formulae for calculating surface area and volumes of these solid figures - define frustum of pyramid and of circular cone, derive formulae for	6. Solid Geometry 6.1. Revision on solid figures (cylinder, prism, cone pyramid and sphere) 6.2. Frustums of pyramids and circular cones - Introduction to the notions "Frustum of a pyramid" and "Frustum of a cone"	12 5	- revising solid figure like prism, cylinder, cone, pyramid etc, by using discussions (their surface areas and their volumes including the formulae). - Assisting students in carrying out calaculationson surface area and volumes of solid figures (world problems on usage of water resource should be included) Eg. What is the amount of water in m^3 than can fill a cylindrical tanker of inner radians 40cm and height 2m? - Introducing the notion " frustum" of pyramid and of circular cone. - Deriving surface area and volume formulae for frustums of pyramids and circular cones.	- Models of different solids (prism, cylinder, cone and pyramid, etc.) - Models of frustums of pyramids and circular ones.	- Given exercise problems as class and home works related to sold figure and their volumes and their surface area. - re-deriving area and volume formulae for frustums. - Various exercise
Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques

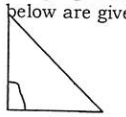
Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
State the trigonometric relations of complementary angles.	- the complementary angle relation between a	2	- assisting students to discover the relationship between trigonometric	- chart showing the relationship between	- Oral questions can be asked initiate a class discussion that helps
Calculating surface areas and volumes of these solids, - Apply the formulae for calculating surface areas and volumes of frustums of pyramids and circular cones. - Calculate surface areas and volumes of composed solids and similar solids.	- Exercises in calculating surface areas and volumes of composed solids		- facilitating so that students solve different world problems involving frustums of objective frustums of objects used by students (the world problems should include the usage of water resource) Eg. How much water can be reserved in a circular frustum reservoir of height 4 m supper radius 2m and lower radius 5m? - Demonstrating the algorithm for calculating the volumes of composed solids. - Facilitating and assisting so that students exercise on problems of surface areas and volumes of solids, composed solids, similar solids. - You can give different practical examples (problem) on composed	- Different physical objects having the shapes of the above geometrical shapes like funnel, barrel, pencil, candle, etc. - Models of composed solid such as candle, pencil, funnel etc.	Problems on surface areas and volumes of frustums of pyramids and circular cones. - Students may be given assignments to calculate the volumes of some of the objects they use at home (for example, the water bucket they use) - Various exercise problems as class works and home works.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to solve to bable to solve problems related to volumes and surface area of solids	- volumes of similar solids 6.3. Miscellaneous exercise.	1	- Give miscellaneous exercises from the text books as well as from other reference books on volume and surface area of solids		- You can ask some of the students to solve some problems on the chalk board.

Unit 7. Trigonometric Functions

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Students should be able to: - Derive the relations $\sin 2x+\cos^2 x=1$ and tan x. cot x=1 restricted to $0<x<\frac{\pi}{2}$ and rearrange the equation	7. Trigonometric functions 7.1. Relations between trigono metric functions - Relations between values of functions for equal angles trigonometric functions. - Derive the formulae. Sin 2 x+cos2 x =1 and tan x. cot x=1 triangle in a unit circle representing cos 2, tan x and cot x by sin x, or in s, tan x, and cot x by cos x only , with the active participating of the students.	36 10 2	- Can start the lesson by asking different questions from the trigonometry portion studied in grade 9, to make a necessary revision on trigonometric functions	- Chart showing different identities	- Asking different oral questions from trigonometry studied in grade 9, for example, the students can be asked to define the sin. Cos, tan functions. Then a revision is made based on the feedback . - Students should be asked to redeliver the formulae $\sin^2 x+\cos 2 x+1$ and tan x cot x=1 by their own - Different class activity and home work exercises are given.

Use reduction formulae in order to find the related angle of any given angles, so they can give the trigonometric values of any given angle - Determine the trigonometric values using tables their use.	trigonometric functions and its co-function - Quadrant relations - Tables of the trigonometric functions and		functions of complimentary angles. - Introducing the idea of co-function. Using right angled triangle and the trigonometric relation, show that since and cosine, tangent and cotangent, secant and cosecant are co functions. - Assisting students to recognize the complementary angles relation and co-function on the trigonometric of complementary angles. Sin(∏/2-x)=cos x Cos (∏/2-x)=sin x Tan (∏/2-x) = cot x Students should be helpled to realize the necessity of reduction formulae, such as in α= sin (180⁰-α), cost α= -cos (1800-α, ten α=-tan (3600-α), etc Facilitating gor students so that they reach at quadrant relations - interpreting and demonstrating them by means of their graphs/ proving sin (∏-x)=sin x - Discussing the structure of the table of values of trigonometric functions (values of the sine and tangent functions for values of z where 0x<90⁰, applying the complementary angles relations to and in the values of the cosine and cotangent functions) - revise the relations sin (-x)=-sin x Cos(-x)=cosx tan (-x)=-tan x -use examples how to find values of functions for x<0or x>90⁰, using the trigonometric table of values, for example.	trigonometric functions of complementary angles. - Chart with graphs of trigonometric functions and their inverse functions. - Chart showing the unit circle - Table of trigonometric function - Chart of unit circle	students to discover the relationships between trigonometric functions of complimentary angles. - Different exercise problems are given as class and home works - Oral questions and class discussions that lead students to the - Oral questions and answers - Class discussions on the use of the trigonometric table of values for finding function values where x<00or x>900. - Various class activity problems are given as exercises, and students should be assisted and checked.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- Describe the properties of triangles - state theorems on right angled triangles. - apply the trigonometric rations to solve right angled triangles. - functions with respect to right –angled triangles for determine the length of a side, the measure of an angle, and area of a right angled triangle.	7.2 Applications of trigonometric functions, the laws of since, cosine and their applications. - Revision on properties of triangles. -Application of trigonometric ratios to solve right-angled triangles	26 2	- sin (-62°)= - sine 62°=-.88829 tan 2690= ten (180°+89°)=tan 89°=57.29 - - Assisting and motivating student in finding for angles given in degree or radian measure and or angles x where x<0°or x>90°(using the periodicity and the quadrant relations). - Surveying traingles and their properties with special emphasis to right – angled triangles. - Students should be assisted to Classify triangles according to - Lengths of their sides - The types of angles the triangle has. - Revising theorems on right angled triangle specially the Pythagoras theorem, and the relations between interior angles and areas inform of discussions. - Revising the trigonometric raties in right-angled traingels in a form of a discussion. - Facilitating for students in determining the length of side, the measures of an angle and the area of a right angled triangle. Exercise problems such as "solve the right angled triangle given. By the figure below are given" 7cm  2cm - Assisting students in using the table of trigonometric functions and in checking results by means of constructions and measurements (theorems of congruence).	- Charts showing different types of triangles classified according to their side lengths and side lengths and also according to their sizes of angles - Mathematical instrument set. - Chart showing the trigonometric rations if right angled triangles. - tables of trigonometric functions.	- Students should also be given enough exercise problems on finding angles when the values of the functions are given like; determine the solution set of the equation sin x=a (where as ER, -1<a<1), tan x=b (WherebER) observing the given domain (Specially in the 1st and 2nd quadrants). - given different exercise problems as class activities and home works on properties of triangles and check their work - ask students to restate theorems like Pythagoras, Euclid, altitude theorems. - Oral questions and answers. - Class –Activity exercises. - Various class activity and home work exercise problems are given and follow up to get feedback from students. Appropriate remedial measures are taken .

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
- apply trigonometric ratios functions for determining the side length, measures of angles and areas of isosceles and equilateral triangles derive and use the formula A= ½ ab sin C for calculating area, side length and angle of a triangle. - apply the basic principles, ideas and techniques used for calculations on triangles to quadrilaterals and regular polygons. - determine volume, the lateral and total surface areas of cone, pyramid, and sphere using the trigonometric ratios. - Derive the sine low and use it to solve problems - Derive the cosine law.	- Applications of trigonometric ratios for calculations on equilateral and isosceles triangles - The formula A= ½ ab sin Ć for the area of triangle - Applications of the trigonometric rations for calculation on special quadrilaterals and regular polygons problems from the field of stereo metry (solid geometry) - The sine low - The cosine law	2	- Assisting students in resolving given triangle into two right angled triangles and applying the trigonometric ratios for computing sides and angles. - Exercise problems of the sort "Find the area of an equilateral triangle whose side length is 16cem." are given - Deriving the formula for the area of a triangle (dividing the triangle into two right angled triangles, replacing the height with the trigonometric ratios, examining different cases.) - Assisting students in applying the formula of solving problems such as " A triangular price of round has the length of one of its sides 200m, what should be the length of a side of the triangle that makes an angle of 600 with the side whose length is already given so that the are a of the triangular piece of ground will be 7500 $\sqrt{3}$ m2?" - Students are guided and helped to reduce the problems back to right angled triangles and isosceles and to apply the trigonometric ratios for computing side engths, heights and angles of such figures. - Students should be assisted to drive that the length of side 's" and perimeter 'p' of a regular n sided polygon with radius "r'" are respectively. S=2r sin 1800/n P= 2nr sin 1800/n - Showing how to reduce the problems to right angled triangle and using trigonometric ratios for computing angle, heigh slant height, sides and other line segments in solids (prisms, pyramids, cones, frustums of pyramids and cones). - Deriving the formula known as the sine law (in any triangle, the sides are proportional to the since of the opposite angles a/sinA= b/sinB =c/sinC) and assisting students in applying this formula for computing arbitrary triangles (sides and angles) - Derive the cosine law formula with the active participation of students and assisting students in effectively applying this formula to solve problems. - Give ABC with the lengths of the sides opposite to angles A, B, and C to be a,b and c units respectively, then $a^2=b^2+c^2-2ab \cos A$	- charts with equilateral and isosceles triangles. - Chart showing the derivation of the formula for the areas of a triangle -Tables of trigonometric functions - Models of some solid figures such as prisms, pyramids, cones, frustums of pyramids and cones. - Chart showing the sine law - Chart with the cosine law,	-Various class work and home work exercise problems such as calculating the area of an equilateral triangle whose side length is 12cm are given and the teacher is expected to follow up their performance and take remedial measures. - Ask students to show the formula is valid for different types of triangles. - Give various exercises problems on the application of the formula should be given as class and home works. - Class activity problems such as calculating the lengths of each diagonal of a rhombus whose side length is 12cm and one angle measures is 60^0 are given. - give various class activity and home work problems on the application of the trigonometric ratios for solving problems from solid geometry. -discussion with questions and answers in deriving formula - Discussion in the derivation of the formula. - students are encouraged to re-derive the formula.

Specific objectives	Contents	Pd.	Teaching Methods	Teaching Aids	Assessment techniques
Apply the laws of sine and cosine for calculating sides, angles and areas of triangles	- Applications of the laws of since and cosine for calculating sides,		$B^2=c^2+a^{2-2}$ca cos B $C^2=a^2+b^2$-2ab cos C Give examples on cosine law. - Motivating and assisting students in solving practicable problems demanding the applications of the laws of sine and cosine.	- Mathematical instruments set.	Various exercises problems are assigned as class and home works and the teacher should motivate and asset students in solving the exercise problems and check their work.
-solve different problems related to the applications of trigonometric relations.	- Miscellaneous exercises		- directing and helping students to deal with problems from different fields like mathematics (planometry, stereometry), physics(vector quantities), techniques (ravigation, military, surveying), and daily life by using methods and alogorithm already studied for solving word problems. - Encouraging students to use mathematical tables (numerical table and aloes of formulae) appropriately and effectively	- Trig tables.	- Exercise problems are given as class works and home works. -Discussions on selected problems that need special attention. - Follow up and feedback is obtained from students so that revision is made for clarification accordingly.

Appendix – D

Table 18 Chi-square Goodness of fit test for objective developed in the syllabus.

Objectives related to	**Observed frequency (fo)**	**Expected frequency fe**	**$(fo-fe)^2$**	**$(fo-fe)^2/fe$**
Knowledge	44	28	256	9.14
Attitudes	2	28	676	24.14
Skills	37	28	81	2.89
Total	84	84		

NB. Degree of freedom- 2

- The critical value of x^2= 5.99 at 0.05 level of significant
- The critical values of x^2- 9.21 at 0.01 level of significance
- The com,puted x^2 –$\square(fo-fe)^2/fe$= 36.17*

Appendix E

ADDIS ABABA UNIVERSITY

COLLEGE OF EDUCATION

DEPARTMENT OF CURRICULUM AND TEACHERS' DEVELOPMENTAL STUDIES GRADUATE PROGRAM

Coding Sheet – I

This coding sheet is prepare to assess the organization of the contents and teaching methods in grade -10 mathematics guide revised in 2003/4.

General Information

Subject: Mathematics curriculum guide

Grade: 10

Unit of analysis: syllabus

Direction for coding: read each teaching methods in grade-10mathematics curriculum guide and put the total number under each categories in the following table.

Tank you in advance

Total n^{o} of teaching methods in the syllabus	Teaching methods				
	Lecturing	Discussion	Discovery learning methods	Demonstration	others
Frequency					
Percentage					

Coding –Sheet II

This coding is prepared to assess the coverage of the objectives developed in the mathematics curriculum guide revised in 2003/4.

Subject: mathematics curriculum guide grade -10

Unit of analysis: objectives in syllabus in relation to coverage.

Direction for coding: Read each objectives developed in the units of the curriculum guide and put the total number under each categories in the following table. To make your coding easier and consistent look at the definition of objectives and action verbs under each domain of learning which are attached with this coding sheet.

Thank you in advance

Units	Total numbers of objectives in each unit	Number of each categories in each units			Remark
		Knowledge	Attitudes	Skills	
Unit 3					
Unit 4					
Unit 6					
Unit 7					

Appendix F

ADDIS ABABA UNIVERSITY

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DEPARTMENT OF CURRICULUM AND TEACHERS' DEVELOPMENTAL STUDIES GRADUATE PROGRAM

Questionnaire for Teachers

General direction: This questionnaire is designed to collect information for research purpose. The questionnaire focuses on teachers opinion on mathematics curriculum (scope, integration, continuity, sequence and relevance of contents, objectives in syllabus and text books) and the actual implementation of grade-10 mathematics. The aim of this study is to investigate how grade-10 mathematics curriculum developed, the relationship between instructional methods and strategies suggested in the syllabus and the actual implementation in the classroom. Your genuine responses to the questionnaire is very much helpful for this research.

Thank you in advance

I. Background Information

1.1. Sub-city _____

1.2. Name of school _____

1.3. Grade(s) you teach _____

1.4. Total periods you teach per week ___

1.5. Qualification: M.SC/M.A/M.Ed/ ☐ B.Sc ☐ B.Ed ☐

Others _____

1.6. Total number of service in teaching

1-5 years ☐ 6-10 years ☐ 11-15 years ☐

16-20 years ☐ 21-25 years ☐ 26-30 years ☐

Above 30 years ☐

1.7. Sex Male ☐ Female ☐

1.8. College/university you graduated _____

II. Please respond to the following question by circling the letter of your choice or write a complete answer on the space provided

2.1. Do you like to teach mathematics?

a. Yes b. No c. Undecided

2.2. If your answer for question 2.1 is 'No' what is (are) your reason(s) (circle more than one if any) because

a. It is difficult to teach

b. it is tired some

c. It is full of abstract ideas, principles or rules

d. It is difficult for students to learn

e. Its contents are not related to real-life

f. I am not happy in teaching profession at all

g. list if any _____

2.3. If your answer for question 2.1. is 'yes' what is your reason? (circle more than on) because

a. It enjoys me
b. It is more practical subject
c. it is applicable in the real-situation
d. It is a base for all subjects
e. it is fascinate and fun
f. list if any _____

2.4. Do you have any access to grade-10 mathematics syllabus?

a. yes b. no

2.5. If your answer for question no. 2.4 is 'No' what is the reason? Because

a. there is no excess number of copies in the school

b. it is not useful for teaching learning process

c. the syllabus is not attractive to use it

d. the textbook is enough to teach

e. list if any _____

2.6. If your answer for question No.2.4 is 'yes', to what extent do you think that the contents of the textbook are reflected in the syllabus?

a. to very great extent b. to a great extent c. to no extent

2.7. Do you prepare weekly lesson plan?

a. yes b. no c. undecided

2.8. If your answer is 'yes' how much does it fit with plasma instruction?

a. to very great extent b. to a great extent c. to no extent

2.9. Do you comfortable in your school environment?

a. Yes b. No

2.10. If your answer for No 2.9 is 'no' what is your reason/ because

a. there is no communication between staff freely

b. there is no sufficient materials for teaching learning process

c. the principal is not fair in giving opportunity for teachers

2.11. Is there any training opportunities given in your school to improve your teaching learning process?

a. Yes b. No

2.12. If your answer for question No. 2.11 is 'yes'. In what way do you get the opportunities?

a. through conference

b. through quality package (SIP, CDP, ICT etc)

c. through group discussion in departments

III. Questions related to teachers attitudes to grade ten mathematics curriculum organization, the teaching learning process, their role in the development of curriculum and implementation. Put tick mark (✓) under strongly agree (1), agree (2), undecided (3) disagree (4) or strongly disagree (5)

No	Items	Alternatives			
		1	2	3	4
A	**About curriculum organization**				
3.1	I believed that mathematics curriculum organization of this grade level enables teachers to make their teaching relevant to the live of their students				
3.2	In my view, mathematics is a core subject in and out of the schools				
3.3	I believed that the curriculum elements (knowledge attitudes and skills) are highly organized in the syllabus that the teachers are easily understand them.				
3.4	I believed that the contents of grade 10 mathematics are horizontally (with other subject such as physics, chemistry etc) organized that the students are able to perform any problems which need the application of mathematics.				
3.5	The objectives of grade -10 mathematics which are written in the syllabus and text book are appropriate				
3.6	In my view, the organization of contents and learning activities in the syllabus is appropriate for teaching students.				

3.7	I believed that the application of grade 10 mathematics to other subjects is not significant.				
3.8	I believed that most of the contents of grade 10 mathematics are beyond the ability of the students.				
3.9	In my view, the syllabus contains variety of teaching methods that maximize students participation				
3.10	I believed that the contents of the syllabus are vertically (continuity with grade-9, logical sequence within the content) organized that students are easily understand the concepts, principles and rules				
3.11	In my view, there are adequate examples and exercises at the end of each topic of the lesson in the textbook.				
3.12	In my opinion mathematics is little importance in the real life				
3.13	I believed that most of the contents are focused on knowledge acquisition				
B	**About teaching learning process**				
3.14	In my view, a teacher should be a source of knowledge in the classroom.				
3.15	I enjoy by using, variety of teaching methods in a given period				
3.16	I believed that the students enjoy for plasma teacher uses variety of teaching method				
3.17	I do not think that the students should be recipient of knowledge, from classroom teacher or plasma teacher				
3.18	In my opinion, most of the students have too little background of mathematics so that they do not fit with plasma instruction				
3.19	The major roles of the teacher should be to encourage students to memorize all definitions, theorems, rules and axioms instead of worrying about their proofs				
3.20	I use different teaching aids to make the teaching learning to be tangable				
3.21	I believed that my role is facilitating my students' learning not imparting knowledge				
3.22	I believed that plasma instruction is more of students centered				
3.23	In my view, the students learn better from plasma teacher than the classroom teacher				
3.24	I believed that plasma instruction ignore the psychological and behavioral charge of learning				
3.25	As an individual, teachers are responsible for helping their students how to learn mathematics in and out of the classroom				
3.26	In my opinion, students should taught mathematics to score good grade not how to apply it into real life				
C. Teachers role in curriculum development					
3.27	In my view, mathematics curriculum development is effective if teachers are involved in the development				
3.28	I believed that mathematics curriculum development is effective if only the curriculum experts develop it and bring to teachers for the discussion.				
3.29	I believed that mathematics curriculum development is effective if both the curriculum exports and teachers participate in development.				
3.30	I do not think that there is an opportunity for teachers involved in the development of mathematics curriculum				

Part IV.

4.1. In many schools Majority of students are being fail in mathematics and hav negative attitude towards mathematics? State your opinion_____

_____

_____

4.2. Do you think that the contents incorporated in the syllabus organized in the wa they have to be organized? State your opinion

_____

_____

4.3. What problems do you face during the implementation of grade 10 mathematics

_____

4.4. Suggest your comments _____

_____

V. After reading the following lists of possible factors give rank according to level of influence on the implementation of grade 10 mathematics on the space provided in front of each statement.

NB. Those factors which have strong influence should take the upper rank (1,2,....) and those which have minimal influence should take lower rank (13,12,11,10....).

No	Possible factors	Rank
1	Poor supply of student text book by the school	
2	The maximum load that the teacher teaches/week	
3	Teachers disinterestedness towards teaching mathematics	
4	The less supportivness of school administration	
5	Absence of inservice training for teachers related to maths syllabu	
6	Large class size	
7	Students' background knowledge of mathematics	
8	In adequate copies of syllabus and plasma manual in the school	
9	Absence of Teaching aids in pedagogical center	
10	The low quality of mathematics syllabus and textbook preparation	
11	The irrelevance of content which are not move in line with maturity level of students	
12	Students traditional belief of the subject as difficult	
13	Students misbehavior in the classroom	
14	Availability of teaching materials in school.	

Appendix G

ADDIS ABABA UNIVERSITY

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DEPARTMENT OF CURRICULUM AND TEACHERS' DEVELOPMENTAL STUDIES GRADUATE PROGRAM

Questionnaire for Students

Dear students:

This questionnaire is designed to collect information for research purpose. It's objective is to assess your feeling of mathematics learning as a result of actual teaching learning process of grade ten mathematics. Your genuine responses to the questions is very much helpful for this research.

Thank you in advance

I. Background Information

1.1. Sub-city _____

1.2. name of your school _____

1.3. Sex Male ☐ Female ☐

1.4. Age _____

1.5. Total number of students in your school

1.6. Mathematics textbook ratio: 1:1 ☐ 1:2 ☐ 1:3 ☐

1.7. The plasma in your class: work ☐ not work ☐

Sometimes it has problem ☐

1.8. Your mathematics result in 1st semester _____

II. About actual teaching learning of mathematics and students' feeling about learning of mathematics

Direction:- The following questions are formulated and focused on the actual teaching leaning of mathematics and students' feeling about mathematics learning during actual teaching learning process. Please put tick mark (✓) under strongly agree (1), agree (2), undecided (3), disagree (4) or strongly disagree (5).

No	Items	1	2	3	
A	**Teaching-learning process**				
2.1	In my view, the classroom teacher introduces and summarize the lesson before and after plasma instruction				
2.2	The teacher always gave us related questions, class work and home work to the lesson				
2.3	I think that mathematics learning is highly possible when teacher guides and the students solve the problems by themselves				
2.4	I believed that I do the class work and home work effectively				
2.5	I believed that mathematics instruction through plasma is learner-centered				
2.6	In my view, there are instructional materials in the classroom				
2.7	I believed that there are enough reference mathematics books in the library so that they help me to do different problems				
2.8	In my view, the preparation of grade ten mathematics text book is attractive for students to read it				
2.9	I enjoy learning mathematics in classroom because my teacher check my work every time				
2.10	In my view, the teacher often gave us quiz, exams and assignments				
2.11	I feel that learning mathematics through plasma is better than that of classroom teacher				
2.12	I believed that learning mathematics concepts, rules principles ideas, and formula are helpful to solve different question in other subjects (e.g. physics, chemistry etc)				

		1	2	3
2.13	In my view, without the knowledge of mathematics, it is difficult to learn other subjects			
2.14	I believed that learning grade-10 mathematics increased my mathematical knowledge			
2.15	I believed that mathematics teacher relate mathematics lesson to our real life			
2.16	In my view, the time given for each exercise during plasma broad casting is enough			
2.17	I believed that school environment (library, playing space, classroom size etc) favorable for teaching learning process			
B.	**Students attitudes toward mathematics subject**			
2.19	I like mathematics because it is practical			
2.20	In my view, mathematics is an important subject in and out of the school so that I follow it attentively			
2.21	Mathematics is dull and boring			
2.22	I feel a sense of insecurity when attempting mathematics			
2.23	A approach mathematics with a feeling of hesitation, resulting from fear of not being able to do mathematics problems			
2.24	I have seldom liked studying mathematics			
2.25	I believed that mathematics helps in mental development and teachers the way of thinks			
2.26	Mathematics is not essentially important in every day life			
2.27	I detest mathematics and avoid using it all times			
2.28	I do not get up set when trying to work mathematics problems			
2.29	I am happy in mathematics periods			
2.30	I am not motivated to work mathematics problem			
2.31	I like trying to solve new problems in mathematics			
2.32	I enjoy learning mathematics through plasma			

3.1. In what way do you like to learn mathematics ? state your opinion_____

3.2. Do you face any problem in learning mathematics? State your opinion_____

Appendix H

በአዲስ አበባ ዮኒቨርሲቲ
የድህረ ምረቃ ትምህርት
የሰረዓተ-ትምህርትና መምህራን ልማት ጥናት ትምህርት ክፍል

በተማሪዎች የሚሞላ መጠይቅ

ዓላማ፡- የዚህ መጠይቅ አላማ የ10ኛ ክፍል ተማሪዎች በሂሳብ የትምህርት ላይ የላቸውን አስተሳሰብና አመለካከት፣በመመር መስተማር ሂደት ወቅት በሚያገጥማቸው ችግሮችና ተያየኛ የሆኑ ጉዳዮችን በተመለከተ ለጥናታዊ ምርምር መረጃ መሰብሰብ ነው፡፡ በመሆኑም የተከበራችሁ ተማሪዎች በቅንናትና በተማኝነት የሰጠችሁኝ መረጃ ለጥናቱ አስፈላጊ ስለሆነ በቅድሚያ አመሠግናለሁ፡፡

I. አጠቃላይ መረጃ (ስም መግፍ አያስፈልግም)

1.1. ክ/ከተማ ----------
1.2. የት/ቤቱ ስም ----------
1.3. ፆታ፡ ወንድ ☐ ሴት ☐
1.4. ዕድሜ ----------
1.5. በክፍል ውስጥ ያሉት የተማሪዎች ብዛት ----------
1.6. የተማሪ መፀሐፍት ጥምርታ፡ 1ለ1 ☐ 1ለ2 ☐ 1ለ3 ☐
1.7. የአንደኛ ሴምስቴር የሂሳብ ት/ት ውጤትህ/ሽ (በቁጥር ግለፅ)
1.8. የክፍላችሁ ኘላዝማ፡ ይሳራል ☐ አይሳረም ☐ አልፍ አልፎ ችግር አለበት ☐

II. በ10ኛ ክፍል የሂሳብ ትምህርት የመመር መስተማር ሂደትና የተማሪዎችን አመለካከት ለመወቅ የሚከተሉት ጥያቄዎች ተቀምጠዋል፡፡ የሚከተሉት ጥያቄዎችን ካነበባችሁት በኋላ በሠንጠረዡ ውስጥ በአመራጮች ስር የ «√» ምልክት በመስቀመጥ መልሳችሁን ሰጡ፡፡

ተ.ቁ	ሀ የመማር ማስተማር ሂደትን በተመለከተ	በጣም እስማማለሁ	እስማማለሁ	አልወሰንኩም	አልስማማም	በጣም
2.1	በኔ እምነት መምህሩ የመግቢያ የክለሳ ሂደቶችን ከኘላዝማ በፍትና በኋላ ይሰጣል፡፡					
2.2	መምህሩ ከትምህርት ይዛቱ ጋር ተያይዥነት የላቸውን ጥያቄዎችን፣ የክፍል ስራና የቤት ሰራ በየጊዜው ይሳጠናል፡፡					
2.3	የሚሳጡትን የቤት ስራና ክፍል ሰራ በአግባቡ እሰራለሁ ፡፡					
2.4	የሂሳብ ትምህርት በጥሩ ሁኔታ መማር የሚችለው መምህሩ መንገዱን ስያሳየኝና በራሴ ስሰራው ነው ፡፡					
2.5	በኘላዝማ የሚሳጣው የሂሳብ ትምህርት ብዙውን ጊዜ ተማሪ ተኮር ነው ብዬ አምናለሁ፡፡					
2.6	መምህሩ የ ትምህርት መርጃ መሠሪያ ይጠቀማል፡፡					
2.7	በት/ቤቱ ቤተ መፀሐፍት ውስጥ በቂ የሂሳብ አጋዥ መፀሐፍት ስላሉ የሂሳብ ጥያቄዎችን ለመስራት አልቸገርም					
2.8	የ10ኛ ክፍል የሂሳብ መፀሐፍ አዘጋጃጀት ሳቢና ተናበቢ ስለሆነ ለመጥናት አልቸገርም					

2.9	መምህሩ ሁሉንም ሰራዬን ስለምመለከትልኝ የሂሳብ ትምህርት በክፍል ውስጥ መማር ያስደስረኛል።					
2.10	መምህሩ በየጊዜው ፋተናዎችንና አሳይመንቶችን ይሰጠናል።					
2.11	በኘላዝማ የሂሳብ ትምህርት መማር ከክፍል መምህር የተሻለ እውቀትና ክህሎት የሰጫብጣል ብዬ አምናለሁ።					
2.12	የሂሳብ ትምህርት ሐሳቦችን፣ ህጐችንና ቀመሮችን ከሌላው የት/ት ዓይነት (ለምሳሌ Physics, chemistry)ቀድሜ ስለተመርኩ በቀላሉ በሌሎች ትምህርት እጠቀማለሁ።					
2.13	ያለሂሳብ ትምህርት ክህሎችና ዕውቀት ሌሎች ትምህርቶችን ለመመር ይከብዳል ብሎ አምነለሁ።					
2.14	የ10ኛ ክፍል የሂሳብ ትምህርት የሂሳብ ክህሎቴን ይጫምረልኛል ብዬ አምናለሁ					
2.15	የሂሳብ መምህሬ የሄሳብ ይዛትን ከዕለት ተዕለት ኑሮዬ ጋር አገናኝቶ የሰተምረኛል ብዬ አምናለሁ።					
2.16	ለእያንዳንዱ ጥያቄ ከኘላዝማ የሚሳጣው ሰዓት በቂ ነው ብዬ አምናለሁ።					
2.17	ት/ቤታችን ያለበት አካባቢ (ላይብረሪው፣ የመጫዎች ቦታዎችና የክፍል ሰፋት) ለመመር ማስተማር ምቹ ነው።					
	ለ. የሂሳብ ት/ት በተመለከት የተማሪው አሰተሳሰብ					
2.18	የሂሳብ ትምህርት የተግባር ት/ት ስለሆነ እወደዋለሁ።					
2.19	የሂሳብ ትምህርት በት/ቤት ውስጥና ከት/ቤት ውጪ ጠቃም መሆኑን ስለመውቅ በአንክሮት እከተታለለሁ።					
2.20	የሂሳብ ት/ት አሰልች ት/ት ነው					
2.21	የሂሳብ ት/ት ለመጥናት ሳስብ አጨነቀለሁ					
2.22	የሂሳብ ት/ት ስለምፈራ የሚሠራቸውን ጥያቄዎች መልስ እጠረጣረቸዋለሁ።					
2.23	የሂሳብ ትምህርትን ዕምብዛምም አለጣናም					
2.24	የሂሳብ ት/ት ለአምእሮዬ ዕድገት ወሳኝ ስለሆነና የአስተሳሰብ አድማስ ስለምያሳፋ እወደዋለሁ።					
2.25	የሂሳብ ት/ት በህይወቴ ውስጥ አስፈላጊ ስለልሆነ ትኩረት አልሳጠውም					
2.26	የሂሳብ ት/ት ስለምጣለ ሁልጊዜ መጥናት አልፈልግም።					
2.27	የሂሳብ ጥያቄዎችን ሠርቼ መልሱን በሳገኝም አልነደድም።					
2.28	በሂሳብ ክ/ጊዜ በክፍል ውስጥ ደስተኛ ነኝ።					
2.29	የሂሳብ ትምህርት ለመጥናት የሚያነሳሳኝ ምንም ነገር የለም።					
2.30	አዳዲስ የሂሳብ ጥያቄዎችን ለመስራት ሁልጊዜ ዝግጁ ነኝ።					
2.31	በእለት ተዕለት ህይወት ውስጥ የሂሳብ ትምህርት የዛን ያህል አስፈላጊ አይደለም።					

3.1. የሂሳብ ትምህርት በምን መልኩ ብትመር/ሪ ግልፅ ይሆንልኛል ብለህ/ሽ ታስባለህ/ሽ ? ግለፅ/ጪ----------

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3.2. በሂሳብ ትምህርት መማር ማስተማር ሂደት ወቅት የገጠመህ/ሽ ችግሮች ካሉ ጥቀስ/ሽ ? ----------

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Appendix I

Semi- Structured Interview Questions for ICDR Expert

1. What is the rationale to revise mathematics curriculum of grade-10?
2. Who participated in auditing and revising the mathematics curriculum of this grade level? In what aspects?
3. How much do you believed that the mathematics curriculum preparation considered the criteria of curriculum organizations (sequence, continuity, coverage, scope)?
4. What is the integration of curriculums elements knowledge, attitudes and skills)?
    a) Horizontally with other subjects
    b) Vertically with other grade levels?

Semi-Structured Interview Questions for Directors and Department Heads

1. What is your perception about grade -10 mathematics curriculum and its implementation?
2. How often do you make direct contact with mathematics teachers?
3. In what way the school administration give necessary support for the implementation of grade-10 mathematics?
4. How do you make a close contact with the concerned bodies in order to get supports for proper implementation of mathematics curriculum?
5. Are there problems regarding the implementation of the curriculum? if any what are they?

Appendix J

Classroom Observation Checklist

The objectives of this check list is to assess the actual teaching learning process; the way

active and how teacher used variety of teaching methods.

No	A. Teaching method suggested in the syllabus	Extent to use				
		1	2	3	4	Total session observed
1	Lecturing /explanation/					
2	Discussion					
3	Demonstration					
4	Questioning and answering					
5	Student (cantered) activity					
6	Group work					
7	Problem solving					
8	Proof and reasoning					
9	Discovery learning method					

Key 1 = Always 3 = Sometimes

2 = frequently 4 = No at all

	B. Instructional consideration	Rating scales			Total sessions observed
10	The teacher lecturing through out the period	1	2	3	
11	Students listen and write from the screen while plasma instruction takes place				
12	Teacher facilitates students' learning while plasma instruction broad casting				
13	The teaching learning process through plasma focuses on facts written in the textbook				
14	Plasma teacher present the lesson by relating to students real-life				
15	The time given for exercise during broad casting is sufficient				
16	The classroom teacher performs the exercises by himself for the students during broad casting				
17	Most of the students perform the exercises given from plasma within the given minutes				
18	The teacher introduces the lesson before the plasma instruction				
19	The teacher attempt to use different instructional methods				
20	The classroom situation is conductive for teaching learning purpose (ex. Chalk-board usage, clarity of plasma screen)				
21	The teacher give class work and homework and correct their work				
22	The teacher makes summary of important concepts after plasma broadcasting				

Key 1= Frequently 2= Rarely 3= Not at all