

**EVALUATION OF THE IMPLEMENTATION OF
PREPARATORY MATHEMATICS SYLLABUS IN ASSELA
TVET INSTITUTIONS**

KINFU TASACHEW TEKLEHAIMANOT

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE
STUDIES OF
ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF
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Acknowledgements

First and for most, I would like to express my deepest and heartfelt thanks to my advisor Dr. Solomon Areaya for his knowledgeable advise and constructive comments that have shaped this thesis immeasurably from the very beginning up to the end of this study. Without his proper guidance, the study would never have seen in light of today.

I am also indebted to the school of graduate studies, Addis Ababa University for its research grant

Lastly, I would also like to express my thanks to the Assela TVET institutions' principals, teachers and students for their cooperation during data collection.

Yet, above all, my thanks be to the Almighty God.

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Acronyms

- TVET:** Technical and Vocational Education and Training
- ICDR:** Institute for Curriculum Development and Research.
- MOE:** Ministry of Education
- MOA:** Ministry of Agriculture
- EGSECE:** Ethiopia General Secondary Education Certificate Examination
- ESDP:** Education Sector Development Program
- NCTM:** National Council of Teachers of Mathematics
- GONL:** Government of Newfoundland and Labrador
- EMT:** Electro Mechanical Technology
- RWSS:** Rural Water Supply and Sanitation
- SSID:** Small Scale Irrigation and Drainage

Abstract

The purpose of this study was to evaluate the implementation of the preparatory mathematics syllabus in TVET Institutions. Attempts have been made to examine: - whether the instructional guidelines set in the syllabus are properly implemented at classroom levels, the attitudes of teachers and students' perceptions towards the implementation of the syllabus, institutional contexts and classroom environments for effective implementation of the syllabus and factors affecting the implementation of the syllabus in the TVET institutions. To this end, a descriptive survey approach was used as a method of the study. The data was collected from 236 sample students, 12 mathematics teachers, 3 principals and 2 department heads in three Assela TVET Institutions. Respondents were selected by using systematic random sampling and purposive sampling techniques. Questionnaires, observations, interviews and document were used as data gathering instruments. The data were analyzed both quantitatively and qualitatively. Accordingly, the result of the study indicated that the majority of mathematics teachers did not implement the instructional guidelines suggested in the syllabus effectively. Teachers frequently used explanation or lecture and questions and answers instructional strategies. The mathematics teachers did not use continuous assessment techniques to evaluate their students' performance. Significant proportion of mathematics teachers (42%) had negative attitudes towards the implementation of the syllabus. Furthermore, the majority of the students' perceptions towards the implementation of the syllabus were found to be very low. There was scarcity of curricula and instructional materials and shortage of time to implement the mathematics syllabus. Lack of technical and material supports, lack of communication and low attentions on the part of principals, department heads and administration were observed to be the major factors affecting the implementation of the syllabus. Consequently, there is a huge gap between what is intended in the syllabus and its implementation in the TVET institutions. Hence, to alleviate the problems encountered in the implementation of the syllabus, continuous teacher professional development, adequate provision of curricula and instructional materials for mathematics teachers, devising the ways for frequent discussions between teachers, department heads and principals and modifying or revising or changing the mathematics syllabus according to the needs of the students and the objectives of the TVET programs after conducting an extensive national study are suggested.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Education can change or modify the environment in which human beings live in. It is the fundamental instrument by which human beings adapt nature according to their needs. Without education development will not occur (UNESCO, 1999). Education, particularly formal schooling is, therefore, essential in nation building and development. Hence, education has to be used as a vital instrument for social, economic and political changes and should be related to the long-term national aspirations and the programmes of national development on which the country is engaged (Aggarwal, 1997:3).

One of the characteristics and requirement of formal education sector is the design and development of curriculum. Curriculum can be defined both narrowly and broadly. The narrow definition of curriculum includes curriculum as syllabus and as a body of knowledge-content and/or subject. In its broader definition, however, the curriculum is considered to be everything that transpires in the course of planning, teaching and learning in educational institution. That is, it can be defined as the entire range of experiences, both undirected and directed concerned in unfolding the abilities of individual or it is the series of consciously directed training experiences that the school use for completing and perfecting the unfoldment (Derebsa, 2004: 5). Education in the sense of narrow definition of curriculum is the process by which it is transmitted or delivered to students by the most effect methods that can be devised (Blenkin et al cited in Derebsa, 2004:16).

According to Derebsa (2004), a well designed curriculum will be of no value unless it delivers the result. Thus, curriculum implementation is critically important as it is to deal with the means of accomplishing desired educational objectives. In curriculum implementation different parties are involved such as teachers, supervisors, school principals, educational officials, students and others. The knowledge, attitudes and actions of those parties need to be changed so as to have successful curriculum implementation (Marew, 2000:12). If there is a negative attitude on the part of those involved in the process of implementation, they will not be enthusiastic for its successful implementation.

Teachers and the concerned bodies must have a clear picture how to implement the newly planned or revised curriculum. Frequent discussion about the new program among teachers, principals and curriculum workers is a key for successful implementation (Crandall et al cited in Ornstein and Hunkins, 2004:302). Moreover, people usually support the curriculum if they understand its need and rational. As the result, curriculum implementation is the action and interaction of the practitioners with the program's activities under a certain institutional settings (Sowell, 1996).

There are various factors which contribute to and affect curriculum implementation. Among the factors contributing to implementation are presences of human resources and their awareness of the curriculum and its implementation, availability of resources, and guidance and support systems. On the other hand, factors such as absence of finance, insufficient supply of materials and equipments, lack of cooperative work relationships, lack of trained manpower and insufficient time seriously affect the implementation (Pratt, 1980, Ornstein and Hunkins, 2004).

Implementation and evaluation are essential components of curriculum studies. Evaluation can be used to decide what instructional material and methods are satisfactory and where change is needed; it can also be used to judge how well the school system is, how good the individual teachers are (English and Harries, 1992). In addition, one of the purposes of evaluation of implementation of a syllabus is to provide information for continuous on going modification of the learning program, and the other is to find out whether a syllabus really does achieve what it intends to achieve (Yeoman, G. D and Beck, A. W, cited in Solomon 2000:3). Evaluation is also imperative to determine the worth of something (Payne, 1974).

The Ethiopia Education and Training Policy have given attention to mathematics instruction at all levels of primary, secondary and TVET Educations (TGE, 1994). Hence, in our education system the place of Mathematics as a subject has been very important. Mathematics is one of the oldest and most fundamental sciences. It uses Mathematical theory, computational techniques, algorithms, and the latest computer technology to solve economic, scientific, engineering, physics and business problem. In addition, it has many different applications. In supporting this idea, Price (1971: 86) stated that the subject has a wide range of application in various field of

sciences like business, technology, physical science, medical science and industries. It is also applicable in art, social science and humanities. In addition, it acts as a catalyst in stimulating the development of others.

It is indispensable fact that Mathematics is vital in science and technology of the World. So the need for Mathematics education is compulsory in any educational sector. Together with Language and Science, it forms part of a core of school subjects that are accepted as compulsory at all levels around the world (Orto and Wain, 1994). Moreover, it is embedded in all societies and it is an important academic subject with a vast and growing literature. Apart from dealing with some aspect of academic, it plays a crucial role in the world of work (ibid). Since Mathematics is considered as one of the core subjects in technical studies, students' performance in the subject should be given a priority. Kemeny (1964:27), for instance, described the matter as "While Mathematics has always been recognized as one of the corner stones of education system, we are entering an era in which an understanding of Mathematics will be of even greater importance to all educated men".

Solomon (2000) evaluated the implementation of Grade Eight Mathematics Syllabus in selected schools and identified the outcomes as well as the problems encountered in implementing the Syllabus. In his findings, Solomon asserted that:

The majority of teachers exhibited unfavorable attitudes towards the specification of the syllabus. There are a considerable proportion of the teachers who are assigned to teach Mathematics at grade eight without the necessary qualification. The specifications of the syllabus are not implemented fully. Most of the instructional procedures observed in classrooms are teacher-centered. The dominantly used teaching strategies in classrooms are writing on the blackboards and teacher-directed explanation. Most of the mathematics class time was used for writing and copying facts of mathematics rather than doing mathematics. Consequently, the implementation process of the syllabus not effective in enabling students to have mastery of the subject matter (Solomon, 2000:vi).

Solomon Deressa (2004) also carried out a study to evaluate the implementation of Grade Nine Mathematics Syllabus in Addis Ababa Administrative region. According to his findings, there were less physical and instructional facilities available in the schools for effective implementation of the syllabus and the over crowdedness of the classroom greatly affect the implementation of the syllabus. Moreover, during classroom instruction, the traditional teaching methods (teacher-centeredness) were practiced. The study is also asserted not only poor

communication system existed among teachers and others school community members to implement the syllabus but also lack of teachers' commitment for implementation of the syllabus. He finally concluded that the implementation of grade nine Mathematics syllabus in Addis Ababa administrative regional was ineffective (ibid: 70 -71).

In addition to the above studies, there are also studies carried out regarding evaluation of implementation of syllabus in different subjects in Ethiopian context. All of the studies addressed problem encountered during the implementation of syllabi. The common problems mentioned in their findings were:- teachers' inefficient classroom performance, using the traditional methods of teaching instead of variety of teachings strategies suggested in syllabus, poor supply of curricular and instructional materials, large class size, teachers overload, teachers' lack of pedagogical skills towards innovations, lack of communications, inadequate support for teachers, lack of awareness of the school communities about the new approach of education system, poor school management system, school financial problems and the likes (Getachew, E. 1994; Dawit, M. 1999, Assefa, C. 2001; Amare Adela, 2006; Ayele, S. 2006; Fekadu, S. 2007).

1.2. Statement of the Problem

Education is important for improving science and technology, promoting labor productivity and human resources, enhancing culture, etc. Particularly, Technical and Vocational Education and Training (TVET) provide education in order to increase the productivity of low and middle level technicians to the world of work. With this regard, a UNESCO publication (1999:27) states:

Technical and vocational education and training (TVET) is the most directly concerned with the acquisition of knowledge and skill required for the world of work. And every country must adapt its TVET program to cater the skill requirement of the work place.

With this point of view, the Ethiopian government established TVET program in new form through out the regions in different sectors. The major objective of the program is production of lower and middle level skilled manpower that can participate in various fields of the economic sector and contribute to the country's economic growth and social development (TGE, 1994). TVET is an instrument for producing technicians equipped with practical knowledge that would be job creators rather than who expect jobs to be provided by the government (ESDP III, 2005).

The new education and training policy in Ethiopia gives special attention to TVET by providing

broad and multilevel foundations. The policy (TGE, 1994:6) states "Parallel to the general education, diversified technical and vocational training will be provided for those who leave schools from any level of education". Currently, TVET is sub divided in to training for agriculture, health, industry, commerce, water technology and other skill trainings. Furthermore, trainees are also encouraged through entrepreneur education to create job for themselves. In TVET program of Ethiopia, the proposed syllabi include main courses, supportive courses and common courses (MOE, 2003). The common courses consist of Mathematics, English language, Civic and Ethical Education, Entrepreneurship and Computer. With regarding to Mathematics, the trainees are supposed to take the preparatory (Grades 11 and 12) Mathematics in TVET institutions as common course because the Ministry of Education believes that they need to have basic knowledge in order to pursue higher level of education (MOE, 2002).

Initially, the preparatory Mathematics syllabus was developed for students who attend the preparatory schools (Grades 11 and 12). In these schools, Mathematics education has been different for natural science and social science streams because the natural science stream students learn Mathematics for specialization since they use rigorous Mathematics in order to apply its concept in their field while the social science stream students learn Mathematics as a tool to understand their area of specialization (MOE, 2000).

The Mathematics syllabus of grades 11 and 12 contains 10 units and 6 units respectively. The five units of grade 11 namely unit 1, unit 2, unit 3, unit 5 and unit 6 have given commonly for all social and natural science streams students but students in both streams learn all units of grade 12 mathematics. However, the students at 10+1 level in TVET institutions have been supposed to take the common units of grade 11 mathematics for social and natural science streams. The trainees have learned units 1, 2, and 3 of grade 12 Mathematics at 10+2 level and units 4 and 5 of grade 12 Mathematics at 10+3 level in the TVET institutions.

As my experience of teaching mathematics in the TVET College, I observed many of the trainees do not have interest to learn the preparatory Mathematics. In addition, they have low academic background knowledge since they are low achiever of EGSECE. During implementation of the Mathematics syllabus, I saw there are different problems and the Mathematics teachers also complained that teaching preparatory mathematics in the TVET institutions was difficult because it is designed for those students who passed EGSECE. These issues initiate me to investigate the

implementation of the syllabus in the TVET institutions.

Moreover, as far as my knowledge is concerned there is no research done before this study in relation to implementation of Mathematics syllabus in TVET institutions, particularly in Assela TVET institutions. So, there is no research evidence that indicate the existence or non existence of the above problems in these types of institutions. Research that investigated how TVET institutions implement the preparatory mathematics syllabus is not available. Thus, it is of paramount important to evaluate the implementation of preparatory (Grades 11 and 12) mathematics syllabus in the TVET institutions

In this study, the major concern is to evaluate the implementation of the preparatory mathematics syllabus in Assela TVET institutions with emphasis on impediments during implementation process. Thus, the aim of this study is to evaluate the implementation of preparatory mathematics syllabus in the TVET institutions.

1.3. Specific Objectives

With the above aim the study will address the following specific objectives.

1. To examine the extent to which the guidelines set in mathematics syllabus are employed by the mathematics teachers.
2. To examine the attitudes of mathematics teachers toward the implementation process of the Mathematics Syllabus.
3. To investigate students' perceptions toward the implementation process of the Mathematics syllabus in the TVET institutions.
4. To examine the favorability of the institution and classroom environments for teaching and learning mathematics.
5. To identify the factors influencing the implementation of the mathematics syllabus in TVET institutions.

1.4. Research Questions

With the above specific objectives, then, the study attempts to answer the following basic research questions:-

1. To what extent did the instructional guidelines suggested in the Syllabus properly implemented at classroom levels by mathematics teacher in the TVET institutions?

2. What are the attitudes of mathematics teachers toward the implementation process of the Mathematics Syllabus?
3. What are students' perceptions toward the implementation process of the Mathematics Syllabus?
4. Are there conducive institutional and classroom environment to effectively implement the given Mathematics syllabus in the TVET institutions?
5. What are the factors influencing the implementation of the Mathematics syllabus in TVET institutions?

1.5. Significant of the Study

This study has at least the following significance:-

1. It will initiate the TVET curriculum experts to develop Mathematics syllabus appropriate and applicable for the TVET program.
2. It will increase the interest and curiosity of the trainees to learn Mathematics by way of providing the most appropriate curriculum to them.
3. It can serve as a base line study for further in depth study on the area.

1.6. Delimitation of the Study

Although there are several components of the TVET program and many curricular materials as well as manuals which need investigation, the current study is delimited to an evaluation of the implementation of the Mathematics syllabus in the TVET. The scope of the study is limited to an assessment of the teachers' instructional classroom performance, method of teaching, assessment techniques, teachers' attitude and students' perception toward the implementation of the syllabus, the conduciveness of the institution and classroom environments and factors affecting the implementation of the syllabus. This evaluation is generalizable by and large to the studied TVET institutions in Assela at all levels.

1.7. Limitation of the Study

In order to evaluate the desired classroom instructions in depth continuous classroom observations are vital tools. In this study, however, each sample teachers were observed only two times in his classrooms. Due to time factor, it was not possible for the researcher to have some

more observation sessions. The refusal of interviewees to be recorded during interview sessions was also another problem faced in the data collection. Though these limitations existed in the study, I attempted to make it as complete as possible by using field notes and another data collection instruments such as questionnaire and observation.

1.8 Definition of Key Terms

Preparatory mathematics syllabus: It is a mathematics syllabus which is prepared to second cycle secondary school (Grades 11 and 12) students in Ethiopia.

TVET Institutions: - Institutions, School or Colleges which provide technical skill training at 10+1, 10+2 and 10+3 years levels in different occupations in Ethiopia.

Teachers' instructional classroom performance: - It means the capability of teachers in using the suggested guidelines to translate the content, methods, assessment etc of the syllabus in the classroom practices.

Antecedents: - Any conditions that exist prior to teaching and learning (before the treatments begins) that may influence outcomes.

Transactions: - The interaction among students, teachers, materials and environment. It is the process of teaching and learning

Outcomes: - The consequence of the program – cognitive, affective, personal, community – wide, immediate and long- term

Intended: - It refers to what are suggested or planned in preparatory mathematics syllabus and teachers' guide

Observed: -It refers to the actual use of the intended elements in the syllabus

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. TVET in Ethiopia

Ethiopia needs hardworking citizens who comprehend and respect their constitutional rights, those that have the capacity to solve problems that generally have positive attitudes towards science and technology and strive to transform their country. A country has to have skilled manpower if it is to have rapid economic development and growth. No matter how vast its natural resources might be, a country cannot achieve economic growth without trained and skilled manpower.

In the first half of 20th century, the development of vocational and technical education in Ethiopia, for instance, was very limited (grade 10+3) and that was not given sufficient attention or policy support. There were sixteen institutions that offered vocational and technical education with an annual intake of not more than 1000 students (ESDPIII, 2005). As the quality of education was not high enough, the trainees' contribution to the country's growth was far below expectations. In fact, despite their training, most were even left jobless. Prior to 1990s, technical and vocational education received less attention in Ethiopia. It generally used to occupy a small and a minor position in education system of the country. As one documents of the ministry of education (MOE, 2002) indicated that on average it is used to occupy only 2% of the total secondary school students in years before 2001/2002.

In recent year the government has made immense effort to design and implement employment oriented technical and vocational education and training programs in various levels of educational system. In this regard, the new education and training policy that the country by now follows gives special attention to technical and vocational trainings and the pervious rigid program of 10 + 3 at the secondary level has now been divided into various complementary programs. Thus, the new organization of technical and vocational training has a broad and multilevel foundation. The policy (ETP) in 1994 insures the introduction of intensive TVET strategies. In its statement of the policy paper states "Parallel to the general education, diversified technical and vocational training will be provided for those who leave schools from any level of education" (TGE, 1994:6).

The primary objectives of the new TVET program in Ethiopia is to provide various skill training for the present and future labor force in order to adapt the requirement of the labor market. To realize this objective the training programs were organized in the three different packages. These are:-

- a) **The basic vocational training program-** anticipated to provided crafts level training for people who dropout from primary school level (in fact who are attended basic literacy).
- b) **Junior technical and vocational training program-** intended to provide junior level technical and vocational trainings for primary school graduates or secondary school dropouts.
- c) **Middle level TVET** – intended to provide education and trainings, perhaps for general education graduates from grade ten in order to produce middle level technician. This program subdivided into 10+1, 10+2 and 10+3 levels which eventually lead to certificate standard I, certificate standard II and College diploma qualification respectively (ESDPIII, 2005).

The middle level TVET program provides different packages of courses that can be broadly classified in to three courses: The main courses, supportive courses and common courses. The main courses packages provide a number of independently prepared modules of employable skills that are designed to train students to perform a certain duty under the prevailing conditions and established standards. They represent different occupations which in turn are further sub divided into different jobs categories; then different duties; and finally in to different tasks. The supportive courses are meant for helping the acquisition of knowledge and skills which are expected to be obtained from the main courses, while common courses are designed in order to upgrade the trainees' academic competences that may help them in their future career advancement (Mekonnen, 2004, MOE, 2003).

Since the focus of this paper is evaluation of the implementation of the preparatory mathematics syllabus in the Assela TVET institutions, the main concepts of the review literatures were written under the topics curriculum implementation, curriculum implementation evaluation, factors affecting the implementation of curriculum and mathematics instruction.

2.2. Curriculum Implémentation

2.2.1. Concept of Curriculum Implementation

A curriculum is the most critical thing in any educational settings. Thus, it must be carefully planned or designed in order to meet the educational aim of the country and the goals of the school or educational institution. Chhem and khoo Hoon Eng (2001) pointed out designing the curriculum is the most exciting and creative part of the curriculum development. However, the ultimate goal is not to design the best and ideal curriculum, but to put it into practice successfully. In supporting this idea, Ornstein and Hankins (2004, 198) suggest a curriculum with optimal designed for students must get delivered; it must be implemented in the school if it is to make any impact on student learning. In other words, Saylor et al (1981) suggests that if there is no instruction, which is main part of implementation, no need of producing or developing a curriculum. Therefore, implementation is the necessary condition for the improvement and development of a curriculum.

A concept of curriculum implementation is then conceived differently by various authorities in the field of curriculum. Lewy, A. (1977) assumes implementation as the open use of program throughout the entire school system. Fullan and Pomfret (1977) also defined implementation as open use of innovation. For Schubert (1986), it is a system of engineering that takes design and construction of specifications through various channels to the teacher in classroom. Stern (1992) also defined it as the translation of curriculum into classroom reality. According Pratt, D. (1980:435), implementation is the point at which the change is actually realized in classroom. Derbessa (2004: 240) states that curriculum implementation is a process of putting the developed/planned curriculum into effect. To sum, all definitions mentioned above have a common consensus that curriculum implementation is defined as making use of the developed curriculum materials in the whole school system, or putting the document into practice in classroom.

The views of curriculum implementation may be classified according to continuum that ranges from very technical in nature to very fluid (non-technical) and very aesthetic (Ornstein and Hunkins, 2003, 299). Persons in technical (rational) camp view that the success of curriculum implementation rests on delineating precise steps at the outset of the development process.

Individuals in non-technical camp consider implementation as uncertain and unpredictable. At this extreme individuals might even repudiate to use the term implementation thinking that it suggests a technical rationality, in stead they have substituted the term enactment which suggest a more fluid approach.

2.2.2. Nature of Curriculum Implementation

Many argue that implementation is a component in curriculum action cycle and step in curriculum development. Others also consider it as separate step. This step involves extensive action by many parties. It is clear that teachers supervisors, principals, educational officials, etc at different levels have roles in implementing newly planned or changed curriculum. By its nature, curriculum implementation needs changes in the attitudes of those parties that participated in the process. Thus, the suggested ways of implementation of the newly developed or changed curriculum have to be communicated to the teachers and the concerned bodies through different mechanism. Communication takes time because at this stage of curricular activity efforts will be made to persuade people and to influence their attitudes in order to get support. Their knowledge, attitude and actions affect implementation (Marew, 2000; Derebssa, 2004; Ornstein and Hunkins 2004).

In recent years, implementation has become a major educational concern because many of the curriculum projects, especially for reading and mathematics, did not succeed even if much money was spent to develop those curriculum projects. The failure of the successful implementation of innovative curricula is due to the ignorance of school culture by curriculum designer outside the school; the mismatch of the theoretical information or knowledge and a real world context, not considering the social – institutional context and others (Sarason in Ornstein and Hunkins, 2004). After reviewing several innovative projects, Fullan and Pompret cited in Derebssa (2004:241) state that effective implementation of innovations requires time, personal interaction and contacts, in – service training or continuous professional development and others forms of people based support.

Besides the above mentioned nature of curriculum implementation, there are many steps which are involved in moving from general curriculum conceptions to actual treatment of the curriculum in the classroom. Broad concepts are translated into major curriculum projects, or

more often into publishing venture. In the broader movements, typically prepare curriculum guidelines to available curriculum materials, especially textbooks. Some effort is also made in most instances to prepare teachers for implementation. Finally, teachers place their own interpretations on the basic concepts of the curriculum, the materials at hand and the capabilities of their students to deal with the materials, and the circumstance with in each school which affect the ability to deliver the curriculum [GONL, 1994].

For effective implementation of the newly designed curriculum, a careful planning is necessary. It is an activity of setting mechanisms and requirements in order to address the needs, the importance of the change, resource allocations and time allotment for carrying out, intended action. It takes place prior to program creation and / or delivery, and focus on the factors such as people, program and organizational process (Derbessa, 2004; Ornstein and Hunkins, 2004). These three factors are inseparable. A skillful curriculum leader can not ignore any one of the factors. If some one ignores one of them, for example, the people factor and spent much time and money for modification of the program or organizational process, the implementation of the program may be failed (Fullan 1991).

Frequent discussion about a new or a changed curriculum among teachers, principals, and curriculum workers is a key for successful implementation. Every involved party in the task of implementation should aware of the circumstance to realize the curriculum. For that purpose, communication channels should be kept opens through some mechanisms like seminars, workshops, symposia, panel discussion, informal communication networks, etc. Communication channels can be used orally or written such as letters, articles, books, bulletins, research reports, memos, speeches etc depending on the nature of the curriculum (Ornstein and Hunkins, 2004).

Putting the curriculum into practice should not be done by teachers alone; there must be cooperation between all the concerned bodies in the implementation. Teachers usually need the cooperation of those people who are evolved in the planning process, those who are managing resources, and with their colleagues. Since teacher's cooperation is a determinant factor in curriculum implementation, it affects the whole process.

In addition to, planning, communication and cooperation, different kinds of support are needed for effective or successful implementation of the curriculum. In-service training and staff

development for teachers, supervisors and principals, materials and financial supply, peer support, etc is vital. Thus, implementation is a collaborative effort of many parties.

2.2.3. Approaches and Models for Curriculum Implementation

According to Snyder et al cited in Solomon, A. (2000), curriculum implementation has been classified into three approaches such as fidelity, mutual adaptation, and curriculum enactment perspectives. The fidelity perspective is an approach to curriculum implementation which intends to determine the degree of implementation of an innovation in terms of the extent to which actual use of the innovation corresponds to intended use and to determine factors that facilitate and inhibit such implementation. In this perspective, the curriculum is developed or created outside of the classroom by the experts. Curriculum change is seen as a linear process, with teachers as classroom implementers only and the curriculum is evaluated to determine whether the planned outcomes have been achieved. Here, curriculum implementation is successful when the teacher carryout the change as directed.

In mutual adaptation, the curriculum is already developed by experts, but there is a certain degree of adjustments, negotiation and flexibility exist on the part of both designers and practitioners. Moreover, there is a possibility in adapting, modifying and decision making by the implementer with curriculum developer during implementation. There may be concrete problems that hinder or facilitate the implementation as it may be planned. In this approach, the organizational, administrative and knowledge factors may be the major variables (Snyder et al cited in Solomon, A. 2000).

The curriculum enactment is an approach which is non-technical and curriculum is viewed as education experiences jointly created by students and the teacher. Educational materials and instruction strategies are seen as tools for students and the teacher facilitate and encouraged the instructional process as the students construct the enacted experience in the classroom. Curriculum knowledge is constructed by the individual learner, but which must be based on personal needs and the external standard. Curriculum change is seen not only as observable alternation in behavior, but also as personal developmental process, both for the teacher and student. The role of the teacher is that of a curriculum developer together with his or her students.

This new century continue to be a time of over choice, not only of products, but also of orientation to certain action as well as models for guiding our action (Ornstein and Hunkins, 2004:311). They described five type of curriculum implementation model in detail. These models are: -

1. Overcoming Resistance to Change (ORC) model. The model was developed by Neal Gross. It rests on the assumption that the success or failure of planned organizational change efforts is basically a function of the ability of leaders to overcome staff resistance to change that is presented just prior to or at the time of the introduction of the innovation. The curriculum leader must convince all the involved people to the implementation of the new innovation. One strategy to overcome resistance to change is power equalization between management and organizational members- school administrators and teachers in this case. For power equalization, the curriculum leaders share their power with subordinates by allowing them to participate in decisions about program changes. Generally, an assumption of this model is that individuals must changes before organizations can be altered.

2. Organizational Development (OD) model. The Author or originator of this model was Richard Schmuck and Mathew Miles in 1971. They suggest Organizational Development has come to mean a rather specific approach for bringing about change efforts and improvement in an organization. In this model, the emphasis is on teamwork and organizational culture. OD views the process of curriculum implementation as an on going interactive process. This emphasis might well place OD under what some currently consider curriculum enactment (Ornstein Hunkins, 2004; 315).

A key assumption of this approach to curriculum implementation is the individuals care about their future. Thus, they desire to be actively engaged in designing, developing, implementing and evaluating the education system. The model advocates also both teachers and students are actively involved in curriculum development and its implementation.

3. Concerns – Based adoption model. It is very closely related to the OD model. One key difference involves how those using this approach view- individuals with in the school and school system. All changes originates with in individuals; individuals change, and through their changed behaviors, institutions change. Change occurs when individual concerns are made

known (Ornstein and Hunkin, 2004: 314). The Author and the originator of the model was F.F. Fuller in 1969. The assumption of the model is that change is personal which stress on school culture. The key players in this model are teachers. The model assumes that the teachers and other educational workers have already created or selected a curriculum for the school. The focus here involves enabling teachers to adopt this curriculum and to view it as their own (Marsh and Wills in Ornstein and Hunkin, 2004).

4. Organizational parts, units and loops model: - This model was developed by Rensis Likert. The assumption of the model is, if there is no system relation drawing various parts into a whole, then parts, units and departments of the organization compromise the whole by linking people and groups. This means that the manner in which those in the larger teams work with those in the smaller team will rub off the smaller teams. Implementation consists of corrective actions.

Key players in this model are administrators, directors, teachers and supervisors. It is known that a school is actually an organization of loosely coupled units such as departments, classrooms, and persons. Also, the parts of the units have rather flexible relationships. The new program being implemented in the school presents an opportunity for all involved parties to gain students, teachers, heads and principals. However, successful implementation requires energy, time, and patience. Implementation to be successful must be perceived as an effort requiring a long range time frame and major involvement and cooperation among people and departments.

5. Educational Change model

Michael Fullan developed the model on the assumptions that successful change involves need, clarity, some explicitly and quality of programs. These four factors are the characteristics of educational change which affecting the implementation of curriculum. In this model the key players are Administrators, teachers, students, school boards, and community and government members.

2.3. Factors Affecting Curriculum Implementation

Many scholars in the field of curriculum agree that curriculum implementation is the actual use of the official curriculum in the school or educational institution. Its process is complex because it needs carefully planning, sufficient time, favorable environment, funding, resources, and support. In addition many parties involved in it and their collaboration efforts are important for

successful implementation. Due to the complexity of implementation, various studies confirm that there are different factors which affect the implementation of the curriculum. Posner (1995), for example, identify seven areas called "frame factors" that can hinder effective curriculum implementation. These are: - Temporal, Physical, Political-legal, Organizational, Personal, Economical and Cultural.

Time is a crucial issue. Inadequate time allotment for implementation of the curriculum can seriously affect it and teachers need time to practice the new way prior to full implementation. Many physical factors related to natural and built environment of school are also major impacts of implementation. This physical condition includes materials, equipments, organization and personal factors are probably the most crucial things to be considered in curriculum implementation because they deal with human consideration and all change ultimately depends on the willingness of the people involved to adapt it. Although the cultural frame factor does not relate directly to technical dimensions of implementation, school culture and culture of community may be hinder the implementation.

Fullan and Pomfret (1977) and Fullan (1991) find out sixteen factors that influence implementation. These factors are categorized into four groups: -

1. Nature of change consist of needs and relevance of change, clarity, complexity, and quality and practicality of the program;
2. strategies include in-service training, resource support, feedback mechanisms, and participation;
3. characteristics of adoption units such as adoption process, organization process, environmental support and demographic factors
4. Macro- socio – political units consist design questions, incentive system, evaluation and political complexity.

In this reviewed literature an attempt is made to categorized factors which facilitate or hinder the curriculum implementation into three groups such as factors related to nature of change; roles of teachers, principals and students; and school organization will be mentioned as viewed by different scholars in the field.

2.3.1. The Nature of Change

Micheal Fullan (1991) has discussed factors related to nature of change with in four points that are need, clarity, complexity and quality and practicality of the program. The need for innovation must be specified for and accepted by those affected persons to change. When the need for change has not been made known or if it is made known, but not accepted by people, they will likely often resist the change. In fact, the acceptance of the change by the people will be realized if innovation is considered with their values.

People want to know the purpose of innovation and how it is going to be conducted. A curriculum leader should maintain the process of implementation by convincing them about the change to make a certain decision. Since, clarity of the intent of innovation is very important for the users, curriculum leader makes clear the goals and means of any change activities (French and Bell in Ornstein and Hankins, 2004, 317).

Complexity refers to difficulty which is relative to many factors. It is indispensable fact that curriculum change is a complex and difficult process and it requires explicitness by its nature. Smooth and successful curriculum change is enormously difficult and time consuming and cannot be accomplished without potential implementers which personally involved and accepting the change on their own terms, according to their own construction of reality (Fullan 1991, Marsh and Huberman, 1984, Rudduck, 1991).

Next to initial knowledge of innovation, the second step in innovative – decision model is persuasion. People need to perceive the quality, worth and practicality of innovation in order to adopt or reject it. Although we would hope that any curriculum innovation would have evident quality, developers often miss the mark when it comes to practicality. Sometimes, the newly changed curriculum does not have quality and practicality to meet the desired goals of schools. In this case, the students and teachers should be dissatisfied or uninterested in teaching and learning process of the subject. Hence, the implementation of the curriculum should be affected by lack of quality and practicality of planned curriculum for the specific area.

2.3.2. Factors Related to the Role of Principals, Teachers and Students

2.3.2.1. The Role of Principals

Currently, we are in information age, making it more important than ever before for principals to have a strong understanding of curriculum to help them effectively lead schools (Marlow and Minehira, 2006). In order to bring effective curriculum implementation in the school, the role of principals should change from manager to leadership. Indeed, the principals' leadership is critical to the success of any curriculum development and implementation (Marsh and Wills in Ornstein and Hankins, 2004:324). The over all curriculum implementation is mostly determined by the leadership role of the principals. Hence, According to Erlandson and Witters-Churchill (1990), the principals must understand the various aspects of curriculum development and implementation; be informed of current trends in instruction; understood the relationship between curriculum and assessment; know how to provide appropriate staff development to support teachers in implanting curriculum and instructional change; be able to provide adequate resources to teachers and be able to communicate effectively with parents so that the school's curricular and instructional programs are relevant, understood and supported by community.

Principals have to give more attention for effective curriculum implementation than administrative work. But, most of them devoted much of their time working with administrative concern. On this line, Murphy (1990: 164) found that while most principals believe they should spend more time attending to the "technical core" of the school (Curriculum and instruction), they spent the majority of their time working to other issues related to operations, management, and public relations. Furthermore, he suggests that part of the reason principals have not been able to act effectively as curriculum and instructional leaders is because of teachers' perceptions of their role in this capacity.

A substantial body of research (Posener, 1995, Murphy, 1990, Marlow and Minehira, 2006) indicates that teachers do not view instructional leadership as the primary responsibility of principals. They do not see much evidence of instructional leadership on part of principals. They also are reluctant to accept principals as leaders. Therefore, to overcome such problem, principals

must do working with teachers to develop common understanding of what it means to be instructional leaders.

To be effective curricula leaders at operational level, principals must work closely with teachers. They walk in the campus and talk to students, visit classrooms and meet with teachers frequently. They also have an open door policy and regular feedback from parents, teachers, students, and other community members about happenings in the school. In addition, principals must provide support to teachers. If there is no adequate support of principals to teachers in actual use of innovative curriculum, then it is clear that teacher will resist implementing the new curriculum.

Generally, Barry Berlin et al as cited in Ornstein and Hankins (2004: 323) determined the top ten roles of principals as curriculum leaders. These are: 1/develops an orientation program for new teachers; 2/develops a clear set of goals and objectives; 3/involve individual departments in curriculum development; 4/encourages communication among schools with in district; 5/handles controversial issues involving curriculum; 6/ spends time visiting the teachers in classroom; 7/plan staff development programs; 8/rewards curriculum innovation; 9/encourages use of library and media services by the teachers; 10/modifies school environment to improve instructions.

The absence of these principals' activities in the school as curriculum leader may harm the success of implementation of the curriculum. Indeed, the collaboration effort of principals and teachers is a decisive factor for effective implementation. Supporting this idea, McNeil (1996: 244) suggests "that teachers alone are unlikely to innovate and implement school wide curriculum. However, department and grade level faculty, possibly under the direction of chair person or team leader and operating with the backing of the principal, often influential".

2.3.2.2. The Role of Teachers

Teachers play a key role in implementing the changed curriculum in classroom. It is undeniable that they must have knowledge, skills and attitude about the subject matter and method of teaching to deliver the intended syllabus in the school. McBeath (1997) indicates that curriculum innovation was seen as a smorgasbord of new ideas or new materials from which teachers could select and use in the classroom in the way they thought fit.

The teacher has to have sufficient time to recognize and understand the changed curriculum and to put it into practice with commitment in classroom. Time is the teacher most valuable resource and the amount of time needed to implement curriculum change is almost underestimated. Indeed, teachers need sufficient time for planning lessons, for preparing instructional materials, for greater amount of evaluation and marking and in-service training (Pratt, 1981: 430). If there is lack of sufficient time, the curriculum can not be materialized into effect.

In addition, if teachers feel comfortable for the new change and accept it, they can fully implement the innovation. Marlow and Minehira (2006) state four stages which involved in the change process such as 1) Beginning awareness 2) rise in comfort level, 3) spread out acceptance and 4) full implementation. At the beginning of awareness level, teachers, are made aware of innovation through education and staff development. As teachers participate in staff development activities, they begin to collaborate with other teachers and feel more comfortable with technical and pedagogical aspect of the change (Joyce and Showers cited in Marlow and Minehira, 2006). They found that in effective schools, there is a 'coaching environment' where teachers work as one another coaches in implementing change. In this way a teacher have a real reason to work together. As teacher collaborate and comfortable with the new curriculum, more teachers begin to change their practice forming a "critical mass". After these stages, the curriculum change is fully accepted and becomes institutionalized in the organization. It becomes integrated with other curricular areas and it is tailored as it is evaluated. Failure of any of these stages can affect the success of full implementation.

According to McNeil (1996:24) often teachers are reluctant to implement the newly planned curriculum as suggested in guidelines because they are constrained by lack of time and heavy teaching loads, and they might perceive a resistance to change from parents, peers, or principal. Even if others are not actually opposed to teachers implementing a new curriculum, the anticipation of resistance might be enough to preclude innovation.

For effective implementation of the curriculum to occur many teachers will need to experience skill training workshops, staff development and experience sharing program with each other. Regarding this Pratt (1980:430) suggests that

Teachers will be unequipped to implement curriculum change if they lack the necessary expertise. They must have a competent grasp of subject matter and of

the approach to adopt it. Development of this expertise often requires specifically designed in-service training. With out such training, teachers are likely to continue what they have done in the past with at most a few surface changes

Currently, education has been growing rapidly due to the expansion of information and explosion of knowledge at alarming rate with the invention of new technology. Thus, to get teachers to implement the newly designed curriculum, it requires a paradigm shift. Cognitive Coaching model of getting teachers “up to speed” is very important. In order to go with technology, teacher need continuing professional development or staff development with in the education system; so that they will develop different views of curriculum, teaching style (method of teaching, model of teaching), knowledge and attitude (Ornstein and Hunkins, 2004).

Teachers must utilize the available materials, resources and equipments in order to have effective teaching- learning processes in classroom. For planning, preparing and presenting lessons in classroom teachers need syllabus, textbooks and teachers’ guide as well as reference books. Moreover, instructional materials like teaching aids and stationery materials are also necessary. If teachers do not have access and motivation to employ such materials adequately, it is likely to say implementation of the curriculum will not be materialized effectively. Furthermore, Teachers use appropriate instructional methods. On this line, Yalew, E. (2004, 18) describes as:

In any setting of school system, teachers play a paramount role in student learning. No matter how good the curriculum may be and how well it is organized and whether or not teaching materials are available, ultimately the quality of education rests mainly on the methodology of instruction employed by teachers.

The role of teachers, therefore, is decisive and extensive for effective implementation of curriculum. However, the absence of knowledge, attitude, interests, motivation and satisfaction of teachers has a great influence to accomplish their task properly.

2.3.2.3. The Role of Students

One of the human factors that influence implementation is students. Posner (1995: 192) remarked that “the extent to which students possess academic skills and background knowledge is a major determinant of the success or failure of curriculum”. Fullan (1991) further mentioned that students participation in the design of new curricula determine the success or failure of it because implementation compromises a change in the role relationship between teachers and students.^{1,1}

Students should actively participate in the school where the curriculum actually put in to practice. Their active participations have been realized in the school when they are motivated, interested and have positive attitude towards learning the specific subject matter in classroom. Concerning this, Ornstein and Hunkins (2004:321) suggests that:

Just as 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 curriculum activities planned, they are not going to be motivated to participate or learn. Ideally we want students to react with heightened interest, with enthusiasm.

However, if the students are discouraged and dissatisfied, they will not actively involve in the learning. In supporting this statement, McCluskey et al (2001) states that students who have the intelligence or talents to do school tasks do not succeed because they perceived the educational curriculum irrelevant, which consequently leads them to feel bored, discouraged, and unproductive.

2.3.3. Factors Related to School Organization

The school is the main place where the designed curriculum can be operationalized. This school must be well organized in order to be suitable for proper implementation of the proposed syllabus. The school has been organized and structured in terms of resources, finance, human, materials, buildings (classrooms, offices, library, laboratory, etc) and administration. If there are absence of financial support, insufficient supply of materials and equipments, and lack of good administration support in the school, it is true that curriculum implementation will be hampered.

2.3.3.1. Absence of Finance

Many theorists agree that the schools' efforts to implement the newly designed curriculum shall be affected by the shortage of financial input. With this regard, Ornstein and Hunkins (2004:303) stated that "*With out adequate financial support, efforts to get a program going district wide will fail*". Financial support for the school has various advantageous. Money is required for materials and equipment to institutionalize the new program. Money is also necessary to provide often overlooked human support for the implementation effort. In educational innovation, providing incentives for teachers are important to motivate them so that they will do their tasks effectively. According to House as cited in Pratt, D. (1981: 441), the teacher's perception of the reward

system is a critical variable in educational innovation. One cannot deny that for incentives or rewards money is needed. Teachers and Professionals should be paid for their extra efforts. Thus, the school needs enough money so as to implement the curriculum effectively. However, involvement in curriculum change and implementation solely for absence of financial resources only contributes minimum effort to the venture. Thus, it makes school less innovative.

2.3.3.2. Insufficient Supply of Materials and Equipment

The availability and adequacy of materials, equipments and facilities in the school climate are the most powerful variables to be considered as factors pertinent to the school organization. It is difficult to think the effective implementation of a curriculum in the absence of materials, equipments and facilities. These resources help the teacher to facilitate the teaching-learning process because they assist him/her to plan the instruction properly, select and organize methods and learning activities.

The success of curriculum implementation is often restricted by lack of facilities, materials and equipment. Some research works in Ethiopian school indicate that lack of classroom facilities, lack of instructional and curricula materials, shortage of books in the library etc have a great impact on the effectiveness of its implementation (Solomon, A., 2000, Akalu, C., 2001, Amare, A., 2006).

As Pratt as cited in Solomon, A. (2000:29) expound it one of the major factors in successful implementation of the innovation is accompanied by useful, high quality instructional materials. A school's physical conditions can have an influence on the teaching and learning. It should be furnished with different materials like chairs, desk, tables, boards, various instructional materials, curricula materials, well organized library, etc. When space and other resource allocation are fulfilled, the school environment could be conducive to implement the curriculum effectively. In contrast, Vernspoor as cited in Solomon, A. (2000: 30) suggests that the unfavorable environment and the scarcity of resources put at risk the capacity of developing countries to provide quality of education. Though instructional materials help students to develop their cognitive abilities, to actively involve in instructional process and broaden their experience, and also they enhance clarity of message, simplify concepts and principles, different studies conducted in developing countries confirm that teachers do not have the necessary instructional materials at their disposal.

2.3.3.3. Administrative Support

The successful implementation of curriculum is not only relied on financial and material support, but also good relationship of the school community, well administration in the school and collaboration efforts of the involved parties are essential component. In supporting this Ornstein and Hankins (2004: 303) suggest that “*a trusting relationship must exist among all parties in the school especially between administration and teachers. As implementation is a collaborative and emotional effort, peer support is vital for effective implementation*”. In fact, it is not an individual activity; many hands need to be put together for implementation to be successful. Hence it is the responsibility of Administrators to coordinate the collaboration effort. McNeil (1996: 244) indicates that:

School administrators are viewed by sociologists as persons in the middle with little possibility of being primary advocates for major curriculum change. In the formal organization, they may maintain equilibrium among different forces. When they are aware of and sympathetic to change, the innovation tends to prosper. In contrary, when administrators are uninformed, apathetic, or hostile, an innovation tends to remain outside the school. Hence implementation is directly related to immediate administrative support.

Thus, the administrative bodies in the school such as the directors, the administrators, the unit leaders and department heads are also considered as immediate supporters for teachers' role in curriculum implementation. Without the support of school administration the chance for effective curriculum implementation is very low. Due to this, the school administrative bodies should be involved in or consulted from the very beginning at design of curricula programs to be executed in the schools in order to play their roles actively (Lewy, 1977; 71-72).

Besides the above responsibilities, Administration has organized. Continuing professional development or staff development for teachers in their school and/or others related institutions. Professional development has advantage for teachers to understand how curriculum is and how it is created. Ornstein and Hunkins (2004: 303) describe as “If teachers wish to have an influencing voice in curriculum development and implementation must have sophisticated understanding of concept of curriculum and how it is created”.

In order, to have professional development, one of the strategies is in-service programs. The program has been designed so as to be integrated into and supported by organizations with in

which they are designed to function. In-service program that work have resulted for collaboration efforts and have addressed the need of those who are to be affected by the new curricula (Ibid).

Education is needed for Human to acquire knowledge, skills and attitude of something and it is also a labor intensive field rather than eliminating the need for human services. So, it requires teachers more than machines. Hence, a key to educational change must include staff development because curriculum innovations have been dynamic. Staff development is now a central focus in successful curriculum implementation (McNeil, 1996: 254). Therefore, in order to have effective staff development for practitioner, the school administration must arrange it properly. However, absence of cooperation among school teachers, principals, students and administrative staff and lack of technical support of administration can hinder curriculum implementation.

Generally, there are a number of factors that influence the implementation of curriculum. The nature of change, the attitude, ability and role of teachers, principals, and students, absence of finance, insufficient supply of instructional and curricula materials, lack of well equipped facilities, lack of staff development or in service training, insufficient time and lack of personal support appear to be the main potential factors identified in the literatures which hinder the successful implementation.

2.4. Curriculum Evaluation

Curriculum evaluation is essential for curriculum development, implementation and maintenance. People do evaluation in order to make decision whether the intended curriculum to be accepted, changed or rejected. They must realize as decision makers, it is not only done at the end of the year of teaching, but also at various point throughout the development and implementation of the program (Ornstein and Hunkins, 2004).

Educators define Curriculum evaluation in their own views. There is disagreement how defined evaluation. Some consider evaluation and assessment are synonymous. Others consider evaluation solely to the activity in which people make value judgment in reference to a person, product and process. These value judgments are based on data collected. Whereas, assessment refers to only data gathering process aimed at how much students has learned as a result of teaching and experiencing the curriculum (Tanner, 2001 in Ornstein and Hunkins, 2004).

Evaluation of curriculum is different from monitoring, appraisal and assessment. It defined as determining the quality of the curriculum through systematic study, collecting data, analyzing, discussing and reporting evidence which allows value judgments to be made in order to inform decision maker.

Evaluation involves three things such as outlining clear purposes, gathering evidences and judgment. It can be seen, therefore, as continual cycling goal settings, data collection and analysis, change etc. Thus, it should be seen as integral part of curriculum development.

Curriculum can be evaluated for two reasons. On one hand, for the purpose of accountability that demonstrate quality, on the other hand, for the purpose of development in order to improve the quality. It also serves as to identify strength and weakness of the curriculum before implementation and the effectiveness of its delivery after implementation (English and Harries, 1992).

2.4.1. The Difference between the Terms “Curriculum Evaluation” and “Curriculum Implementation Evaluation”

Since this particular study is focused on the evaluation of implementation of the syllabus, it is necessary to make clear the difference between curriculum evaluation and curriculum implementation evaluation so as to hold the research under the study. These two terms create some confusion in educational research related to curriculum.

Michael Screven in Ornstein and Hunkins, (2004:338) makes a clear distinction between the two terms. The aspect of curriculum evaluation is described as intrinsic evaluation. It refers to the study of curriculum design and development as a whole. Mainly, curriculum evaluation focuses on the inherent characteristics such as worth of goals and objectives, appropriateness of the content and types of learning activities. It also focuses on the accuracy, coverage and significance of content (Marew, 2000:52). In short, it is determining an evaluation of the adequacy and significance of curriculum anticipations. Generally, intrinsic evaluation requires some form of philosophical analysis.

However, curriculum implementation evaluation focuses on synonymous with pay-off evaluation or empirical evaluation which examining the extent to which the planned curriculum is put into

action as intended. It centered on usually short-term effects of the curriculum that are extent to which objectives were achieved and effects on parents, students, teachers and administrators (Screven in Ornstein and Hunkins, 2004: 339). Thus, this evaluation draws the most attention from educators. For instance, Carl, E.A. (1994:91) gives its definition as “By implementation evaluation is meant evaluation of extent to which curriculum anticipation become reality”

According to Pratt, D. (1980: 412), In Evaluation of implementation attempt is made to focus on the following questions.

- Is there a strategy and time table for implementation?
- Are roles and responsibilities clearly defined?
- Are resources and incentives available to users?
- Is the implementation strategy realistic?

Thus, implementation evaluation can answer these questions in educational settings. This implies curriculum implementation evaluation is a comparison of curriculum realities (implemented contents, instructional actions and learning outcomes) against anticipation (planned contents, instructional action and learning outcomes). It is mainly pertinent to examining the strategies and action undertaking in implementation of the curriculum in school.

The two concepts, curriculum evaluation and curriculum implementation evaluation are distinct, but they are interrelated. They are distinct because, as indicated before, curriculum evaluation is concerned with internal characteristics where as curriculum implementation evaluation is concerned with the extent to which the practicality of the plan occurs as intended. Again, they are interrelated because the result obtained through each of them can be used to modify or change the intended curriculum.

2.5. Mathematics Instruction

Mathematics which originated in response to society's needs to organize its transactions is still developing and expanding and curricula are being challenged by continuous change. The need for development in mathematics curricula is a feature of our changing world. Thus it became necessary to upgrade mathematics curricula and teaching methods in a way that encompassed the

modern concepts which enabled human society to evolve in to the nuclear, computerized and space age.

Mathematics is becoming increasingly significant due to the technological development of our era and becoming an inseparable part of contemporary life. Therefore, mathematics curricula have changed in terms of the teaching methods and the content in order to keep in line with these cultural and technical changes (Julie Sarama, 2004). The traditional view of regarding mathematics as the acquisition of computational skills is no longer sufficient or accepted. Every individual is currently facing social and economic problems that can be expressed in mathematical forms which require a more in depth knowledge of mathematics. Students particularly need to recognize and learn to understand the new mathematical knowledge so that they can establish the link between the content of the mathematics curriculum and applications in real life.

It is clear that mathematics, though one of the most important subjects in the curriculum of most countries, it is also commonly seen as one of the most difficult subject by most of students and adults (Mujis, D. and Reynolds, D. 2003). However, it plays major roles in a number of other scientific fields, such as physics, engineering and statistics (ibid). It is also important for students who attend in TVET institution because today technology is highly depends on the knowledge and skills of mathematics. On this line, McNeil pointed out:-

The programs in Vocational Education such as Auto mechanics wood work, metal shop, constructions, transportation and manufacturing allow for the application of mathematics and Science. The advocacy of these subjects in Vocational Education rests on the belief that further job opportunities will be relay on high technology (McNeil, 1996:336).

From this point of view one can recognize that mathematics subject is crucial for the TVET program. Particularly, in industrial, construction, water and other technological fields rigorous Mathematics should be needed.

By early 1960, a new trend in Mathematics instruction has been emerged so as students' acquisition of mathematics as a discipline. Two influences helped to set this trend in motion. The first influence reflected the need for competent and creative scientist. The other influence on the mathematics curriculum was the belief that every one could profit by acquiring knowledge of

mathematics as discipline. Briefly stated, the belief was the subject matter fields should introduce students to the general principles, concepts and laws that members of a discipline use in problem solving (McNeil, 1996).

For effective teaching mathematics the teacher can use direct instruction or whole class teaching technique. A number of conditions need to be met in order to maximize the effectiveness of the method. These are clear structure lesson includes starting the lesson by reviewing and practice what was learnt during the pervious lesson; the objectives of the lesson should be clear form the out set; the teacher should emphasize the key points during presentation; at the end of the lesson the main points should be summarized once again either by the teacher or preferable by the students themselves. Sub parts of the lesson can usually be summarized in the same way during the course of the lesson; repeating and revising general rules and key concepts in order to facilitate students understanding of the topics. Teacher would also do well to explain such demanding topics using a variety of media and methods in order to help students with different learning style. The others conditions are clear structured presentations, pacing, modeling, use of concept mapping and interaction and individuals /group practices (Mujis, D. and Reylonds, D., 2003)

In Mathematics instruction teachers design activities that link new content to students' prior experience and teach perquisites to critical tasks because students' background experience is the best predictor of their success (McNeil, 1996: 151). But, according to Sheila Tobias in McNeil (1996) identifies factors which make teaching mathematics and science subjects hard. These factors are: - 1/ the students lake of frame works and prior knowledge, 2/ demonstration often led to confusion instead of clarification, 3/ lectures moved fast, making it difficult for students to grasp the meaning of lessons, 4/ students need more time to think about the ideas, 5/ words that were used create some confusion and 6/ students were interested in why questions while teachers in how questions. In order to alleviate such problems the teacher use Varity of teaching methods when he/ she teach mathematics in classroom.

The NCTM has identified ten standards for mathematics curriculum development and evaluation. The documents standards also stated five aims of mathematics for students:- to learn to values mathematics, to learn to reason mathematically, to learn to communicate mathematically, to

become confident of their mathematical abilities and to be able to solve mathematical problems. The ten standards describe what mathematics instruction should enable the learners to know and to do from kindergarten to grade twelve. Out of ten the five standards describe mathematical content in the area of numbers and operations, Algebra, Geometry, measurements, analysis and probability. The other five standards concerned on the methods of mathematical instruction processes that are problem solving, reasoning and proof, communication, connection and representation. These five mathematical processes permeate everyday lesson in classroom (NCTM, 2000).

In the document identifies problem solving as the most fundamental feature of mathematics curriculum. These standards are already having a profound influence towards a new generation of mathematics curriculum materials (Eszter and Somfai, 2006). Problem solving approach is significant to understand and accrue the knowledge of mathematics. So, it is imperative to use different strategies towards problem solving and adapt different situation (Abele cited in El Khateeb, 2006). Basic knowledge of mathematics concepts, facts, procedures, heuristics, beliefs and other affective factors can contribute to students' ability to do problem solving. In addition, open discussion, questioning, guiding practice and journaling are essential components of problem solving.

Activating prior knowledge and using manipulative are two important issues in mathematics instruction. Mathematics teachers could do warm up activities that help students recall prior knowledge before going to the main lesson. Students also need to be engaged in problems of manageable but challenging level (Romberg and Wilson, D., 1995).

A variety of teaching methods can be employed by Mathematics teachers in order to enhance the students understanding of the lesson, these are deductive, discovery, demonstration etc. Much representation and concrete demonstration are necessary for the development of an internal view of mathematics. Students reach the stage of deductive reasoning after finding solutions for many problems in an inductive manner and in some cases there is also an important need for factual explanation, demonstration and inductive reasoning in upper levels (Eszter. and Somfai, 2006). An appropriately guided process of discovery ensures the freedom to make mistakes and leave room for students to develop their creativity and problem solving capability.

Teachers' subject knowledge and their management of pupils are strong features of mathematics teaching and they must use variety of teaching recourses and a broad range of teaching activities to maintain students' interest and motivation (Alexandra, H., 2003). For good quality of teaching mathematics, students learning environments should be favorable in terms of physical facilities such as the classroom adequately equipped with furniture, library, curricula materials, instructional materials and good school management.

To day continuous assessment is the most prominent technique to evaluate the students' performance and achievement in mathematics. Hence, the teachers utilize this method of assessment by giving them class work, homework, assignment, different tests and other assessment techniques. However, some studies indicate that one weakness in teaching mathematics in the school is less use of continuous assessment to promote learning mathematics. It is deeply needed to pay attention to use day-to-day assessment as a tool to raise achievement at all level further (Eszter, C. and Somfi,Z., 2006, Cheung, K, C., 1988).

Therefore, as the literature cited in this section indicate the teachers' ability to use different methods and continuous assessment techniques in the classroom and their knowledge and skills are decisive to implementation of the Mathematics syllabus.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

This chapter deals with the design of the study, research settings, model used in the study, sources of data, subject and sampling procedures, instruments of data collection and methods of data analysis.

3.1. Design of the Study

The major concern of this study as indicated earlier in chapter one is to evaluate the implementation of preparatory mathematics syllabus (Grade 11 and Grade 12) in Assela TVET institutions. To this end, a descriptive survey approach was employed as method of the study. This method is more appropriate to gather variety of data related to the study and to analyse the data in mixed type of quantitative and qualitative approach (Creswell, 2003: 128).

3.2. Research Settings

I focus on mathematics subject because mathematics was my major in undergraduate study and I have also taught the subject in high school and TVET College for fourteen-years. Thus, the knowledge and the skills required in the area would help me to see problems in teaching mathematics.

TVET institutions were selected because the preparatory mathematics syllabus has been implemented in the institutions. Hence, I wanted to evaluate its implementation in order to examine the problems encountered during implementation.

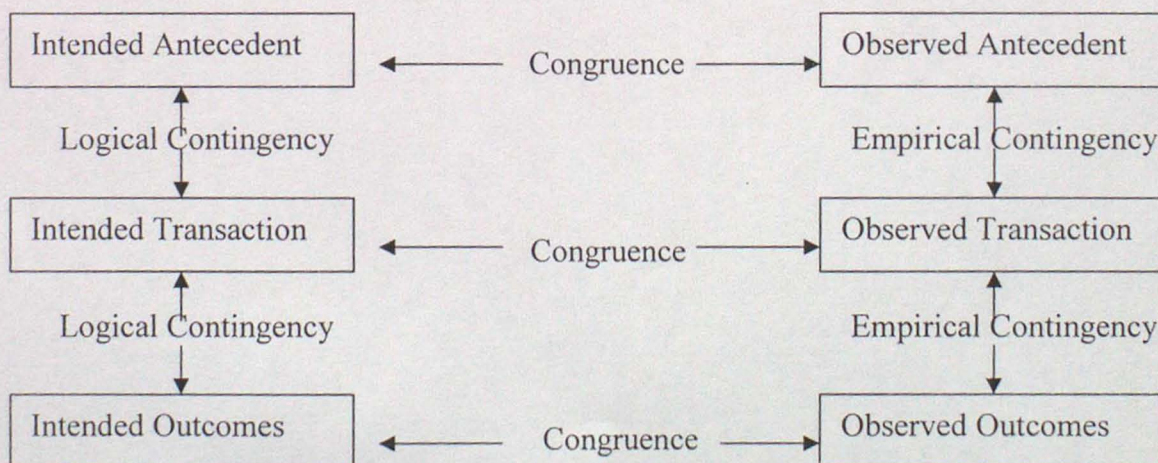
Assela TVET institutions are selected as the center of the study for three basic reasons. Firstly, I am familiar with the town since I have families and relatives in the area and educated there. Thus, it is hoped that I could secure adequate cooperation and assistance from respondents. Secondly, in Assela TVET institutions most of the TVET streams and field of studies were found. So, it is expected to get variety of information and thirdly, such study has never been carried out in Assela TVET.

3.3. Model Used in the Study

Stake congruence–contingency Evaluation or countenance of Educational evaluation model was selected and used because it is suitable to this particular study. Robert Stake (1967) produced the model in order to evaluate the curriculum in terms of the logical and empirical relationships between antecedents, transaction and outcomes. In using this model, the information obtained is analyzed in terms of the match and mismatch between what is intended and what is actually observed. The model is selected mainly because it gives due consideration for the Antecedent, Transaction and Outcome aspects of educational activities that are the concern of the current study about implementation of mathematics (see figure 1).

In his countenance of Educational Evaluation model, Stake suggested the use of a huge matrix of evaluation information. In the matrix, the row entries help to identify the many variables of instructional program to be evaluated. These entries are classified into the three categories (Antecedent, Transaction and Outcome). The column entries identify separate source of information: - teachers, administrators, counselors, supervisors, parents and so on. In the matrix, the sources of data classified into four parts such as intents, observations, standards, and judgments sources (see table 1). Obviously, information to fill the thousands of sub-cells of this matrix couldn't be obtained in any one of evaluation study. A principal task of the evaluator is to concentrate on variables that are related to the goals of his study, variables leading to decisions, and variables that are available within his budget from appropriate sources (Payne, 1974).

Figure 1:- A Representation of the Processing of Descriptive Data



Source: Robert E. Stake, "The countenance of Educational Evaluation" teachers college record 68 (April 1967): 533. Taken from Payne (1974): Evaluation of curriculum

Though there are a number of characteristics within the cells of the huge matrix classified under the three categories (Antecedents, Transactions and Outcomes), in this study, I selected the model because it is suitable to evaluate the implementation of curriculum in fidelity perspectives. Variables to be described and judged were also chosen. Thus, the variables such as teachers' and students' characteristics, curricular and instructional materials, requirements for teaching mathematics and the school organization are the main antecedent variables. Variables such as classroom environment, the teacher- student's interaction, teachers' performance of implementing variables suggested in syllabus were taken as transaction variables. In addition, the teachers' attitudes and students' perceptions towards the implementation of mathematics were taken as outcome variables.

Intents and observations are congruent if what is intended actually happens (R. stake, 1969 in Payne, 1974). Stake states that to be fully congruent the intended antecedents, transaction and outcomes must be identical with the observed antecedents, transaction and outcomes. In this particular study, the congruence of intents of the syllabus with the observation (implementation) should be examined. So, the study is only concentrate on the congruence aspect of the model. In this case, Intents consist of what are suggested or planned in preparatory mathematics syllabus and teachers' guide. The observations are the data obtained from respondents and documents regarding the implementation of the syllabus in Assela TVET institutions.

Table 1: Illustration of Data Possibly Representative of the Contents of Four Cells of the Matrices of a given Educational Program

Program Rational	Data for the Evaluation of Educational program			
	Intents sources	Observational sources	Standard sources	Judgments sources
Antecedents - Students characteristics - Teachers characteristics - school organization - curricular and instructional materials				
Transaction - communication flow - time allocation - sequence of events - Environment schedule				
Outcomes - teachers' attitude and students' perceptions				

Adapted from Robert E. Stake "the countenance of Educational Evaluation "Teachers college Record 68, No. 7 (April 1967), p. 529.

3.4. Sources of the data

In this study, the sources of data are:-

- a) Information provided by principals, teachers, students and department heads who are currently involved in implementing the preparatory mathematics syllabus in Assela TVET institutions.
- b) The actual classroom settings and the school environment.
- c) Documents (Educational policy documents, mathematics syllabus, teachers' guide and text books, and other related Educational statistical data).

3.5. Subject and Sampling Procedures

The target population of the study includes all mathematics teachers, principals, common courses department heads and all of the students at 10+1, 10+2 and 10+3 levels in three Assela TVET institutions (Assela Agricultural TVET College, Assela industrial, construction and water TVET College and Assela Business and Home Economics TVET institution (for 10+1, and 10+2 only)). These three TVET institutions are found in the town and all are government owned institutions. Totally, there are 8 principals, 13 mathematics teachers, 3 department heads and 2675 students (1937 of them are males and 738 are females (see tables 2&3).

Table 2:- The Number of Principals, Mathematics teachers and Common Courses Department Heads in each of Assela TVET Institutions

S. No	Population	Size of population and sample in each TVET				
		Assela Agricultural TVET college	Assela Industrial and construction TVET college	Assela TVET Business and Home Economics Institution	Total	Sample size
1	Principals	3	3	2	8	3
2	Mathematics teachers	4	7	2	13	13
3	Common courses departments heads	1	1	1	3	2
	Total	8	11	5	24	18

Regarding the sample selection of respondents, an available sampling technique was used to include all of the thirteen mathematics teachers who currently teach mathematics in Assela TVET institutions. They were selected to fill the questionnaire which was prepared to them. However, since it was difficult to interview all of principals, department heads and teachers, the researcher

was forced to select respondents for interview to manageable size. Accordingly, purposive sampling technique was employed to choose three principals, two common course department heads and four mathematics teachers in the TVET institutions under the study. Cohen and Manion (1994: 103) argue that in purposive sampling technique the researcher builds up a sample size that is satisfactory to his specific needs by picking the cases to be included in his sample. Ten percent of total number of students was selected from each occupation (field of studies) in the three TVET institutions. Totally, 268 students were selected to fill the questionnaire that was prepared for them (as shown in table 3 below). The selection in each occupation was carried out based on the systematic random sampling techniques.

Table 3:- The number of students with their occupation (field of study) and the sample size from each of Assela TVET institutions

No	TVET institutions	Streams	Occupation (field of study)	Number of students				Sample of Students			
				10+1	10+2	10+3	Total	10+1	10+2	10+3	Total
1	Assela Agricultural TVET college	Agricultural fields	Animal science	128	205	-	333	13	20	-	33
			Plant science	84	174	-	258	9	17	-	26
			Natural resources	84	187	-	271	8	19	-	27
			Total	296	566	-	862	30	56	-	86
2.	Assela Industrial, construction and water TVET college	Industrial fields	Auto mechanics	72	23	50	145	7	2	5	14
			General mechanics	27	32	25	84	3	3	2	8
			Electricity	53	27	25	105	6	3	2	11
			Electronics	51	24	28	103	5	2	3	10
			Machine tech.	30	-	-	30	3	-	-	3
			Garment	-	-	28	28	-	-	3	3
			Textile	29	-	-	29	3	-	-	3
		Construction	Building	55	-	-	55	6	-	-	6
			Construction	-	43	-	43	4	-	-	4
			Drafting	33	26	-	59	3	3	-	6
			Surveying	31	27	-	58	3	3	-	6
			Wood work	29	18	-	47	3	2	-	5
		Water	EMT	65	58	40	163	7	6	4	17
			RWSS	31	25	28	84	3	2	3	8
SSID	64		60	45	169	6	6	5	17		
Total number of students in A TVET College				570	363	269	1202	58	36	27	121
3.	Assela Business and Home-economics TVET Institution	Business	Accounting	56	49	-	105	6	5	-	11
			Secretarial science	35	39	-	74	3	4	-	7
			Information tech	54	38	-	92	5	4	-	9
			Marketing	56	43	-	99	6	4	-	10
			Purchasing	56	49	-	105	6	5	-	11
		Home Economics	Garment	27	17	-	44	3	1	-	4
			Cooking	21	19	-	40	2	2	-	4
			Hairdressing	22	9	-	31	2	1	-	3
			Hotel management	21	-	-	21	2	-	-	2
Total number of students in A TVET institution				347	264	-	611	35	26	-	61
TOTAL				1213	1193	269	2675	123	118	27	268

3.6. Data Collection Instruments

The concept of using multi-method approach in collecting data in a single study favored in recent trends for many authors. An increasing number of researchers are using multi-method approaches to achieve broader and often better results. Denzin in Teshome (1998:46), for example, argues that because each method reveals different aspects of empirical reality, multiple methods should be employed in every investigation. He explains that triangulating such methods as questionnaires, interviews, and observations build checks and balance to a study design. Therefore, to obtain adequate information for the study four types of data gathering instruments (questionnaire, observation, interview and documents) were employed.

3.6.1. Questionnaire

Two sets of questionnaire were prepared for teachers and students in connection with the research questions from preparatory mathematics syllabus, teachers' guide, related literatures and the researcher experience in teaching mathematics in TVET College.

3.6.1.1. Questionnaire for Mathematics Teachers

The questionnaire which was prepared for teachers contains five parts. The first part of the questionnaire was prepared to obtain background information about teachers, their activities, availability and utility of curricula materials, the communication existing among teachers, teachers and department heads, teachers and principals, and the major problems that have been affecting the implementation process. The second part of the questionnaire incorporates questions in the form of attitude scale to get information about teachers' agreement or disagreement with the implementation of mathematics syllabus in the TVET institutions using five point likert scales. Those questions were prepared using preparatory mathematics syllabus, teacher's guide and student's textbook as references. The third part of the questionnaire contains items that indicate the necessary inputs or requirement used for teaching mathematics. In this part, teachers were asked to rate the extent to which the institution provide the materials for them. The items in the fourth part specify the suggested methods of teaching in syllabus and the teachers were asked to rate how they used them during instruction. The final part of the questionnaire was prepared to collect data about the major factors that affect the effective implementation of the syllabus in the study area. Accordingly, a set of possible factors from literatures were listed under the table and the teachers were asked to put in rank order.

Four copies of questionnaire were distributed to four mathematics teachers in Woliso Industrial and Business TVET College for pilot test. Accordingly, each item was analyzed and unnecessary items, redundant and vague questions were deleted or made clear. Specifically for attitude part, the Guttman split- half method of measuring reliability was calculated to determine the reliability of the statements in attitude scale. To calculate this method of measuring reliability, the sum of responses of a teacher for each item was divided into the sum of odd items responses and the sum of even items responses. Thus, the correlation coefficient (0.95) was obtained (see appendix G). It appears to be a good indicator of the internal consistency of the items. After checking the reliability of the items in the questionnaire during pilot study, the copies of questionnaire were administered for thirteen teachers in Assela TVET institutions. Out of this number of copies of questionnaire twelve (92.3%) were filled and returned back from teachers.

3.6.1.2. Questionnaire for Students

The questionnaire was prepared to obtain information about students' attitudes toward mathematics learning, the use of assessment techniques by teachers, teacher and students interaction during mathematics instruction in the classroom and the classroom climate during teaching mathematics. The copies of questionnaire were distributed to twenty- students in Woliso Industrial and Business TVET College for pilot study. After examining the responses of the students in each item, questions which were too general made specific and clear, moreover some unclear and ambiguous statements were discarded and some other relevant questions were included. Finally, copies of questionnaire were administered for those selected students in each of the occupations in Assela TVET institutions directly by the investigator. The two academic vice deans, the principal in the TVET institution and the department heads of each occupation helped me in distributing the copies of the questionnaires to 268 students. Out of these copies of the questionnaires distributed to student respondents 236 (88.06%) were filled and returned back.

3.6.2 Observations

Two types of observations were made in the TVET institutions namely classroom observation and outside classroom observation.

3.6.2.1. Classroom Observation

An observation checklist which had lesson presentation variables in the classroom and observation rating scale regarding some instructional considerations were developed and used during classroom observations. The ideas used in the checklist (yes or no) and rating scale (frequently, rarely and not at all) arose from carefully studying the preparatory mathematics syllabus, the teachers' guide and student's text book. They were then pre-tested in Woliso Industrial and Business TVET College with two observers in one section at same time. The observers were one of the mathematics teachers who have B.Sc. in mathematics in the college and the researcher himself. The mathematics teacher was oriented how to conduct the classrooms observation. The reliability of the observation rating scale ought to be measured in order to determine its consistency. To measure reliability two or more observers can do observation at the same time and calculate the inter-rater reliability (Ary, Jacobs and Razavieh, 2002).

After we observed the classroom, the inter-rater reliability was calculated for the observation rating scale and it was found that 78 percent for the rating scale (see appendix H). This shows that there was a high degree of agreement between observers. Those items which were repeated and ambiguous were also refined for the final use.

For classroom observation, the four mathematics teachers in Assela Agricultural TVET College and the two mathematics teachers in Assela Business and Home economics TVET institution were taken and four out of six mathematics teachers were randomly selected from Assela Industrial, Construction and Water TVET College. Each of these ten teachers was observed twice in his classroom. Therefore, a total of twenty (20) lesson observations were made by the researcher.

3.6.2.2. Outside Classroom Observation Rating Scale

This observation was carried out in order to do inventory and to judge the adequacy of the instructional and curricula materials as well as the requirements needed to teach mathematics in the TVET institutions. In this data collection instrument the researcher used the terms adequate, inadequate and not at all to determine the status and the availability of the materials in the library, store and department head office. The rating scale contains the necessary teaching materials and teaching aids which were suggested in preparatory mathematics syllabus. In this observation, the

word adequate was used to indicate the materials are sufficiently available proportional to the number of students and mathematics teachers in the TVET institutions. In contrary, the word inadequate was used to describe the materials are not sufficiently available proportional to the number of students and mathematics teachers in the TVET institutions. The phrase 'not at all' used if the material is not totally available in the TVET institutions.

3.6.3. Interview

Two sets of interview questions were prepared namely; interview questions for mathematics teachers and interview questions for principals and common courses department heads in the TVET institutions. Interviews were conducted with sample mathematics teachers (four in number), the two vice deans in Assela TVET colleges and one principal in Assela TVET institution, and two common courses department heads in the colleges. All together nine people were interviewed. During interview sessions, the communication was held on with Amharic language between the interviewer and the interviewees in order to reduce the communication barriers. I was writing the necessary points on the field notes while I interviewing the respondents. However, since the interviewees were not willing to be recorded, I did not record the interview. After the data was collected through Amharic, the translation was done into English language with the help of second year MA student in English department in Addis Ababa University.

3.6.4. Documentaries

Best and Khan (1993: 191:193) discussed that documents are important source of data in many areas of investigation. That means documentary sources could serve for a useful purpose in offering information that is helpful in explaining social or educational practices. Thus, the education policy document, educational statistical documents, student mathematics text book, the syllabus, the teachers' guide, and the TVET system curriculum guide were used for the purpose of this study. These documents were used for drawing information about the number of teachers and students, class size; time allotted for mathematics teaching for each year in TVET institution and the suggested instructional guidelines in the syllabus; and to cross- check issues raised by participants.

3.7. Methods of Data Analysis.

The data gathered through the instruments namely questionnaires and observations (rating scale and checklist) were analyzed using percentage, mean and chi-square where as the data collected through interviews were narrated and quoted. For the sake of organization, the items of the instruments were grouped in to their own categories. Related items were treated together. Under each category the data collected through interviews were paraphrased and quoted. For the quotation the fictitious names were given for the respondents. In analyzing and presenting the data, the following procedures were employed.

The mean of each item in the observation sessions was calculated for the rating scale. Accordingly, the following rule is established by the researcher in order to determine the extent of teachers' instructional performance in classroom.

- If the mean is 1 up to 1.5, it indicate not observed
- If the mean is 1.51 up to 2.5, it indicate rarely observed
- If the mean is 2.51 up to 3, it indicate frequently observed

The teacher respondents were asked to their agreement or disagreement of the statements which expressed their attitudes on a five point Likert scale in the second part of questionnaire for teachers. The scale has the following numeric value. 5 = strongly agree, 4 = agree, 3 = undecided, 2 = disagree and 1 = strongly disagree. The mean of responses for each of statement was calculated and tabulated. These mean values are used to express the degree of agreement or disagreement of the teachers on the statements. When the mean value is above 3, it indicates teachers' agreement on the statement and when the mean value is below 3, it indicates teachers' disagreement on the statement.

The data collected through teachers' questionnaire about major hindering factors for the implementation of the preparatory mathematics syllabus was analyzed based on mean rank. The mean values of the responses of the teachers were calculated by adding all the ranks obtained from respondents for each items and dividing the result to the total number of respondents (12). Based on the obtained mean value, the mean rank was assigned to each factor. Thus, the lowest has the first rank and highest mean value got the last rank.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

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

The presentation, analysis and interpretation of the data obtained from the respondents were done both quantitatively and qualitatively under four major themes. These themes are: - the actual use of the instructional guidelines set in preparatory mathematics syllabus by mathematics teachers in the TVET institutions; the attitudes of teachers and students' perceptions towards the implementation of Preparatory Mathematics Syllabus in TVET institutions; the actual institutional and classroom environments for implementation of the syllabus and major hindering factors for implementation of the preparatory mathematics syllabus in the TVET institutions.

4.1. The Actual Use of the Instructional Guidelines Set in Preparatory Mathematics Syllabus by Mathematics Teachers in the TVET Institutions.

Curriculum implementation is the use of the intended curriculum or syllabus in classroom under the school settings. Thus, it is obvious that curriculum implementation is said to be successful if it is operated in the way it is planned (Derbessa, 2004). Therefore, in order to evaluate the effectiveness of implementation of the mathematics syllabus in Assela TVET institutions, the study examined the extent of teachers' use of guidelines suggested in the syllabus in terms of their instructional classroom performance, methods of teaching and assessment techniques. To this end, the data collected through the aforementioned instruments was analyzed as follows.

4.1.1. Teachers' Instructional Classroom Performance

Instruction is the means by which delivering the intended curriculum in the classroom. Johnson as cited in Derebessa (2004:26) defined instruction as "the interaction between the teaching agent and one or more individuals intending to learn". During instruction, teachers' primary responsibilities are the students whom they teach. Therefore, a teacher tends to entertain the designed curriculum in terms of the students learning in classroom. Thus, teachers' instructional

classroom performance is the best indicators of whether what is intended in the syllabus is implemented or not. In the syllabus different activities of teachers are suggested in order to perform by them. Tables 4&5 presents the data collected through classroom observation (rating scale and checklist). In these tables the suggested guidelines in preparatory mathematics syllabus and teachers' guide are listed. In table 4, each activities of the teacher were observed frequently if he did the activities three times or above and rarely if he did the activities two times or once. If the teacher did not perform the activity, it rated as not observed.

Table 4:-Teachers' Classroom Activities in Terms of Some Instructional Considerations

No	Instructional consideration	Rating scales						Total observed sessions		Mean
		Frequently (3)		Rarely (2)		Not observed (1)		N ^o	%	
	How often does the teacher	N ^o	%	N ^o	%	N ^o	%	N ^o	%	
1	Use variety methods of teaching and techniques in lesson presentation?	2	10	10	50	8	40	20	100	1.70
2	Encourage the students to participate in discussion?	2	10	13	65	5	25	20	100	1.85
3	Encourage the students to ask question which is not clear to them?	-	-	5	25	15	75	20	100	1.25
4	Ask questions to check their understanding of the lesson?	6	30	11	55	3	15	20	100	2.15
5	Use group work of students for collaborative learning?	-	-	6	30	14	70	20	100	1.30
6	Guide the learner during group work?	-	-	3	15	17	85	20	100	1.15
7	Go round to students in classroom in order to check their work?	9	45	11	55	-	-	20	100	2.45
8	Write important ideas concepts on black board?	18	90	2	10	-	-	20	100	2.9
9	Relate the mathematics lesson to students' real life situation or other subjects?	2	10	12	60	6	30	20	100	1.8
10	Give equal attention for all students in class room?	17	85	2	10	1	5	20	100	2.8
11	Give students prompt feedback?	2	10	14	70	4	20	20	100	1.9
	Grand mean		26.4	-	40.4	-	33.2	-	100	1.93

As can be seen from table 4, for item 1, 50% and the mean value 1.7 of the observation sessions confirmed that the majority of the observed teachers rarely used variety of instructional methods during lesson presentation. Regarding item 2, the mean 1.85 of the observed session indicated that the teachers rarely encouraged the students to participate in discussion and 75% of the observed sessions revealed that they did not encourage the students to ask questions regarding the concepts which are not clear to them in the mathematics instruction. But, only (25%) of the observed sessions indicated they rarely encouraged the students to ask questions, thus, the mean value 1.25 of the observed session implies the majority of the observed teachers did not encourage the students to ask questions about the concepts which is not clear to them. For the fourth item, the mean value 2.15 and the highest percentage (55%) of observed sessions indicated that majority of the teachers rarely asked questions to check the students understanding of the lesson.

For item 5, in 85% of observed sessions, the teachers did not use the group work method for collaborative learning. Here, the mean value 1.15 and the percentage 85% of observed sessions confirmed that the majority of the teachers did not use group work activities for collaborative learning. Moreover, most of the observed sessions (70%) indicated that they did not guide the learner during group work. However, during (55%) of observed sessions, most of them rarely moved round to students' seats in classroom in order to check their work.

For item 8, in most of the observed (90%), teachers frequently wrote important concepts or ideas on blackboard. But in item 9, the mean value 1.8 of observed sessions confirmed that most of the observed teachers rarely related the mathematics concept to the students' real life situations or other subjects in mathematics classroom teaching. For items 10 and 11, 85% of the observed sessions indicated that teachers frequently gave equal attention for all students in mathematics classroom teaching and in 70% of observed sessions; they rarely gave students prompt feedback to their work respectively.

A variety of teaching methods should be employed by Mathematics teachers in order to enhance the students understanding of the lesson. These are deductive, discovery, demonstration, problem solving etc. Much representation and concrete demonstration are necessary for the development of an internal view of mathematics (Eszter. and Somfai, 2006). However, the result of the data

presented in the table 4, revealed that the mathematics teachers rarely used variety of the teaching methods, rarely encouraged the students to involve in discussions, did not initiate them to ask questions, rarely checked whether the students understand the lesson or not, did not use any group work activity, rarely related the lesson to the students real life situation or other subjects, and rarely gave students prompt feedbacks for their work. But, they frequently wrote important ideas concepts on black board and gave equal attention for all students. Generally, the grand mean 1.93 of the observed sessions indicate that most of the observed teachers rarely performed the instructional considerations as set in preparatory mathematics syllabus in the TVET institutions.

Table 5:- Teachers' classroom observation activities result in terms of lesson presentation variables

N ^o .	Lesson presentation variables	Yes		No	
		N ^o	%	N ^o	%
	Did the teacher				
1.	Prepare weekly or daily lesson?	4	20	16	80
2.	Write lesson topic on the blackboard?	18	90	2	10
3.	Start the lesson on time?	1	5	19	95
4.	Specify the objectives of the lesson?	3	15	17	85
5.	Check the pervious homework?	6	30	14	70
6.	Revise the pervious lesson before starting the new lesson?	7	35	13	65
7.	Encourage the students to use the textbook in a classroom?	9	45	11	55
8.	Use the textbook for mathematics instruction?	19	95	1	5
9.	Give home work, class work and assignment?	75	75	5	25
10	Summarize the main points of the lesson?	2	10	18	90
11	Use instructional materials (teaching aids) in the classroom?	-	-	20	100
12	Allow the students to present what they have done in group?	-	-	20	100
13	Illustrate the lesson with more examples?	16	80	4	20
14	Properly use blackboard?	12	60	8	40
15	Manage the classroom effectively?	18	90	2	10
	Mean of percentage	-	44	-	56

Table 5 depicts that 80% of observed sessions indicated that the observed teachers did not prepare weekly or daily lesson plan and 95% of observed sessions confirmed that they did not start the lesson on the time. However, 90% of observed sessions indicated that they wrote the lesson topic on the black board before they start presenting the lesson. In the table, we see that 85% of observed sessions indicated that the teachers did not specify the objectives of the lesson to the students. In 65% of observed sessions, the teachers did not revise the pervious lesson before starting the new lesson in classroom and as (70%) of observed sessions indicated most of

them did not check whether the students did homework or not. Though, in (95%) of observed sessions, the majority of the observed teachers used the textbook for mathematics instruction, 55% of observed sessions indicated they did not encourage the students to use their textbook during mathematics instruction. The table exhibited that 75% of observed sessions indicated that teachers gave class work, home work and assignment for students in order to assess or evaluate their performance in mathematics whereas 90% of observed sessions indicated that they did not summarize the main points of the lesson. In addition, in all of the observed sessions (100%) the teachers did not employ teaching aids and did not allow the student to present what they have done in group in the classroom. Nevertheless, 80%, 60%, and 100% of observed sessions indicated the teachers illustrate the lesson with more examples, properly used the blackboard and manage the classroom effectively in the classroom respectively. Generally, the mean percentage (44%) of the observed sessions revealed that the teachers did the lesson presentation variables whereas the mean of percentage (56%) observed sessions showed that the teachers did not do the lesson presentation variables effectively in classroom.

As it is understood from both tables (4 and 5), the mathematics teachers did not use variety of teaching methods and instruction materials (teaching aids) in order to enhance the teaching - learning process of mathematics in TVET institutions. This is contrasted with the theory that teachers would do well to explain the demanding topics of mathematics using variety of media and methods of teaching so that they can assist students with different learning styles (Mujis, and Reynolds, 2003:7). Use of variety of teaching strategies accommodates various students learning styles and provides opportunities for students that will help them to be motivated and construct their understanding of the concepts involved. Starting the lesson with a review and practice of what was learnt during the previous lesson, for example, by check up homework, as this will permit the teacher to find out to what extent students have grasped the content of previous lessons, and therefore, to what extent this content will need to be taught. In addition, the objectives of the lesson should be made clear to students from the outset or through writing the objectives on the board or on a flip chart. During the lesson presentation the teacher needs to emphasize the key points of the lesson, which may other wise get lost in the whole (Mujis and Reyonolds, 2003: 6). However, in this study, the observations revealed that most of the teachers did not effectively employ the above ideas during mathematics instruction in the classroom.

4.1.2. Teachers' Use of Suggested Teaching Methods in the Syllabus.

Teachers have to use different methods of teaching in order to enhance the students' knowledge, skills and attitude to specific subject matter. According to Aggarwal (1997:87), "It is absolutely wrong to think that true education is acquired from book alone. There are other methods and sources which are more helpful in demanding true knowledge. 'Chalks and talk' lesson are not very useful". In preparatory mathematics syllabus (Grades 11 and 12) different methods of teaching have been suggested so as to teach the mathematics topics and sub topics. In table 6 below, the teaching methods are listed and the teachers are asked to rate the extent of their use in terms of frequently, rarely and not at all used.

Table 6: - Use of Teaching Methods and Strategies by Teachers in Their Classroom

S. No.	Suggested teaching methods and strategies	Teacher respondents = 12									
		Frequently		Rarely		Not used		Invalid missed		Valid total	
		No	%	No	%	No	%	No	%	No	%
1.	Explanation / Lecture	12	100	-	-	-	-			12	100
2	Discussion	3	25	9	75					12	100
3	Group work	-	-	2	16.67	10	83.35			12	100
4	Demonstration	-	-	6	50	6	50			12	100
5	Dialogue	-	-	7	58.3	5	41.67			12	100
6	Questions and answer	9	75	3	25	-	-			12	100
7	Guided discovery	3	25	2	16.67	7	58.33			12	100
8	Deductive approach	4	33.3	5	41.67	3	25			12	100
9	Problem solving	1	8.33	3	25	7	58.33	1	8.33	11	91
10	Written reports (students' presentation in class)	-	-	4	33.3	7	58.33			12	100
11	Application	3	25	5	41.67	4	33.33			12	100
12	Proof and reasoning	2	16.7	6	50	4	33.33			12	100
13	Project work	-		4	33.33	7	58.33	1	8.33	11	91.7

As can be seen table 6, all of the teacher respondents (100%) replied that explanation or Lecture method of teaching were frequently used to teach mathematics and 75% of them reported that they frequently used question and answer and they rarely employed discussion methods of teaching during mathematics instruction. Most of the teacher respondents (83.3%) replied that

they did not use group work activity. In addition, 58.8% of the teacher respondents reported that they rarely used dialogue method and did not use written reports (student presentations in class), problem solving, project work and guiding discovery teaching methods. Half of the teacher respondents (50%) rarely used demonstration and proof and reasoning methods of teaching as well as 41.7% of them confirmed that they rarely used application and deductive approach methods of teaching in mathematics classroom.

During the interview sessions four of the mathematics teachers in the TVET institutions were asked about the method of teaching they used as suggested in the mathematics syllabus. The first interviewee, who has taught mathematics in Assela TVET institution (for 10+1 and 10+2 level) for four years, Biruk, has the following to say:

I only used discussion and explanation methods of teaching during mathematics instruction in classroom. But, I did not use all the methods of teaching set in the preparatory mathematics because, on one hand, I do not have enough time to finish the contents of preparatory mathematics text books for TVET, on other hand, I did not have training how to apply the methods in teaching preparatory mathematics in TVET (Mar. 10, 2008).

Biruk only used Lecture and discussion method of teaching since his intention is to finish the portion on the given time for mathematics instruction. Similarly, Gudeta in Assela Industrial and Construction TVET College who has six years of service in teaching mathematics said:

I employed only lecture or explanation method of teaching because if I used different methods of teaching, I would not have finished the contents within the allotted time. Though the students are supposed to take the preparatory mathematics, there is no preparatory mathematics syllabus in this college. Due to this reason, I don't have the syllabus at hand. So, I don't know what kind of teaching methods are found in the syllabus (Mar. 11, 2008).

Gudeta described that he only used lecture or explanation method of teaching to teach the mathematics in the College because his target is to finish the portion on the given time. In addition, because of unavailability of the syllabus in his hand, he didn't know what kind of teaching methods suggested in the syllabus. Thus, he has been teaching based on his own previous experience only, and not according to the guidelines of the syllabus. The third mathematics teacher in agricultural TVET College who has eight years of service in teaching mathematics, Merga also said:

Most frequently, I used lecture and discussion methods. In order to use a variety of teaching methods as suggested in the syllabus, I think, the school environment should be

conducive. But, in our college the students' academic background knowledge in mathematics, their willingness to learn, little attention was given by the college officials and insufficient supply of instructional materials don't encourage me to teaching mathematics with the variety of method of teaching(Mar. 12, 2008).

Contrary to the above three teachers the fourth mathematics teacher Mebratu in Assela Industrial and Construction TVET college said:

I frequently used variety of teaching methods suggested in the syllabus; but, I did not use group work in classroom because it is time consuming activity (Mar. 13, 2008).

From the above data, we can recognize that most of the teachers participants in the study frequently used explanation or lecture and question and answer methods of teaching, but the other methods such as demonstration, deductive approach, dialogue, proof and reasoning, application, problem solving, written reports (students presentation), project work, and group work which are suggested in the syllabus were overlooked. The teachers were asked about the reason why they did not use variety of teaching methods to mathematics teaching. They responded that lack of time, very low students' background knowledge of mathematics, the students unwilling to learn mathematics, lack of training for teachers how to implement the syllabus, shortage of curricula and instructional materials and unfavorable conditions of the school.

The preparatory mathematics syllabus suggested that "By means of using variety of teaching methods efforts have to be made to motivate the students' interest in the subject" (MOE, 2000). In the syllabus, the teaching methods classified in to three categories such as the teacher - centered method, the student-centered method and the teacher-student-centered method. But most of the mathematics teachers in the TVET institutions used lecture or explanation and question and answer which are categorized under teacher- centered method. Thus, the mathematics teaching- learning process is teacher-centered in the TVET institutions.

4.1.3 Teachers' Assessment Techniques

Teaching depends on assessment because sustained teaching relies on the ability to analyze how students are learning and to diagnose what they need. At the end of the lesson, a teacher evaluates what took place by focusing on concepts that students have learned, knowledge they have acquired and skills they have displayed. Preparation also relies on the critical insight into individual students' attainments (Cullingford, 2004:150). Thus, assessment is inevitable. In the

preparatory mathematics syllabus different types of assessment techniques are suggested such as class work or class activities, home work, group or individual assignments, oral questions, tests and exams. The syllabus also suggested that “Evaluation of students’ performances have to be performed continuously. This can be done both orally and in writing short tests” (MOE, 2000:7).

Table 7: Students’ Response on Extent of Teacher’s Use of Assessment Techniques

		Alternatives	N ^o	%
1.	How often your mathematics teacher gives you class work or class activities?	A. Always (5)	63	26.7
		B. Frequently (4)	33	13.9
		C. Sometimes(3)	88	37.3
		D. Rarely (2)	37	15.7
		E. Never(1)	15	6.33
		Total	236	100
2.	If you response for question number [1] is rarely or never which of the following reasons?	A. shortage of Textbooks.	31	56.6
		B. the teachers is not interested to give class work	11	21.1
		C. Other reasons	10	19.2
		Total	52	100
3.	How often your mathematics teacher gives your home work?	A. Always (5)	90	38.1
		B. Frequently (4)	37	15.7
		C. Sometimes(3)	79	33.5
		D. Rarely (2)	30	12.3
		E. Never(1)	-	100
		Total	236	100
4.	How often your mathematics teacher does give you group or individual assignments?	A. Once per week	29	12.9
		B. Once per month	36	15.3
		C. Twice per month	49	20.8
		D. Once per semester	102	43.2
		E, Never	20	8.4
		Total	236	100
5.	The mathematics teacher assesses your performance based on?	A. continuous assessment	58	24.6
		B. mid- exam and final exam	147	62.3
		C. only final exam	11	4.7
		D. Any other way	20	8.4
		Total	236	100
6.	How does your mathematics teacher know whether or not you understand the lesson he teach in class00room?	A. by asking questions one by one	45	19.07
		B. By waiting for yes answer	39	16.53
		C. By asking “Are there questions?”	81	34.32
		D. By checking class work and home work	52	22.03
		E. others	19	8.05
		Total	236	100

In the preparatory mathematics syllabus different types of assessment techniques are suggested like class work, Homework, assignments, class activities, tests and oral questions as well as final

examination in semester. In the syllabus, it is also indicated that evaluation of students' performance should be carried out continuously. Here, it is scrutinized that how the mathematics teachers use the assessment techniques as suggested in the syllabus during the implementation process. To this end, the collected data about assessment techniques is presented in above table 7.

Table 7 shows that the extent of teachers' use of assessment techniques as perceived by students. In this table, 88(37.98%) of the student respondents replied that the teacher sometimes gave them class work and class activities. Totally, 52 (22.01%) students' participants in the study reported that teachers rarely gave and did not give class work or class activities. Out of those students who replied rarely or never, 31 (59.62%) of the respondents said that shortage of textbooks in the classroom restricted the teacher to give them class work or class activities. However, 90 (38.14%) of the students respondents replied that the teachers always gave homework for the students, 79(33.47%) of them indicated that the teacher sometimes gave the homework and 67 (27.99%) of them replied the teacher frequently and rarely gave home work for the students. Therefore, relatively large number of student respondents (38.14%) confirmed that the teachers always gave home work for them.

Regarding group or individual assignments, most of the student respondents 102(43.22%) reported that the teacher gave group or individual assignments for the students once per semester. In addition, most of the students respondents 147 (62.29%) responded that the teacher assessed or evaluated the students performance based on mid and final examination only. But, some of them 58 (24.57%) said that the mathematics teacher assessed the students performance based on continuous assessment. From this data, one can see that most of the teachers did not employ continuous assessment technique to evaluate the student's performance. 81(34.32%) of the student respondents answered that the teacher knew that students understand the lessons during mathematics instruction by asking them "are there any questions?"

Hence, it can be asserted that, mathematics teachers did not use the assessment techniques indicated in the syllabus. Thus, the result of the study revealed that one of the weaknesses of teaching mathematics in the TVET institutions is the absence of continuous assessment to promote learning.

During interview sessions, the four Mathematics teachers were also asked about the assessment

techniques they used by way of evaluating the students' performance in mathematics subject. Accordingly, Biruk said:

Still I did not use continuous assessment to evaluate students performance because the class size is large, and the allotted time is not sufficient to check and correct the students work continuously. Moreover, students did not have adequate mathematics reference books in the library so as to do the given assignments properly. But, I evaluated their performance using only mid-semester examination and final examination in a semester (Mar. 10, 2008).

Biruk complains that the number of students in class, the shortage of time and inadequate mathematics reference books in the library did not permit him to conduct continuous assessment. In continuous assessment techniques, it needs variety of source of information about the students' knowledge, skills and activity in performing a task. Sources of information include general impressions as well as written tests, pupils' self assessment as well as rating scales, marking course work as well as checklists, assignments as well as practical tests. One of the weaknesses of continuous assessment is time consuming (Cullingford, C. 2004: 154). Continuous assessment needs ample time and comfortable classroom environment. Due to lack of time and unfavorable condition of classroom environment many teachers turndown to assess the students' performance continuously.

Mathematics teachers in Assela TVET are reluctant to employ continuous assessment technique. According to Gudeta, a mathematics teacher at Assesla Industrial and Construction TVET College, for instance, has the following to say:

I assessed students understanding of mathematics during mathematics instruction by using class work, homework and assignments. But, I did not always check student's work and did not give them feedback, because; in addition to teaching mathematics I have worked as registrar of the college (Mar. 11, 2008).

Merga, in Assela Agricultural TVET College, has also the following to add:

I only evaluated the student's performance at the end of a semester with final examination. However, I sometimes assessed student's performance in mathematics by using home work, class work and assignment (Mar. 12, 2008).

Merga explained that he was not following the guideline suggested in the syllabus. He only evaluated the student performance at the end of the semester by final exam. But, Mebratu, in Assela Industrial and Construction TVET College, said:

In order to assess the students understanding and ability of mathematics, actually I used oral questions, class activities, class work, homework and assignment. Moreover, the students have been evaluated by mid- semester examination and final examination in semester. However, the problem was they did not perform well because they have not learned mathematics with interest (Mar. 13, 2008).

The interview results revealed that the mathematics teachers have not really used continuous assessment technique in order to evaluate the student's performance in mathematics. Because of large class size, insufficient time allotment to teach mathematics, poor facilities of the library, heavy workload insufficient supply of materials restricted them to use continuous assessment.

Generally, most of the mathematics teacher lack pedagogical skills of mathematics teaching in the TVET institutions because they use only lecture or explanation and question and answer method of teaching. They did not employ all the methods suggested in the syllabus and teachers' guide during mathematics instruction. Since some of the mathematics teachers were qualified with applied mathematics, they did not have the knowledge of pedagogical strategy to instruct the subject. These teachers did not learn pedagogy during pre-service training. According to the interviewed principal there was no in-service training in the form of work shop, seminars or panel discussion before the teachers implement the mathematics syllabus.

The result which revealed the low capability of the teachers in using variety of teaching methods to teach mathematics in the institutions is also substantiate by self report of the teacher them self. That is as can be seen in the table 19 on page 80, 75% of the teacher respondents have reported that they need some training to be given to implement the syllabus effectively. According to Russell (1998), pedagogical strategies that help the teacher to understand and support the mathematics progress of the entire range of students in the classroom.

The quality of day-to-day assessment and the use of different types of assessment information to evaluate the students' performance are unsatisfactory in overall of the three TVET institutions. Therefore, the results answer the first research question of the study. That is whether the mathematics teachers use the instructional guidelines set in the syllabus effectively in the TVET.

4.2. Attitudes of Teachers and Students' Perceptions towards Preparatory Mathematics Syllabus Implementation in the TVET Institutions

Attitude towards mathematics is defined as a general emotional disposition toward the school subject of mathematics. Generally, a positive attitude toward mathematics is valued; because, it is an important school outcome. It is often positively, although tightly, related to achievement and it may increase one's tendency to elect mathematics courses in high school and college and possible one's tendency to elect careers in mathematics or mathematics related fields (Haladyna et al, 1983). In this section the attitudes of teachers and students are examined based on the data obtained through questionnaires and teachers' interview.

4.2.1. Teachers' Attitudes toward the Implementation of Mathematics Syllabus

Teachers' attitude can be one of the factors that influence the implementation of the syllabus in the school. It is obvious that the attitude of individuals to a particular subject or issue emerges from their knowledge of the subject

One of the TVET institutions under the study, Assela Agricultural TVET College, is administered by the Ministry of Agriculture (MOA) and the other two institutions are administered by the Ministry of Education (MOE). The Attitudes of four mathematics teachers in agricultural TVET College and eight mathematics teachers in the other TVET institutions were measured using five points Likert scale. The number of teachers who scores above the mean of scores and below the mean of scores is presented in the following table 8

Table 8: - Teachers' Attitude by Institution Type

Category	Teacher respondents = 12		
	Agricultural TVET C.	The other two TVET Inst.	Total
Above mean	3 (75%)	4 (50%)	7(58%)
Below mean	1 (25%)	4 (50%)	5(42%)
Total	4	8	12
$x_0^2 = 0.686$ and $df = 1$			

x_0^2 - represents the observed chi-square and x_c^2 - represents critical value of chi-square

The mean for the twelve teacher's respondents is 34.16 (see Appendix I). Consequently, as shown in table 8, teachers who obtain a score above the mean and those who scored below the mean are distinguished in terms of the institution type they taught and forming a two-by-two

contingency table. From this table the chi-square X^2 was Computed (see Appendix I) and ($\chi_0^2 = 0.686$) is less than the critical value ($\chi_c^2 = 3.84$) at degree of freedom 1 and level of significant $P = 0.05$. Hence, there is no statistical significant difference between the attitudes of the teachers toward the implementation of preparatory mathematics syllabus in TVET institutions.

Table 9: -Teachers' Attitudes mean values

S. No.	Statements	Mean
1	Since low achiever students of GESECE admitted to TVET institution the preparatory mathematics syllabus is difficult for most students in TVET.	4.5
2	The aims and objectives of preparatory mathematics syllabus are appropriate	3.9
3	The aims and objectives of preparatory mathematics syllabus are compatible to aims and objectives of TVET program.	2.2
4	The preparatory mathematics syllabus and teachers guides are helpful to mathematics teachers in TVET to plan their teaching strategies.	3.8
5	The organization of the content and learning activities of preparatory mathematics syllabus is appropriate for teaching students in TVET.	2.6
6	The application of preparatory mathematics to other subjects (occupations) in TVET institution is significant.	3.25
7	Most of the contents of preparatory mathematics syllabus are beyond the ability of the trainees in TVET institution.	4.4
8	There are adequate exercises at the end of each topic of mathematics textbooks.	4.1
9	The preparatory mathematics syllabus contains variety of teaching methods that can maximize students' participation.	3.25
10	The major role of mathematics teacher in TVET should be to encourage students to memorize all definitions, theorems, rules and axioms instead of worrying about their proofs.	3.25
11	Students have too little background knowledge of mathematics in TVET.	4.5
12	Students in TVET institutions learn mathematics with enthusiasm.	1.75
	Grand Mean	3.46

As can be seen in Table 9, as the mean value 4.5 indicated that the majority of teacher respondents agreed on the statements that since low achiever students in EGSECE admitted to TVET institutions, the preparatory mathematics syllabus is difficult for most students in TVET and students have too little background knowledge of mathematics in the institutions. Moreover, as the mean value 1.75 indicated that the teacher respondents disagreed about students learn mathematics with enthusiasm in TVET institutions.

In this table, the mean value 3.9 of the responses of statement 2 show that the teachers agreed with the acceptability of the aims and objectives written in preparatory mathematics syllabus. However, the mean 2.2 of the responses for statement 3 indicate that the teacher respondents disagreed on the aims and objectives of preparatory mathematics are compatible to aims and objectives of TVET program. Though they disagreed about the aims and objectives of the syllabus compatible to aims and objectives of TVET program, most of them (mean value 3.8) agreed on the syllabus and teachers' guide of the preparatory mathematics help the teachers to plan the teaching strategies in TVET institutions. The mean 2.64 of the responses for statement 5 shows that the majority of the teacher respondents disagreed on the organization of the content and learning activities of the syllabus is appropriate for teaching mathematics to students in TVET institutions. But, as the mean value 3.25 for statements 6 and 9, the teacher respondents are agreed on the application of preparatory mathematics to other subjects (occupations) in TVET institutions is significant and the syllabus contains variety of teaching methods that maximize students' participation respectively.

The mean values 4 and 4.1 indicated that the teachers also agreed on the statements "most of the contents of preparatory mathematics syllabus are beyond the ability of the students in the TVET institution" and "There are adequate exercises at the end of each topics of mathematics text books" respectively.

Regarding statement 10, the mean value 3.9 indicated that the teacher respondents agreed on the major role of mathematics teachers in the TVET is to encourage the students to memorize all definitions, theorems, rules and axioms instead of worrying about their proofs.

Generally teachers' attitude measurement revealed that 58% of the respondent teachers show positive attitude to the implementation of preparatory mathematics syllabus and the grand mean 3.46 confirmed that relatively most of the teachers have positive attitude towards the implementation of the mathematics syllabus. However, 42% of the respondent teachers show negative attitude towards the implementation of the syllabus in the TVET institutions.

Certain Factors such as aptitude, achievements, sex, motivation teachers' quality and teaching-learning environment are known to correlate with attitude toward mathematics. Among these factors teachers quality, the learning environment and motivation are the most powerful causal

determinants of attitude towards mathematics (Haladya et al, 1983: 19-20). Since motivation is one of the determinate factors to attitudes of teachers, the mathematics teachers were interviewed about their interest and motivation of teaching the preparatory mathematics syllabus in TVET institutions. Accordingly, Bruk said

I am interested to teach the mathematics subject but the preparatory Mathematics syllabus is not appropriate for students in the TVET institution because its contents are vast and cannot be finished within allotted time. There is also no good administrative support for common courses in the TVET institution and there is a great discrimination between the main courses and common courses that is the principals and administrators give more attention for main courses but ignore the common courses. This leads me not to be motivated to teach the preparatory mathematics in the institution (Mar. 10, 2008).

Biruk seems disappointed because of a little attention given from the school community for mathematics teaching. In the same way Gudeta said:

I am very interested to teach the mathematics subject in this college, but students do not have good academic background knowledge in mathematics and they are also not curious to learn mathematics since they think that it has no usage. In addition, some of the main course teachers talk about teaching preparatory mathematics in the TVET institution is a waste of time and also principals do not give much attention for mathematics. These and other issues discourage me to be ill-motivated to teach mathematics (Mar. 11, 2008).

Both Biruk and Gudeta are interested to teach mathematics, but some conditions in their institutions do not initiate and motivate them to teach mathematics with passion. As they indicated the conditions are in such a way that students low background knowledge of mathematics, the students are less eager to learn mathematics, absence of good support from administration and little attention was given from the principals. Merga also expressed his feeling quite similar to that of Biruk and Gudeta. When he say:

----- when you look at the students academic status they are not up to their level even if it is presumed that they have completed grade 10. So, teaching preparatory mathematics syllabus in the TVET intuitions is unplanned and this create different problems during implementation (Mar. 12, 2008)

As the result, though the data in the table 8 revealed that it seemed teachers have positive attitude (58%), according to the interview result they were not motivated to teach preparatory mathematics syllabus in TVET institutions due to vast contents of the syllabus, low academic background knowledge of students, little support and attention from principals and administration and students lake of willingness to learn the preparatory mathematics syllabus.

4.2.2. Students' Perceptions toward Implementation of Preparatory Mathematics Syllabus.

It is believed that mathematics plays a crucial role for the development of science and technology. It has also wide application in real life situations. Hence, it has been given for pupils in any schools or educational institutions as basic. Despite this fact, some studies confirmed that many of the students do not perform well in mathematics and they have low interest to learn mathematics. Khalids' (2004) research about enhancing mathematics in Brunei Technical School indicated that mathematics is an intimidating subject to the students and they tend to shy away from mathematics as it represents unfamiliar and difficult territory. With this understanding, this study includes assessment of the students' perceptions toward the implementation of the syllabus. The data obtained from the students by asking some open-end and closed-end questions in the questionnaire. It reveals the case as follows.

Table 10: - Students' Perception towards Mathematics Instruction in TVET Institution

No	Item	Student respondents = 236		
		Alternatives	No.	%
1.	How much is your interest to learn preparatory mathematics in TVET institution?	A. very high	23	9.7
		B. high	58	24.6
		C. medium	69	29.2
		D. low	78	33.1
		E. Very low	8	3.4
		Total	236	100
2.	If your answer for question 1 is 'low' or 'very low' which of the following do you think the reasons? (more than one answer possible)	A. the syllabus is not design for TVET	30	33.3
		B. the subject is difficult	23	25.6
		C. poor teaching methods of teachers	37	41.1
		D. others	-	-
		Total	90	100
3.	Do you think the preparatory mathematics is appropriate for TVET?	A. Yes	48	20.3
		B. No	175	74.2
		C. Not sure	6	2.54
		In valid missed	7	2.96
		valid total	229	96.9
4.	How do you rate the application of preparatory mathematics in your occupation or other subjects in your institution?	A. very high	41	17.4
		B. high	24	10.2
		C. medium	128	54.2
		D. low	40	16.9
		E. Very low	3	1.27
		Total	236	100
5.	To what extent learning mathematics increase your knowledge and skills?	A. to large extent	151	64
		B. to some extent	73	30.9
		C. not sure	12	5.1
		Total	236	100
6.	Is there a group work practice in your mathematics class?	A. Yes	115	48.7
		B. No	121	51.3
		C. Not sure	-	-
		Total	236	100
7.	If your response of question 6 is 'yes'. What is your experience of group work?	A. Very good	41	35.6
		B. good	34	29.6
		C. Poor	34	29.6
		D. Very poor	6	5.2
		Total	115	100

Table 10 continued

No	Item	Alternatives	No.	%
8.	If your response of question 7 is 'poor' or 'very poor'. What is the reason do you think?	A. because mathematics teacher does not initiate me to work in group	3	7.5
		B. Group work is not convenient for mathematics	2	5
		C. I don't like group work	5	12.5
		D. It is time consuming	24	60
		E. Other	6	15
		Total	40	100
9.	How often does your mathematics teacher explain mathematics concepts clearly?	A. always	111	47.1
		B. Frequently	32	13.6
		C. Sometimes	66	27.9
		D. Rarely	22	2.3
		E. Not at all	5	2.1
		Total	236	100
10.	How often your mathematics teachers relate the mathematics knowledge to your real life situations?	A. Always	42	17.8
		B. Frequently	43	9.8
		C. Sometimes	125	53
		D. Rarely	39	16.5
		E. Not at all	3	1.3
		Invalid missed	4	1.6
		Valid total	232	98.4
11.	How often do you use the library to study mathematics?	A. always	16	6.8
		B. frequently	18	7.6
		C. sometimes	107	45.3
		D. Rarely	64	27.1
		E. Never	31	13.2
		Total	236	100
12.	If your response to question 11 is 'rarely' or never which of the reasons restricted you?	A. Teachers do not recommend us to refer additional reading materials.	35	23.2
		B. The textbook is sufficient	10	6.6
		C. do not have ample time	21	3.9
		D. Lack of experience to use library	5	3.3
		E. Poor facilities of the library	42	27.8
		F. Others	38	25.2
		Total	151	100
13.	To what extent did the teaching and learning of preparatory mathematics lessons motivate your interest in learn mathematics?	A. to large extent	18	7.6
		B. to some extent	65	27.6
		C. not at all	153	64.8
		Total	236	100

As can be seen in the table 10, relatively most of the respondent students [78 (33.1%)] answered that they have low interest to learn preparatory mathematics syllabus in the TVET institutions. Among the students who replied 'low' or 'very low' interest to learn the mathematics, (41%) of

them indicated the reason as poor teaching methods of teachers and 31.3% and 25.6% of the student indicated the reason as the syllabus is not design for TVET and the subject is difficult respectively. The majority of the students respondents 175 (74.2%) also confirmed that they do not think the preparatory mathematics syllabus is appropriate to the TVET program. However, 128 (54.25%) of them rated the application of the mathematics in their occupations is moderate. Students in the TVET institution believe that learning mathematics increase their knowledge to the large extent since the data shows as 115 (63.98%) rated learning mathematics in their institution increase their knowledge to large extent. Nevertheless, most of the students 125 (53%) reported that teachers sometimes related the mathematical knowledge to students real life situation. 107 (45.3%) of the respondent students indicated that they sometimes use the library to study mathematics. Out of the students who replied they rarely or did not use the library, they indicated the reason as poor facilities of the library 42(27.8%); lack of necessary mathematics reference books and the library is not regularly opened 38(25.2%); and teachers do not recommended them to read additional reading materials and they do not motivate them to use the library 35 (23.2%).

Though 121(51.3%) of the respondent students reported that there is no group work activity during mathematics instruction, 115(48.7%) of them reported that there is a group work activity in mathematics teaching learning process. Among the students who involved in group work activity, 41 (35.6%) of them have very good experience in group work.

Most of the student respondents 153 (64.8%) replied that the teaching and learning of preparatory mathematics did not motivate students' interest to learn mathematics in the TVET institutions. This implies that the feeling of the students towards the implementation of the syllabus is negative. The student respondents reflected their feelings about learning preparatory mathematics on the open – ended question. They wrote:

- *We did not have good feelings to learn the preparatory mathematics because the contents of the text book are wide and more of academic; the contents should not be covered with in the allotted time and the mathematics teacher always hurry to finish the contents of the suggested units. As the result, it is very difficult to us to understand the basic concept of mathematics;*
- *Learning preparatory (Grades 11 and 12) mathematics is very difficult in TVET institution;*

- *We demand to learn the mathematics to develop our knowledge of mathematics and we need mathematics in our daily life situations, but we haven't sufficient mathematics reference books in the library;*
- *Some of the students claim that Mathematics is not our major subject so that we should not have given attention to learn it as major courses;*
- *Learning preparatory mathematics in our TVET is so good but the teachers did not have systematic teaching technique to teach us and*
- *We required to learn the preparatory mathematics in order to pursue the degree level in our field;*

Generally, the data obtained from the students' questionnaire about their perceptions revealed that they did not have good feelings to learn the preparatory mathematics. The students have learned the mathematics subject more attentively when they are interested in the subject they learned. In relation to this, Schofield (1982) in his review of affective factors of mathematics learning indicated that teachers and other mathematics educators generally believe that pupils learn more effectively when they are interested what they learn. Aiken (1972) also suggested that students with positive attitude toward mathematics tend to like detail work, to view them as more persevering and self-confident. As Steen (1989) stated the ability of individuals to cope with mathematical demands of every day life – as employees, as parents, and as citizens – depends on their feelings toward mathematics conveyed by school experiences. Therefore, the continual actions should be directed towards creating and developing positive attitudes of students toward learning mathematics. Therefore, the result of this study answer the second researcher question about the attitude of teachers and students perceptions regarding to the implementation of the syllabus in the TVET Institutions.

4.3. Institutional and Classroom Environment for Teaching Mathematics

The implementation of preparatory mathematics syllabus in the TVET institutions will be effective if the institutions and the classrooms environments should be in a supportive atmosphere for the implementation process. It is true that the school climate will strongly influence classroom climate. In order to be effective the two need to be complementary (Mujis and Reynolds, 2003). Thus, to examine the favorability of the environments in the institution and classroom the following points are considered under this section. These are: - classroom climate, assessment of teachers' load and time allotted to cover the portion of the syllabus, the availability of the curricula and instructional materials for mathematics instruction, and communication and

support services provided by the principals, department heads and administration of the institutions and their mutual co-operation.

4.3.1. Classroom Climate

In this study, the focuses of the classroom climate are the availability of the required material resources, the number of students in classroom and the classroom management.

The classroom should be well furnished with the necessary requirements such as tables, chairs, blackboards, graph boards, and other instructional materials so as to have suitable facilities for the teaching- learning process. Instructional materials can be used to serve as catalysts for change in the whole instructional environment, to facilitate instructional process and to provide intellectual development. In addition, it can help the learners to provide a learning atmosphere in which they actively participate in the learning process (Heinich et al, 1999:24). In Table 11 the classroom materials are listed. These materials are important in the classroom for successful implementation of the syllabus in the institutions.

Table 11: Availability of Material Resources in the Classroom as Responded by Teachers

No.	Material Resources	Adequate		Inadequate		Not at all	
		No	%	No	%	No	%
1	Tables and chairs for teachers	6	50	2	16.7	4	33.3
2	Students' desks, armchairs and tables	12	100	-	-	-	-
3	Chalks	12	100	-	-	-	-
4	Duster	10	83.3	2	16.7	-	-
5	Color Chalks	2	16.7	7	58.3	3	25
6	Chalkboards	12	100	-	-	-	-
7	Notice boards	-	-	8	66.7	4	33.3
8	Graph boards	-	-	-	-	12	100
9	Instructional materials for mathematics teaching- learning process	-	-	1	8	11	92

As can be seen in table 11, there is no problem regarding student's desks, chairs and tables, chalks, Dusters and chalkboards because all of the teacher respondents replied that these materials are adequately available in the classrooms and 83% of the teacher respondents rated the availability of the duster is also adequate. Though 50% of the teacher respondent rated the availability of tables and chairs for Teachers are adequate, 33% of them rated there is no chair

and table for teachers in the classroom. Most of respondents (66.7%) and (58.3%) rated that the presence of the notice boards and color chinks in the classrooms are inadequate respectively. In addition, all of the respondent teachers (100%) and the majority of them (92%) rated that there was no graph board and instructional material in the classroom respectively.

Instructional facilities encompass materials through which teaching and learning process are carried on. They also include the physical environment of the classroom. The success of curriculum implementation is often restricted by lack of facilities, equipment and teaching resources in the school. As David Pratt (1980: 198) describe the major factors in successful implementation of innovation is, whether or not the curriculum is accompanied by useful, the absent of high quality of instructional materials. Here, the study revealed that there are adequate material resources such as desks, chairs, tables, duster and chalkboards in the TVET institutions. However, the lack of mathematics instructional materials in the classroom are very severe and thus, the mathematics teachers did not use variety of instructional aids in the teaching- learning process. During interview sessions, I asked the teachers about the reason why they did not prepare and use instructional materials. Most of them replied that less material support form the common courses department heads and administration, no pedagogical center in the institutions, shortage of time, and there is no appropriate place or office to prepare and amass the instructional materials. I also observed there is no pedagogical center in the institution.

The number of students in the classroom must be to manageable size otherwise it creates a problem for teacher to give class works to students and check their work, to control or manage the class, and to minimize the interruption in the classroom. Thus, the condition of the classroom climate is greatly affected by high number of students in classroom. It has been very difficult for teacher to manage the classroom when the number of students in one class is above the standards. According to Mujis and Reynolds (2003:37), one of the important aspects of classroom management is providing appropriate seating arrangements in class so that student should have sufficient space to work comfortably. There should be enough room between seats for the teacher to be able to move around the classroom without bumping into or disturbing students. Hence, the classroom should not be crowded. The following table 12 presents the data gathered form respondent teachers about the class size.

Table 13: The Classroom Management as Responded by Students

S. No.	Item	Student respondents = 236		
		Alternatives	No	%
1.	Does your mathematics teacher start the lesson on time?	A. Yes	68	28.8
		B. No	168	71.2
		Total	236	100
2.	If your response for question is 1 'No' what do you think is the reason?	A. Breaking time going on for too long	25	18
		B. Chaotic transaction from breaking time to lessons	33	23
		C. In effective management of students coming into the classroom	83	59
		D. Others	-	-
		Total	141	100
3.	Is there a disruption from outside or inside the classroom when you are learning mathematics?	A. Yes	96	41
		B. No	140	59
		Total	236	100
4.	If your response for question 3 'yes' what type of disruptions?	A. Head coming in to make announcement	5	4.5
		B. Teachers from other classrooms coming with questions		-
		C. students coming in with various requests	28	25.2
		D. To much noisy around the classroom	47	42.3
		E. ill- motivated students talk other issues in class during discussion	26	23.4
		F. If any other type of disruptions, please specify	5	4.5
		Total	111	100

As can be seen in the table 13, the majority of the participant of the students in the study 168 (71.2%) responded that the mathematics teacher did not start the lesson on time. The student respondents pointed out the reason why the teacher starts the lesson too late. Accordingly, 83(59%) of the student respondents reported that ineffective management of students coming into classroom, 33(23%) of them reported chaotic transactions from breaking time and 25(18%) of them reported breaking time going for too long. An obvious but often neglected element of effective classroom management is starting the lessons on time. Reasons for lessons starting late are various, among others prior lessons running late, breaking time going on for too long, chaotic

transactions from break time to lessons, and ineffective management of students coming in to the classroom (Mujis and Reynolds, 2003: 37). To alleviate these problems the teacher can keep disruption to a minimum by instituting a number of set procedures for dealing with lesson starts.

The majority of the respondent students (59%) confirmed that there is no disruption from outside or inside the classroom. But, 41% of them replied there is disruption. Out of these respondents, 42.3% of them indicated too much noisy around the classroom, 25.2% of them indicated students coming in with various requests and 23.4% of them indicated ill-motivated students talk each others different issues in class during mathematics instruction. Getzels (1969) as cited in Haladyna et al (1983:19) suggested that the classroom environment and group atmosphere may prove to be the most powerful indicators of student outcomes. Moos and David as cited in Mujis and Reynolds (2003) noted classroom is a microclimate with many characteristics. Among the many characteristics of classroom climate, the number of students in the class, the availability of material resources and the management of classroom are examined in this study.

The result of the study revealed that most of the conditions in the classroom are good but lack of instructional materials, lateness of the teacher to start the lesson on time due to ineffective management of the students coming to class and too much noisy around the classroom make some how the classroom is not conducive.

4.3.2. The Availability of Curricula and Instructional Materials for Mathematics Instruction

In addition to teachers' subject knowledge, teaching methods, and management of pupils which are strong features of mathematics teaching. Teachers must use variety of resources such as curricula materials and instructional materials so as to enhance students' interest, motivation and understanding of learning mathematics. In this part of the study, the extent of availability of curricula materials and instructional materials are examined. To this end, the collected data is presented and analyzed as follows.

Table 14: Availability of Preparatory Mathematics Curricula Materials in Assela TVET Institutions as Responded by Teachers

S. No	Item	Alternatives	Assela Agricultural TVET college		Assela cons. & Indu. TVET		Assela TVET institution		Total	
			No	%	No	%	No	%	No	%
1.	Is there a preparatory mathematics syllabus in your TVET institution?	Yes	-		1	16.7	-	-	1	8.3
		No	4	100	5	83.3	2	100	11	91.7
		Total	4	100	6	100	2	100	12	100
2.	Do you have the teachers' guide at your hand?	Yes	4	100	-	-	1	50	5	42
		No	-	-	6	100	1	50	7	58
		Total	4	100	6	100	2	100	12	100
3.	Are there sufficient textbooks for the student in the institution?	Yes	3	75	-	-	2	100	5	42
		No	1	25	4	66.7	-	-	5	42
		Note sure	-	-	2	33.3	-	-	2	16
		Total	4	100	6	100	2	100	12	100
4	Are there sufficient mathematics reference books in the library?	Yes	-	-	1	16.7	-	-	1	8.3
		No	4	100	5	83.3	2	100	11	91.7
		Not sure	-	-	-	-	-	-	-	-
		Total	4	100	6	100	2	100	12	100

As can be seen in the table 14, all of the mathematics teachers (100%) in Assela Agricultural TVET Colleges responded that there is no preparatory mathematics syllabus in their College. During interview session I also asked one of the mathematics teachers and vice academic dean of the College for the availability of the syllabus in the college. They confirmed the non-existence of preparatory mathematics syllabus in the college but there are excess of the teachers' guides. The figure in the table also confirmed their statement in which all of the mathematics teachers 4(100%) reported that they have the preparatory mathematics teachers' guide at their hand. In the college, 3(75%) of the respondent teachers responded that there are sufficient textbooks for the students. But, all of the teachers 4 (100%) reported that there are insufficient mathematics reference books in the agricultural TVET college library. Furthermore, I observed only three mathematics books in the library namely Modern Algebra, Advanced Calculus and Algebra.

These books are by no means sufficient for the students in the college. Thus, the mathematics reference books in the library are extremely inadequate.

The majority of the mathematics teachers 5(83.3%) affirmed the unavailability of preparatory mathematics syllabus in Assela Construction and Industrial TVET College and all of them 6 (100%) replied that there is also no preparatory mathematics teachers' guide at their hand. Regarding textbooks, most of the teachers 4(66.7%) responded that there is inadequate supply of the preparatory mathematics textbooks for the students. During interview sessions, I asked two of the mathematics teachers about the availability of textbooks. They said that the college did not bring enough textbooks for the students. Hence, this creates a problem for them to give class work, home work and assignments. In addition, the majority of Mathematics teachers 5 (83.3%) in the college reported that there are insufficient mathematics reference books in the library.

Assela Preparatory School and Assela Business and Home Economics TVET Institution are found in one compound. These two schools have the same library and bookstore but they have different administration. There are two mathematics teachers for TVET in this compound the table 14 shows two of the teachers reported that there is no a preparatory mathematics syllabus. However, one teacher has a teachers' guide of the preparatory mathematics and the other did not have the teachers' guide. These two teachers said that there are sufficient textbooks in the institution but the mathematics reference books are inadequate in the library.

The materials which are listed in the table 15 below should be used by the mathematics teachers in order to teach mathematics. The preparatory mathematics teachers' guide also recommended the teachers to prepare the teaching aids by using the available materials like graph papers, chart papers, markers, etc. Accordingly, the materials were observed in the institutions and present and analysis as follows.

Table 15: Outside Classroom Observation (Rating Scale) for Availability of teaching Materials and Curricula Materials in the Institutions

No	Items	Adequate		Inadequate		None at all		Total	
		No	%	No	%	No	%	No	%
1	Chart shows different types or mathematical properties	-	-	-	-	3	100	3	100
2	Graphs of different function	-	-	-	-	3	100	3	100
3	Pictures (Geometrical/ algebraic)	-	-	-	-	3	100	3	100
4	Numerical Tables	-	-	-	-	3	100	3	100
5	Flesh cards	-	-	-	-	3	100	3	100
6	Models	-	-	-	-	3	100	3	100
7	Set of mathematical instruments for drawing geometrical figures on papers	1	33.3	1	33.3	1	33.3	3	100
8	Set of mathematical instruments for drawing geometrical figures on board	1	33.3	1	33.3	1	33.3	3	100
9	Graph board	-	-	-	-	3	100	3	100
10	Globe	-	-	-	-	3	100	3	100
11	Circular card board	-	-	-	-	3	100	3	100
12	Mathematics syllabus	-	-	-	-	3	100	3	100
13	Mathematics teachers' guide	2	67	1	33	-	-	3	100
14	Mathematics textbooks	2	67	1	33	-	-	3	100
15	Mathematics reference books	-	-	3	100	3	100	3	100
16	Graph papers	2	67	-	-	1	33	3	100
17	Drawing papers	2	67	-	-	1	33	3	100
18	Markers	2	67	-	-	1	33	3	100

As can be seen in table 15, it is observed that preparatory mathematics syllabus and mathematics reference books are not found in the store and libraries in the TVET Institutions respectively. In addition, charts, graphs, pictures, numerical tables, flesh cards, models, graph boards, globe, and circular card boards were not existed in all of the three Assela TVET institutions. Set of mathematical instruments for drawing geometrical figures on the papers and on the boards were adequately existed in Assela Agricultural TVET College; but, they were inadequately found in Assela Construction and Industrial TVET College and totally these materials were not existed in Assela Business and Home economics Institution.

Although there were adequate numbers of graph papers, drawing papers and markers in the two Colleges, the mathematics teachers did not prepare charts, graphs and pictures which portray the properties of mathematical concepts and ideas. The interviewed teachers indicated the reasons way they did not prepare the teaching aids. According to them the reasons are:- there is no

pedagogical center in the TVET institutions; they did not have basic skills to prepare teaching aids; having insufficient time; some teachers think that no need of preparing teaching aids for College students.

Table 16:- Inputs or Requirements for Teaching Mathematics in TVET Institution As Responded by Teachers

S. N	Requirements for Teaching	Teacher respondents = 12								mean
		Adequate (3)		Inadequate (2)		Not exist at all (1)		Total		
		No.	%	No.	%	No.	%	No.	%	
1.	Formats for preparing lessons plans	2	16	5	42	5	42	12	100	1.85
2.	Stationery materials	8	67	3	25	1	8	12	100	2.58
3.	Papers for tests or exam	8	67	4	33	-	-	12	100	2.67
4.	Mark list forms	9	75	1	8	2	17	12	100	2.58
5.	Graph papers and drawing papers	2	17	7	58	3	25	12	100	1.92
6.	Set of mathematics instruments for drawing geometric figures on paper	-	-	3	25	9	75	12	100	1.25
7.	Set of mathematics instruction for drawing geometric figures on board	1	8	2	17	9	75	12	100	1.33
8.	Calculator	1	8	6	50	5	42	12	100	1.67
9.	Computer access	-	-	9	75	3	25	12	100	1.75
10.	Internet access	-	-	8	67	4	33	12	100	1.67
	Average (mean)	-	25.8	-	40	-	34.2	-	100	1.61

The data in table 16 shows the requirements provided by the institution for mathematics teacher. According to the mean (1.85) for the response of the teacher respondents, formats provided by the institution for preparing lesson plan are inadequate. Most of the teacher respondents (67%) affirmed that the stationary materials (exercise books, pens, pencils and papers) provided by the institutions were adequate. The majority of the teacher respondents (75%) reported that the institutions provided them adequate mark list forms. But, (58%) of the teachers reported that there was inadequate supply of graph papers and drawing papers. The majority of the respondent (75%) responded that the institutions did not provide them set of mathematical instruments to

draw geometric figures on papers and on boards. Moreover, 50%, 75% and 67%, of the respondent teachers reported that there were inadequate accesses of calculator, computer and internet sources to mathematics teachers in the institutions respectively.

Generally, as the mean percentage (40%) indicated that the majority of the mathematics teachers rated the provisions of inputs or requirements for teaching and learning mathematics is inadequate.

In addition, the interview results of the department heads also confirm that the non- existence of instructional media for mathematics education, the shortage of textbooks for the students, lack of the syllabus and teachers guide. However, the principal of the Assela TVET institution said

We help the mathematics teachers by providing them the necessary requirements for effective implementation of the syllabus, but the teachers did not ask the administration of the institution for the material support. So, we do not know what kind of material needed for teaching mathematics. Thus, this situation restricted us to provide them the materials in support of teaching of mathematics (Mar. 17, 2008).

As the institution principal indicated that the TVET institution has the capacity to provide the necessary instructional materials for mathematics education. Nevertheless, the problem is the teachers did not ask them for the material supplies through department heads or individually. The common course department heads also said that the mathematics teachers did not have a long-range plan which includes the required instructional resources for teaching mathematics. In fact, the institution needed the mathematics teachers' long- range plan for the provision of the materials for mathematics instruction. Long-range planning, which is typically done during the summer months, usually consists of reviewing materials to be used during the coming year, rearranging topics from school curricula and previous teaching experiences and adding and deleting content to be taught (McNeil, 1999). According to the respondents, principals and common courses department heads, the mathematics teachers did not have a long-range (yearly) plan and this is the major impact for the implementation of the syllabus in the institutions.

Table 17: Instructional Means for Enriching the Mathematics Instruction as Responded by Teachers

Item	alternatives	No.	%
What are your sources of information that you use in order to enrich mathematics instruction?	A. Mathematics textbook	8	38.1
	B. Mathematics reference books	9	42.9
	C. Other related reference books	2	9.5
	D. Teachers' guide	2	9.5
	E. Others	-	-
	Total	21	100

In order to achieve effective teaching – learning process, classroom teachers often use textbooks as one of single source of information. Textbooks are used as reference materials and instructional means for the learning processes of students. As McNeil pointed out textbooks are instructional tools for most teachers that must fit the teacher's view of the 'correct' path to use the textbook: follow the text, teach the text and test the text; or to use it as a reference for students to draw on as they pursue their classroom investigations (McNeil, 1999: 291). Teachers also used mathematics references books to supplement their mathematics instruction in classroom.

Thus, mathematics textbooks and mathematics reference books are playing an important role as sources of information to enrich mathematics since the above table 17 depicts 38.1% and 42.7% of mathematics teachers declared that mathematics textbook and reference books are their main tools for the teaching of mathematic respectively. About 9.5 percent of the respondents appear to supplement the textbook and mathematics reference books by other related reference materials and teachers' guide. The significant number of teachers (80.5%) heavily relied on the textbooks and mathematics reference books. This means that mathematics teaching in the institution seems to be highly book – oriented.

4.3.3 Assessment of Teachers' Teaching Load and Time Allotted to Cover the Course

Time is the teacher most valuable resources. They have to have sufficient time to implement the given syllabus in the classroom effectively. Indeed, teachers need adequate time for planning lessons, for preparing instructional materials, for greater amount of evaluation and marking, and communication with others about the subject (Ornstein and Hunkins, 2004, Pratt 1980). In this

study an attempt is made to examine the teachers' teaching load and time allotted to cover the course. Thus, the collected data is presented in the following table and analyzed.

Table 18: Assessment of Teachers' Teaching Load and Time Allotted.

S. No.	Item	Alternatives	Teacher respondents	
			No.	%
1.	During this semester how many hours do you teach per week?	A. below 10 hours	4	33.3
		B. 10-15 hours	3	25
		C. 16-20 hours	5	41.67
		D. Above 20 hours	-	-
		Total	12	100
2.	How many hours are allotted to mathematics instruction for a class per week in your TVET institution at present?	A. 1 hours	1	8.33
		B. 2 hours	7	58.34
		C. 3 hours	4	33.33
		D. 4 hours	-	-
		Total	12	100
3.	Adequacy of time allotted to cover the portion of mathematics for TVET?	A. Adequate	-	-
		B. Inadequate	8	66.7
		C. Average	4	33.3
		Total	12	100

The data in the table 18 shows 5 (41.67%) of the teacher respondent reported that they taught mathematics for 16-20 hours per week in a semester. Relatively large number of the teachers (58.34%) indicated that the time allotted per week was 2 hours to teach the mathematics in the institutions. However, four of the Agricultural TVET College teachers responded that 3 hours per week was given to teach mathematics. Furthermore, many of the teachers (66.7%) reported that the time allotted to cover the portions (contents) of preparatory mathematics was inadequate.

According to the TVET curriculum guide for each of occupations, the trainees learn five units of grade 11 mathematics (unit 1, unit 2, units 3, unit 5 and unit 6) at 10+1 level in TVET institution for 75 hours. But, in the preparatory mathematics syllabus 114 periods (76 hours since one period is 40 minutes) was allotted to the five units. In this case the time given in TVET curriculum guide and in the syllabus is similar. Yet, the students (trainees) have learned the five units of grade 11 mathematics for 2 hours per week in the TVET institution. Totally, there are about 32 teaching weeks in the academic year. Thus, a mathematics teacher has about 64 hours to teach the units of grade 11 mathematics at 10+ 1 level. Hence, there is a disparity between the given time in the

intended syllabus and the time allotted to actual implementation of the syllabus in TVET institutions.

The trainees (students) have learned grade 12 Mathematics at 10+2 and at 10+3 levels in TVET institution. The TVET curriculum guide also states that 75 hours was allotted to teach units 1, 2 and 3 at 10+2 level and equal hours was also allotted to teach unit 4 and unit 5 at 10+3 level in TVET institution. The period allotment to first three units (units 1, 2 and 3) of grade 12 mathematics syllabus was totally 84 periods (56 hours since one period is 40 minutes). The period allotment for the other two units (units 4 and 5) was totally 85 periods (56 hours and 40 minute). However, the students have taken the mathematics course for one semester with 2 hours per week at each of 10+2 and 10+3 levels. There are about 16 teaching weeks per semester. Hence, a teacher actually has 32 hours to teach the mathematics course in a semester at each level. Therefore, there is also a great discrepancy existed between what is intended in the syllabus and TVET curriculum guide with the actual implementation time for mathematics instruction at these levels in the TVET institutions.

4.3.4. Communication and Support in the Process of Implementation

A close communication between the implementers such as teachers, supervisors, principals, department heads and the like is vital for effective implementation of the given syllabus in the institutions. Implementer should have awareness of the new curriculum, before he or she is going to implement the new curriculum into effect. Thus, initial short term training is crucial for the implementer. In addition, curriculum developer needs to provide the necessary support for their recommended programs or program modifications to facilitate their rapid implementation. Educators often require in-service training or staff development time to feed comfortable with new programs (Ornstein and Hunkins, 2004: 303).

If there is good communication and necessary support in the institution, one can say there is a favorable environment of the institution for the successful implementation of syllabus. The data in table 19 illustrates the extent of the communication between those involved in the implementation of the syllabus and the support provided by principals and common courses department heads.

Table 19: -Communication and Support Service Provided by the Administrator of The Institutions, Principals and Common Courses Department Heads.

S. No.	Item	Alternatives	Teacher respondents.	
			No.	%
1.	Were you introduced with the way of implementation of the preparatory mathematics syllabus in TVET institution?	A. Yes	-	-
		B. No	12	100
		Total	12	100
2.	Do you think that you need more training to implement the syllabus effectively?	A. Yes	9	75
		B. No	2	16.7
		C. Not some	1	8.3
		Total	12	100
3.	How often the principals discuss with you individually or through mathematics department on issues related to the implementation of the syllabus?	A. Frequently	2	16
		B. Sometimes	2	16.67
		C. Rarely	6	50
		D. not at all	2	16.66
		Total	12	100
4.	How many times a year does principal or department head or supervisor supervise you in your classroom?	A. once	2	16.7
		B. Twice	-	-
		C. three times	-	-
		D. Four times	-	-
		E. Not at all	10	83.3
		F. others		
		Total	12	100
5.	How do you rate the support provided by principal to the implementation of the mathematics syllabus in your institution?	A. very high	-	-
		B. high	-	-
		C. medium	6	50
		D. low	2	16.7
		E. Very low	4	33.3
		Total	12	100
6.	Do you believe that the current organization structure of your institution have negative impact on the implementation of syllabus?	A. Yes	4	33.3
		B. partially yes	5	41.67
		C. No	3	25
		Total	12	100
8.	Is there a habit of mutual experience sharing and cooperative work among mathematics teachers in the institution?	A. Yes	8	66.7
		B. No	4	33.3
		Total	12	100

As can be seen from the table 19 all of the teacher respondents 12 (100%) reported that they were not introduced with the way of implementing the preparatory (Grades 11 and 12) mathematics syllabus in the TVET institutions. As far as the training concerning, the majority of the teacher respondents (75%) require more training to implement the syllabus effectively. Beside the

knowledge of the subject mathematics; the teachers must have pedagogical content of knowledge. Willson et al in Haggarty, (1995) suggests that while personal understanding of the subject matter may be necessary, it is not sufficient condition for being able to teach. Since through time the pedagogical content of knowledge is changed, the teacher has to have continuous professional development.

There should be a frequent discussion among principals, department heads and teachers for effective implementation of the program in general and the mathematics syllabus in particular in the TVET institutions. However, regarding item 4 in the table 19, half of the respondent teachers (50%) responded that the principals rarely discussed on issues related to the implementation of preparatory mathematics syllabus with the teachers individually or through mathematics department. In addition, most of the respondent teachers 10 (83.3%) reported that the principal, the common courses department heads and supervisors did not supervise the teachers in their classroom teaching but a very few teachers 2 (16.7%) reported that the principal or department head or supervisor supervise them once per- semester in their classroom. 50% of the teacher respondents affirmed that there was a medium support provided by the principal for the implementation of the mathematics syllabus in the TVET institutions.

While curriculum implementation is a collaborative and teamwork, it requires a mutual understanding and experience sharing among the teachers in implementation process. Moreover, the organizational structure in the institutions can facilitate or inhabit the successful implementation of the syllabus. In this regard, 5 (41.7%) of the teacher respondents declared that the current organization structure of their institutions has some negative impact on the implementation of the syllabus. But most of the respondent teachers 8 (66.7%) reported that there is a habit of mutual experience sharing and cooperative work among mathematics teachers in the institutions. The chance was given for these respondent teachers to describe the way of experience sharing and cooperative work. Accordingly, they stated as discussing how to plan the lesson, observing each other the way of managing the students and the technique of evaluating the students (trainees), used to have meeting in order to share about method of teaching, discussion on certain challenging issues and cooperating during mid-semester exam and final exam sessions. This data indicated that the mutual experience sharing and cooperative work

culture between the teachers has been some strong feature of the implementation process in the institutions.

Generally, the result of the study revealed that the classrooms equipped with tables, chairs, desks and blackboards (chalkboards). In addition the teachers have adequate chalks, and dusters. However, mathematics instructional materials (teaching aids) did not available in the classroom. There was also some disruption inside and outside classrooms. As most of the mathematics teachers indicated that the time allotment for teaching mathematics was insufficient. This also supported by the documentary sources. Therefore, these conditions make a little bit the classroom environments unfavorable. The availability of curricula materials (preparatory mathematics syllabus, the teachers' guide and students' mathematics textbooks) and basic requirement for teachers in order to teach the mathematics subject were inadequate. Furthermore, there was absence of two-way communication between mathematics teachers, department heads and principals. Also there was no technical support for the mathematics teachers from principals and department heads in the TVET institutions. Thus, the environments of the TVET institutions were not conducive to implement the preparatory mathematics syllabus.

Therefore, the analysis of the data in tables 11 to 19 and the discussion of the findings answer the third research question of the study. That is conduciveness is the institutional and classroom environments for effective implementation of the syllabus.

4.4. Factors Affecting the Implementation of Preparatory Mathematics In TVET Institutions

Various factors affect the implementation of the curriculum. Data about the possible factors influencing the effective implementation of preparatory mathematics syllabus in the three Assela TVET institutions was collected through teacher's questionnaire. Sixteen possible factors which affect the implementation of the syllabus in the TVET institutions are listed and the mathematics teachers were gave rank for each factors according to their degree of influence. The results of the data summarized in the following table with their degree of influence.

Table 20: Mean Ranks and Rank Values of the Factors which Influence the Effective Implementation of the Syllabus

No.	Possible Factors	Teacher respondents = 12	
		Mean Rank	Rank
1	Poor supply of students' textbooks	9.9	12
2	Inadequate period allotted to cover the portion	8.3	9
3	Lack of clarity of goals and means of mathematics syllabus for TVET program	8.75	10
4	Low explicitness of the syllabus (i.e. unclear teaching procedures).	10.25	14
5	In appropriate application for other fields in TVET program	6.6	4
6	Little attention is given by the principals to mathematics instruction	6.4	3
7	Teachers lack of modern pedagogical skills	10.1	13
8	Lowness of support provided by the TVET institution administrators	9.0	11
9	Absence of in-staff training or staff development for teachers to implement the preparatory mathematics	7.5	7
10	The students traditional belief of the mathematics as difficult subject	4.5	1
11	Lack of important teaching materials	7.9	8
12	The irrelevant of the content of the syllabus with the ability of trainees	6.8	5
13	Insufficient supply of curricula and instructional materials.	7.0	6
14	Lack of experience sharing program among mathematics teachers	11.1	15
15	Poor background knowledge of the trainees	5.2	2
16	Work load on the teacher	13.9	16

As can be seen in table 20, Based on the ranks, the students traditional belief of the mathematics subject as difficult, poor background knowledge of students in mathematics, little attention is given by principals to mathematics instruction and inappropriate application of the preparatory mathematics in other fields of study in TVET institutions took the first four ranks among the factors that influence the implementation of the syllabus.

The interview with the teachers and department heads also confirmed that the students or the trainees have very low knowledge of mathematics. So, they said, it is very difficult to teach them preparatory mathematics. According to Nahom Fessehaye (2006), the students' performance in the common courses like mathematics and English was very low. The students dislike these subjects and most of them did not like attending in these classes at all in TVET institutions. Students' lack of prior knowledge is one of the main factors which make teaching mathematics and science subject hard (Sheila Tobias in McNeil, 1996: 151). MecNiel (1996) suggested teachers must design activities that link new content to students' prior experience and teach perquisites to critical tasks because students' background experience is the best predictor of their

success. Though mathematics is an important subject in the curriculum of every country, it is commonly seen as the difficult subject by many of the students and adults (Mujis, D. and Reyalonds, D. 2003). The interviewed teachers and the principals said that no attention was given for mathematics like major courses in institutions. So, this has made a problem to effective implementation of the syllabus.

Teachers and students think that the application of preparatory mathematics in TVET institution is inappropriate (see tables 9 and 10). When introducing or generalizing a mathematical concept, it is important to have application. Application is a strong motive. Application affords the opportunity to the student to discover. If Mathematics subject has some sort of application directly to the students' specific field; they will be motivated to learn the subject. Thus, As much as possible, the TVET mathematics curriculum should have some sort of application to the TVET occupations. Houghton, (1963:21) asserted "Mathematics has internal and external application. Both of this application should be taught so that the student will understand both the power of mathematics as a scientific method and the unity and beauty of mathematics as a science in its own right".

The irrelevant of the content of the syllabus with ability of the trainees, insufficient supply of the curricula and instructional materials, absence of in-service or in-staff training or staff development for teachers to implement the preparatory mathematics, and lack of important teaching materials are the other four factors which ranks from fifth to eighth.

If the content of the syllabus is beyond the ability of the students, they become less prepared and less motivated to learn. The students who admitted to TVET were low achievers in national exam of grade ten (EGSECE) and also most teachers stated they have poor background knowledge of mathematics. Moreover, they are more concentrated on practical skills than academic knowledge. But, the preparatory mathematics is more academic. Hence, this make difficult to implement the syllabus in TVET institution.

During interview, teachers and the common course department heads indicated that the administration of the institutions did not provide sufficient curricula and instructional materials for mathematics education. Absence of in staff training or staff development opportunities in the form of workshops, panel discussion and seminars is reported by the teachers as the major factors which affect the implementation. As Marlow and Minehira (2003) suggested principals, as

curricular leaders, must provide direction in helping teachers to identify, select, and develop programs and materials that meet student needs within the context of the school's vision and mission. Principals also need to ensure that teachers have the time, resources, and professional development opportunities to implement curricula programs. Perhaps, the most important role of the principal as curriculum leadership is facilitating teachers in implementation because even the best official curriculum is worthless unless it can be successfully put into operation by the teachers.

The other factors rank from ninth to sixteenth are: - inadequate period allotted to cover the portion, lack of clarity of goals and means of the mathematics syllabus for TVET program, support provided by TVET institution administrators, poor supply of student's text books, teachers lack of modern pedagogical skills, low explicitness of the syllabus (i.e. unclear teaching procedures), and work load of teachers. Even if the above factors listed to last rank of affecting the implementation of the syllabus in TVET institutions, this doesn't mean that these factors are not felt problems of teachers in their implementation endeavors.

Furthermore, the mathematics teachers were asked to mention some of the problems faced in their institution with regard to the implementation of the preparatory mathematics syllabus. As the result the repeatedly mentioned problems are:- shortage of reference books in the library, the students lack of interest to learn mathematics, incapability of the students to understand mathematics subject, Lack of curricula materials such as syllabus, teachers' guide and students text books, lack of teaching aids (instructional media) and absence of additional training for teachers.

Therefore, the analyses of this part of the study answer the last research questions about factors affecting the implementations of the preparatory mathematics syllabus in the TVET institutions

UNIT FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary

This study intended to evaluate the implementation of preparatory mathematics syllabus in Assela TVET institutions. Accordingly, attempt has been made to answer the five basic research questions raised in chapter one. Descriptive survey approach was selected to be the method of the study. In line with this, three Assela TVET institutions were selected and the data was collected from Mathematics Teachers, Common Courses Department Heads, Principals and Students. Questionnaires (for teachers and students), observations (rating scales and check lists), interviews and documentary sources were used as data collection instruments. A total of 3 Principals, 2 Common Courses Department Heads, 12 Mathematics Teachers and 236 Students have participated in this study.

Based on the analyses made on the data secured through the above instruments in the specified area, the summary of the findings of the study are summarized as follows.

- Regarding the actual classroom performance of mathematics teachers in the TVET institutions, out of eleven instructional considerations in the observation rating scale only two (18.2%) were frequently observed. The two instructional considerations which most frequently observed were that teachers wrote important ideas or concepts on the blackboards and they also gave equal attentions for all students in the classroom. The other six (54.5%) instructional considerations were rarely implemented and three (27.3%) instructional considerations were not implemented during twenty observation sessions. In 50%, 65%, 55%, 60% and 70% of the observed sessions, the teachers rarely used variety methods of teaching and techniques in lesson presentation, rarely encouraged the students to participate in the discussion, rarely asked questions to check their understanding of the lesson and rarely go round to students in classroom in order to check their work, rarely related the mathematics lesson to students' real life situation or other subjects and rarely gave students prompt feedback respectively. Thus, it was observed that most of the mathematics teachers rarely performed the instructional considerations in the classrooms and also as the mean percentage (56%) in table 5 indicated that the teachers did not do most of the classroom activities effectively.

- The preparatory mathematics syllabus and the teachers guide suggested variety of teaching methods to maximize the mathematics teaching-learning process. The methods are explanation (lecture), questions and answers, demonstration, discussion, guided discovery, deductive approach, problem- solving, project work, Application, proof and reasoning, group work, dialoged and written reports (student's presentation in class). However, the majority of the respondent teachers frequently employed explanation (lecture) and questions methods of teaching.
- Regarding Assessment techniques, the majority of the respondent students (62.3%) reported that mathematics teachers evaluated the students' performance based on mid-semester and final examinations. In addition, (37.3%) and (38.14%) of the respondent students affirmed that the mathematics teacher sometimes gave class work and always gave homework to the students respectively. The preparatory mathematics syllabus suggested the students should be evaluated continuously but the majority of the respondent teachers did not use continuous assessment to evaluate the student performance. According to them, the reasons were insufficient time, lack of curricula and instructional material and unfavorable environment of the institutions and classrooms.
- 58 % of the teachers have positive attitudes towards the implementation of preparatory mathematics syllabus and 42% of them have negative attitudes. According to the interview, most of the mathematics teachers were not motivated to teach mathematics in the institutions because low background knowledge of students, the students are not interested to learn mathematics, principals gave little attentions for mathematics instruction in the institutions and lack of supports from administration.
- Relatively large number of the students (31.1%) had low interest to learn the suggested mathematics in the TVET institutions because (41.1%) of them indicated the poor teaching method of teachers. Furthermore, most of the students (74.2%) reported that the preparatory mathematics is not appropriate for TVET. However, the majority of the students (54.25%) rated that the application of preparatory mathematics syllables in their occupations was moderate. Although most of the respondent students (63.98%) responded that learning mathematics increased their knowledge to the grate extent, the majority of them (64.8%) reported that teaching-learning process of preparatory mathematics lessons did not motivate them to learn

mathematics and also 53% of the respondent students reported that teachers sometimes related the mathematics knowledge to students' real life. Generally, the students have low perceptions towards the implementation of preparatory mathematics syllabus.

- All of the respondent teachers reported that there were adequate chairs, tables and desks for the students and half of the respondent teachers responded that there are also adequate chairs and tables for teachers. However, the majority of the respondent teachers (66.7%) reported that the availability of notice board was inadequate and all of the teachers (100%) and most of them (92%) confirmed unavailability of graph boards and instructional material (teaching aids) for mathematics instruction in classroom respectively. 67% of the respondent teachers affirmed that the number of students in a classroom was 46 up to 55. Most of the teachers (59%) reported that this class size have not created any problem in mathematics instruction.
- Regarding curricula materials: - Preparatory mathematics syllabus was not available in the three Assela TVET institutions. All of the mathematics teachers had teacher' guide at their hand in Assela Agricultural TVET College; but, all of the mathematics teachers did not have the teachers' guide at their hand in Assela Construction and Industrial TVET College. One teacher had but the other did not have the teachers' guide in Assela Business and home economics TVET institution. Students' mathematics textbooks were adequately available in Assela Agricultural TVET College and Assela TVET Institution but they were inadequately available in Assela Construction and Industrial TVET College. The majority of the respondent teachers (92%) reported inadequate availability of mathematics reference books the TVET institutions libraries.
- It was observed that there were no instructional materials (charts, graphs, pictures, globs, etc) available for mathematic instruction in the three Assela TVET institutions. Moreover, although 67% of the observed sessions indicated that there were adequate number of graph papers, drawing papers, markers and other stationery materials, the mathematics teacher did not prepare charts, graphs, and other teaching aids for mathematics instruction.
- The mean percentages of the responses of the respondent teachers (40%) indicated that the majority of the mathematics teachers rated the provisions of inputs or requirements for teaching-learning mathematics is inadequate. According to the interviewed principals and common courses department heads, the TVET institutions have the capacity to provide the

necessary requirements for mathematics teachers to effective implementation of the syllabus. Yet, most of the teachers did not ask the institutions and they did not have long-range plan which includes the inputs for teaching- learning mathematics. The significant number of respondent teacher (80.5%) heavily relied on the mathematics textbooks and reference books as sources of information to enrich mathematics.

- (41.67%) of the mathematic teacher taught mathematics for 16 to 20 hour per week in the TVET institutions. Most of the respondent teacher (58.34%) indicated that 2 hours were allotted per week to teach mathematic and most of the respondent teachers (66.7%) reported that insufficient time allotted to cover the portion of the intended mathematics syllabus in the TVET Institutions. Generally, there was mismatch between the times allotted in the syllabus and actual implementation of the syllabus in the TVET institutions
- All of the mathematics teachers (100%) were not introduced with the way of implementation of the syllabus in the TVET institutions by any means. As the result, 75% of the respondent teachers feel that they need more training to implement the syllabus effectively. Most of the respondent teachers (83.33%) indicated that there was no frequent discussion between department heads, principal and mathematics teacher on issues related to the implementation of mathematics syllabus. 82.3% of the teacher respondents indicated that no supervision service provided by principles, department heads or supervisors for mathematics instruction. (41.7%) of the respondent teachers believed that the current organizational structure of the institutions had some negative impact on the implementation of the syllabus. However, the majority of the respondent (66.7%) reported that there was a habit of mutual experience sharing and cooperative work among mathematics teacher in the institutions.
- The data collected pertaining to factors influencing the implementation of the syllabus revealed that out of sixteen suggested possible factors, the seventh most influencing factors, according to their order, were the students traditional belief of the mathematic as difficult subject; poor background knowledge of the trainees(students); little attention was given from principled to mathematics instruction; inappropriate application of the syllabus for other fields in TVET program; the irrelevant of the syllabus with the ability of the trainees; inadequate supply of curricula and instructional materials and absence of in-staff training or staff development for mathematics teachers to implement the syllabus effectively.

5.2. Conclusion

From the data collected and analyzed by way of evaluating the implementation of preparatory mathematics syllabus in the TVET institutions under the study, it can be concluded that

- The mathematics teacher did not employ the instructional guidelines as suggested in the preparatory mathematics syllabus because they did not have the syllabus and teachers' guide at their hands and they were not introduced the ways of implementing the syllabus.
- The students have low perceptions towards the implementation of the preparatory mathematics syllabus because most of them feel that it is not designed for them and it has little application in their occupations. The attitudes of the mathematics teachers towards the implementation of the syllabus is more of positive but they are ill-motivated to teach the mathematics in the TVET institutions as a consequence of low academic background of the students, lack of students' interest to learn the preparatory mathematics and little attention given from principals and administration for mathematics instruction.
- There is inadequacy of the necessary curricula materials and important teaching aids for effective implementation of the preparatory mathematics syllabus; the time allotment is insufficient for teaching mathematics in the TVET institutions; lack of communication between teachers, department heads and principals and lack of necessary support of the mathematics teacher to implement the syllabus effectively in the institutions and the absence of on -the -job training for the teachers indicated the unfavorable conditions in the institutions to effectively implement the syllabus.
- The students traditional belief of the mathematics subject as difficult, low background knowledge of the students, little attention was given by the principals to mathematics instruction, inappropriate application of the syllabus to other occupations in the TVET institutions and the irrelevant of the syllabus to the student ability in the TVET institutions were the most prominent factors which negatively influencing the implementation of the syllabus in the TVET institutions.

Therefore, the study revealed that the implementation of preparatory mathematics syllables is not congruent with the intention of the program.

5.3. Recommendations

- To ensure students' effective learning of mathematics, teachers must involve students in their own learning by employing variety of instructional strategies in the classroom that make student active participants.
- Due to the unavailability of the preparatory mathematics syllabus and teacher guide in TVET institutions, the mathematic teacher did to have the materials at their hand. Thus, they did not know the suggested instructional guidelines in the syllabus and they taught mathematics according to their pervious experience. Therefore, to alleviate this problem, the institutions have to provide sufficient preparatory mathematics syllabus and teachers' guide for mathematics teachers.
- Continuous Teacher Professional Development and on-the-job-training should be given for mathematics teachers so that they will have adequate pedagogical skills to implement the syllabus effectively. In addition, TVET institutions have to allocate sufficient implementation time in accordance to the suggested time in the preparatory mathematics syllabus.
- The TVET principals and department heads should give due attention to the effectiveness of the implementation of mathematics and should consider mathematics is equally important like other subjects or courses in the TVET institutions. In addition, the institutions should devise the way of having frequent discussion and cooperative work between principals, department heads and mathematics teachers for successful implementation of the syllabus.
- The students' perception towards the implementation of the preparatory mathematic syllabus is very low because they seemed that the contents of the mathematics are difficult to them, they are not interested to learn the given mathematics and they think that learning the preparatory mathematics is not appropriate for TVET that is they did not see its connection to their occupations (field of studies). Hence, in order to develop positive attitudes of students, the contents of mathematics should be related to their needs and interest. Therefore, as much as possible the concerned bodies should modify or revise or change the mathematics syllabus according to the needs of the students and the objectives of the TVET programs.

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Appendix A

Back ground information of teacher respondents

Characteristics	Alternatives	Teacher respondents = 12	
		No	%
Sex	Male	12	100
	Female	-	-
	Total	12	100
Age	20-29	5	41.67
	36-39	5	41.67
	40-49	2	16.66
	50-59	-	-
	Total	12	100
Qualification level	Diploma	-	-
	B.Sc/B.ED	12	100
	M.Sc/M.ED	-	-
	Other	-	-
	Total	12	100
Total year of experience in teaching mathematics	1-5 years	3	25
	6-10 years	5	41.67
	11-15 years	2	16.67
	16-20 years	-	-
	21-25 years	-	-
	Above 25 years	2	16.66
	Total	12	100
Experience of teaching mathematics in TVET institution	For one year	-	-
	2-5 years	7	58.33
	6-10 years	5	41.67
	Above 10 years	-	-
	Total	12	100
Grade level of teaching mathematics	10+1	6	-
	10+2	4	-
	10+3	3	-
	All	2	-
Number of section teacher taught at present	1-3	8	66.67
	4-6	4	33.33
	7-9	-	-
	Above 9	-	-
	Total	12	100
Participation in co-curriculum activities in the school	Yes	5	41.67
	No	7	58.33
	Total	12	100

Appendix B

Background Information of the Respondent Students

Character	Alternatives	Male		Female		Total	
		No	%	No	%	No	%
Age	16-20 years	132	55.93	48	20.3	180	76.27
	21-25 years	37	15.68	12	5.08	49	20.76
	Above 25 years	4	1.67	3	1.27	7	2.97
	Total	173	73.3	63	26.7	236	100
Grade levels	10+1	60	25.42	21	8.90	81	34.32
	10+2	55	23.31	20	8.47	75	31.78
	10+3	58	24.28	22	9.32	80	33.90
	Total	173	73.31	63	26.7	236	100
Occupational title (field of study) in Assela TVET industrial, construction and water college	Aeromechanics	11	4.24	2	0.84	13	5.08
	General mechanics	8	3.39	-	-	8	3.39
	Electricity	10	4.24	1	0.84	11	5.08
	Electronic	7	2.96	3	0.43	10	3.39
	Machine Technology	3	1.27	-	-	3	1.27
	Garment	-	-	4	1.70	4	1.70
	Textile	3	-	-	1.27	3	1.27
	Building	6	2.54	-	-	6	2.54
	Construction	4	0.84	-	-	4	0.84
	Drafting	3	1.27	1	-	4	1.27
	Surveying	3	1.27	2	0.43	5	1.70
	Wood work	4	1.70	-	-	4	1.70
	RWSS	6	4.24	2	0.84	3	9.32
	SSID	16	6.78	1	0.43	17	7.21
	EMT	13	5.51	2	8.84	15	6.35
Total	105	49.5	18	7.5	123	52	
Occupations, in Assela Agricultural TVET college	Natural resource	20	6.78	5	1.70	24	8.48
	Plant science	17	7.21	7	2.96	24	10.17
	Animal science	21	6.78	2	0.84	22	7.62
	Total	49	20.77	14	5.50	70	26.27
Occupational title (field of study) in Assela TVET institution	Accounting	5	2.12	6	2.54	11	1.66
	Secretarial science	2	0.84	4	1.70	6	2.54
	Information technologies	4	1.70	2	0.84	6	2.54
	Marketing	4	1.70	2	0.84	11	3.39
	Purchasing	5	1.70	4	1.69	6	3.39
	Garment	1	2.12	3	1.27	6	1.70
	Cooking	-	0.43	3	1.27	8	1.27
	Hair dressing management	1	-	3	0.84	8	1.27
		-	11.43	2	0.84	4	0.84
Total	22	11.43	231	14.4	3	21.60	
Total	173	73.3	63	26.7	236	100	

Appendix C
Addis Ababa University
School of Graduate Studies
College of Education
Department of Curriculum and Teachers Professional Development Studies

Questionnaire for Teachers

Dear teachers

The purpose of this questionnaire is to gather data for a study leading to MA in curriculum and instruction. It is administrated to survey your views and to collect first hand information in order to evaluate the implementation of preparatory mathematics syllabus in your TVET institution of Assela (Oromiya region). It also looks for plausible solutions to improve mathematics instruction in TVET institutions. Since the success of this study highly depends on your valuable responses, you are kindly requested to be frank towards all items provided in the questionnaire. All information and data you provide will be used only for the purpose of this academic study.

Thank you in advance
For you kind cooperation

13. Is there a preparatory mathematics syllabus you are supposed to follow in teaching in TVET institution?
A. yes B. No
14. Do you have a teachers' guide for teaching the preparatory mathematics in your institution?
A. Yes B. No
15. If your answer for question number '13' or '14' is 'No' explaining how you plan for teaching

16. Are there sufficient mathematics textbooks for the students in the TVET institution?
A. Yes B. No C. Not sure
17. What are your sources of information that you use in order to enrich mathematics instruction?
(More than one answer is possible)
A. only mathematics text book
B. mathematics reference books
C. other related reference books
D. Teacher's guide
E. If there are other sources that you use, please specify briefly _____

18. How many hours are allotted to mathematics instruction in your institution per year at present?
A. for grade level 10+1 _____
B. for grade level 10+2 _____
C. for grade level 10+3 _____
19. How many hours are allotted to mathematics instructions for one class per week in your TVET institution at present?
A. 1hour B. 2hours C. 3 hours D. 4 hours
20. Adequacy of the time allotted to cover the portion of mathematics for TVET from preparatory mathematics
A. adequate B. inadequate C. Average

21. Do you think that you need more training to implement the syllabus effectively?
 A. yes B. No C. Not sure
22. If your response for question 21 is 'yes' in what way?

23. If your response for question 21 "No" why not?

24. Do you think that the number of students per class has created a problem for the proper implementation of the syllabus?
 A. yes B. No C. Note sure
25. If your response for question 24 is 'yes' what instructional problems do you face in teaching mathematics? Please specify in brief _____

26. How often does the principal discuss with you individually or through mathematics department on issues related to the implementation of the syllabus?
 A. Frequently C. Rarely
 B. Sometimes D. Not at all
27. How many times a year does principal or department head or supervisor supervise you in your classroom?
 A. Once D. four times
 B. Twice E. Not at all
 C. Three times F. Other response _____
28. How do you rate the support provided by principal to the implementation of the mathematics syllabus in your institution?
 A. A very high B. high C. Medium D. Low E. Very low
29. Are all contents in the text book explained sufficiently in Teachers Guide?
 A. Yes B. No C. Not sure
30. Are there sufficient reference books in the library of the TVET institution?
 A. Yes B. No C. Not sure
31. Is there a habit of mutual experience sharing and cooperative work among mathematics teachers in the institution?
 A. Yes B. No

32. If your response for question No. 31 is 'yes' describe the way in brief

33. If your response for question number 31 is 'No' please explain the reason

34. Do you believe that the current organization structure and /or management of your institution have negative impact on the implementation of the mathematics syllabus?

- A. Yes B. Partially yes C. No

35. Do you have serious difficult to implement the preparatory mathematics syllabus in TVET institution?

- A. Yes B. No C. Not sure

If "Yes" would you please mention some of your difficulties _____

36. Were you introduced with the way of implementation of preparatory mathematics syllabus in TVET institution?

- A. Yes B. No

37. If your response for question 36 is 'yes' is what way were you introduced about the syllabus and its implementation?

- A. Seminars B. Work shop C. Any Other _____

38. What are the major problems (if any) you faced in implementing the mathematics syllabus in TVET institution?

Part II

Direction: - Indicate your opinion by putting a mark with a tick (✓) to each statement in only one of the five alternatives below

5= strongly Agree

2= disagree

4= Agree

1 = Strongly Disagree

3 = undecided

No.	Statements	5	4	3	2	1
1	Since low achiever students of EGSECE admitted to TVET institution, the preparatory mathematics syllabus is difficult for most students in TVET institution					
2	The aims and objectives of preparatory mathematics which are written in the syllabus and teachers' guide are appropriate					
3	The aims and objectives of preparatory mathematics syllabus are compatible to aims and objectives of TVET institution					
4	The preparatory mathematics syllabus and teachers guide are helpful to mathematics teachers in TVET to plan their teaching strategies					
5	The organization of the content and learning activities of preparatory mathematics syllabus is appropriate for teaching students in TVET					
6	The application of preparatory mathematics to other subjects (occupations) is significant					
7	Most of the contents of preparatory mathematics syllabus are beyond the ability of the trainees in TVET institution					
8	There are adequate exercises at the end of each topic of the mathematics text books.					
9	The preparatory mathematics syllabus contains Variety of teaching methods that can maximize students' participation.					
10	The major role of mathematics teacher in TVET should be to encourage students to memorize all definitions, theorems, rules and axioms instead of worrying about their proofs					
11	Students have too little background knowledge of mathematics in TVET					
12	Students in TVET institutions learn mathematics with enthusiasm.					

Part III

Direction: Please indicate by a tick (✓) how far the TVET institution provide you the following in puts or requirements for teaching mathematics

S.No.	Requirements for teaching	Adequate	Inadequate	Not at all
1	Format for preparing lesson plans			
2	Stationery materials for preparing lessons			
3	Papers for test/exam			
4	Mark list forms for recording continuous assessment result			
5	Computer access			
6	Calculator			
7	Graph papers			
8	Rulers (straight edge)			
9	Set of mathematical instruments for drawing geometric figures on papers			
10	Set of mathematical instruments for drawing geometric figures on board			
11	Chalks			
12	White board markers			
13	Duster			
14	Instructional materials for mathematics teaching –learning (Graphs, tables, pictures...)			
15	Color chalks			
16	Internet access			
17	Chalk boards			
18	Notice boards			
19	Graph boards			
20	Students desks, armchairs and tables			
21	tables and chairs for teachers			

Part IV

Direction: - The following lists in the table shows that the suggested teaching methods in the preparatory mathematics syllabus. Please indicate your response by putting a tick marks (✓) corresponding to the methods of teaching the extent to use in teaching mathematics in the classroom.

S.No.	Suggested teaching methods in the syllabus	Extent to use		
		Frequently	Rarely	Not at all
1	Lecture/explanation			
2	Discussion			
3	group work			
4	Demonstration			
5	Dialogue			
6	Questions and answers			
7	Guided discovery			
8	Deductive approach			
9	Problem solving			
10	Written reports (students presentation in class)			
11	Application			
12	Proof and reasoning			
13	Project work			

Part V

Direction: The following table contains possible factors which affects the implementation of preparatory mathematics syllabus in TVET institution. After reading the following list of possible factors, give rank according to their level of influence and on the space provided in front of each statement.

N.B:- Those factors which have strong influence should take the upper ranks (1, 2, 3...) and those which have minimal influence should take the lower rank (... 13, 14, 15)

S. No.	Possible factors	Rank
1	Poor supply of students' text book	
2	Inadequate period allotted to cover the portion	
3	Lack of clarity of goals and means of mathematics syllabus for TVET	
4	Low explicitness of the syllabus (i.e. unclear teaching procedures)	
5	Inappropriate application for other fields in TVET program	
6	Little attention is given by the principals to Mathematics instruction	
7	Teachers lack of modern pedagogical skills	
8	Lowness of support provided by the TVET institution administrators	
9	Absence of in-staff training or staff development for teachers to implement the preparatory mathematics	
10	The students traditional belief of the mathematics subject as difficult	
11	Lack of important teaching materials	
12	The irrelevant of the content of the syllabus with ability of trainees	
13	Insufficient supply of curricula and instructional materials	
14	Lack of experience sharing program among mathematics teachers in the institutions	
15	Poor background knowledge of the trainees in mathematics	
16.	Work load on the teacher	

16. Please specify briefly if there are other factors which affect the implementation of the mathematics syllabus in your institution _____

Appendix D

Addis Ababa University

School of Graduate Studies

College of education

Department of Curriculum and Teachers Professional Development Studies

Dear students (trainees)

This questionnaire is designed to collect information for research purpose only. Its objective is to assess your opinions on mathematics learning in your institution. I kindly request you to give your genuine response for each of the questions. All information and data you provide will be used only for the purpose of this academic study.

It is not necessary to write your name in this paper.

Thank you in advance for your kind cooperation.

Direction: - Indicate your response for each of the following questions by circling the letter your choice and by writing a brief statement / phase/ word on the space provided.

1. Sex: _____

2. Age _____

3. Grade level: A. 10+1 level B. 10+2 level C. 10+3 levels

4. Occupational title (Field of study) _____

5. How much is your interest in learning preparatory mathematics?

A. Very high C. Moderate

B. high D. Low E. Very Low

6. If your answer for question 5 is 'D' or 'E' which of the following do you think could be the reason? (More than one answer is possible)

- A. The subject is not designed for TVET C. Poor teaching method of teachers
 B. the subject is very difficult D. Mathematics is not important to TVET
 E. If there is other reason please Specify _____
7. Are there available reference materials for mathematics in your library?
 A. Yes B. No C. Note sure
8. If your answer is 'yes' for question number 7 are the materials sufficient for teaching learning mathematics?
 A. Yes B. No C. Note sure
9. I have used our library to study mathematics
 A. always C. sometimes
 B. frequently D. Rarely E. Never
10. If your response to question 9 is 'D' or 'E' which one of the following reasons restricted you?
 A. Teachers do not recommend us to refers additional reading materials and do not motivate us to use library
 B. Because the text book is sufficient D. Lack of experience to use library
 C. Do not have ample time E. Improper facility of the library
 F. Please specify if there is any reason _____
-
11. How often does your mathematics teacher explain the mathematical concepts clearly?
 A. always C. sometimes
 B. frequently D. Rarely E. Never
12. Is there "group work" practice in their mathematics classroom?
 A. Yes B. No C. Not sure
13. If your response for question number 12 is 'Yes', what is your experience in group work during mathematics learning?
 A. Very good C. poor
 B. good D. Very poor
14. If your response for question number 13 is 'C' or 'D' which one of the following reason do you think?
 A. Because mathematics teacher does not initiate me to work in group
 B. Group work learning is not convenient for mathematics

23. To what extent learning mathematics has increased your knowledge and skills?
 A. to great extent B. to some extent C. Not sure
24. How often your mathematics teacher relates the mathematics knowledge to your real life situation in the classroom?
 A. Always C. Sometimes
 B. Frequently D. Rarely E. Not at all
25. Does your mathematics teacher start the lesson on time?
 A. Yes B. No
26. If your response for question number 25 is 'No' what do you think is the reason?
 A. Breaking time going for too long
 B. Disordered transactions from breaking time to lessons
 C. ineffective management of students coming into classroom
 D. If there is other reasons please specify _____
27. Is there disruptions /disturbance from outside or inside the classroom when you are learning mathematics?
 A. Yes B. No C. Not sure
28. If your response for question number 26 is 'Yes' what type of disruptions?
 A. Head coming in to make announcement
 B. Teachers from other class rooms coming with questions
 C. Students coming in with various requests
 D. To much noisy around the classroom
 E. ill-motivated students talk other issues in class during discussion
 F. If any other type of disruptions, please specify _____
29. Do you think that the preparatory mathematics is appropriate for TVET students?
 A. Yes B. no C. appropriate
 If "No" Why? _____
30. What is your feeling or perception about learning preparatory mathematics in your institution? Please specify in brief _____

Appendix E

Observations

Class Room Observations

Name of institution _____
 Code of the teacher _____
 Grade and section _____
 Date of observation _____
 Period _____ Time: From _____ to _____
 Lesson Topics _____

A/rating scale

3= frequently, 2= rarely, 1 = Not at all

S. No.	Instructional consideration	3	2	1
1	How often the teacher uses different instructional methods and techniques in lesson presentation?			
2	How often the teacher encourages the students to participate in discussions?			
3.	How often the teacher encourages the students to ask question which is not clear to them?			
4.	How often the teacher asks questions to check whether the students understand the lesson?			
5.	How often teacher use group activities of students for collaborative learning?			
6.	How often the teacher guides the learner during the group work?			
7.	How often the teacher goes round to students in classroom in order to check their class work?			
8.	How often teacher relates the lessons to students real- life or others subjects?			
9.	How often the teacher writes important ideas and concepts on the black/white board?			
10.	How often the teacher gives equal attention for all students in classroom?			
11	How often the teacher give students prompt feedback?			

B/ checklist

S. No.	Lesson presentation variables	Yes	No
1	Did the teacher prepare the weekly or daily lesson plan?		
2	Was the lesson plan much with the actual presentation of the lesson in classroom?		
3	Did the teacher write lesson topic on the blackboard or whiteboard before starting presentation?		
4	Did the teacher specify the objectives of the lesson clearly?		
5	Did the teacher checks the previous homework?		
6	Did the teacher revise the pervious lesson before starting the new lesson?		
7	Did the teacher encourage the students to use the text book in the classroom?		
8	Did the teacher use text book for teaching-learning process in classroom?		
9	Did the teacher gives class work, Homework and assignment		
10	Did the teacher summarize the main points of the lesson		
11	Was there misunderstanding of some content elements by the teacher?		
12	Did the teacher use instructional materials in the classroom?		
13.	Did the students communicate (present) in classroom what they have done in group?		
14	Did the teacher properly use the black board?		
15	Did the teacher manage the classroom?		

Outside Classroom Observation rating scale

Name of institution _____

Date of observation _____

For availability of teaching materials and curriculum materials in the institutions

S. No.	Item	Adequate	Inadequate	Not at all
1	Charts shows different types of mathematical properties			
2	Graphs of different kinds of functions			
3	Pictures (Geometrical / algebraic)			
4	Numerical Tables			
5	Flesh cards			
6	Models			
7	Set of mathematical instruments for drawing geometrical figures on papers			
8	Set of mathematical instruments for drawing geometrical figures on boards			
9	Graph board			
10	Globe			
11	Circular Card boards			
12	Mathematics syllabus			
13	Mathematics teachers' guide			
14	Mathematics text books			
15	Mathematics reference books in library			
16	Graph papers			
17	Drawing papers			

Appendix F

Interview schedule

For Mathematics teachers

1. How is the ability and interest of your students in learning the preparatory mathematics?
2. How is your interest and motivation teaching the preparatory mathematics syllabus in TVET institution?
3. Do you get the necessary support and assistance from principals, department head and supervisors?
4. What do you think about the students performance and abilities in mathematics instruction in TVET institution
5. How the institution and classroom are conducive to teach mathematics syllabus?
6. What kinds of teaching methods do you use when you teach mathematics in classroom? Do you employ the teaching methods suggested in the syllabus?
7. Do you have any thing to add regarding the mathematics curriculum you are teaching here to TVET studies?
8. How do you assess or evaluate your students' performance in mathematics subject?

Interview schedule for principals and department Head

1. What is your perception about the implementation of preparatory mathematics in TVET institution?
2. How often do you make direct and clear contact with mathematics teachers?
3. In what way the school administration give necessary support for the implementation of the mathematics in TVET?
4. How do you make a close contact with the concerned bodies in order to get supports for proper implementation of the syllabus?
5. What is your help for mathematics teacher so that they will implementation mathematics syllabus properly in the institution?
6. Are there problems regarding the implementation of the mathematics syllabus here in your TVET institutions? If any what are they?

Appendix G

Calculation of Guttman split half method of measuring reliability of the attitude part of questionnaire for teachers

No. of respondent Teachers	Scores					
	E	O	X	$(E - \bar{E})^2$	$(O - \bar{O})^2$	$(X - \bar{X})^2$
1	20	17	37	2.25	1	6.25
2	21	19	40	6.25	9	30.25
3	21	17	38	6.25	1	12.25
4	12	14	23	42.25	25	132.25
Total	74	64	138	57	36	181

E- Represent the sum of even items responses

O- Represent the sum of odd items responses

X- Represent the total score of the responses of the teacher for their attitude scale

$$\begin{aligned} \text{The mean } \bar{E} &= 18.5, & \bar{O} &= 16 & \bar{X} &= 34.5 \\ S_E^2 &= 19.67 & S_o^2 &= 12 & S_X^2 &= 60.33 \end{aligned}$$

Thus, the inter- Consistency coefficient

$$r_{OE} = 2 \left(1 - \frac{31.7}{60.33} \right)$$

$$r_{OE} = 0.95$$

Appendix H

Calculation of the correlation coefficient to determine the inter-rater reliability of the observation rating scale

the serial number of Institutional consideration to be observe	Observer 1	Observer 2	X^2	Y^2	XY
1	2	2	4	4	4
2	3	2	9	4	6
3	1	1	1	1	1
4	2	2	4	4	4
5	1	2	1	1	2
6	2	2	4	4	4
7	1	1	1	1	1
8	1	1	1	1	1
9	3	3	9	9	9
10	2	3	4	9	6
11	3	3	9	9	9
Total	$\sum x = 21$	$\sum y = 22$	$\sum x^2 = 47$	$\sum y^2 = 50$	$\sum xy = 47$

$$\begin{aligned}
 r_{xy} &= \frac{N \sum xy - \sum x \sum y}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{N} \right) \left(\sum y^2 - \frac{(\sum y)^2}{N} \right)}} \\
 &= \frac{11(47) - (21)(22)}{\sqrt{(47)(11) - (21)^2} \sqrt{(50)(11) - (22)^2}} \\
 &= \frac{55}{\sqrt{76} \sqrt{66}} = \frac{55}{70.8} = 0.78 \text{ which is } 78\%
 \end{aligned}$$

Appendix I

Calculating the mean of Teachers' Scores of the attitudes measurement

Type of institution	Teachers	scores
Agricultural TVET college	1	38
	2	39
	3	37
	4	31
The other Two TVET institution in Assela	5	29
	6	36
	7	30
	8	40
	9	41
	10	23
	11	31
	12	35
Mean		34.16

Calculation of Chi- Square for Attitudes of teachers

The given table

Category	Assela Agricultural TVET College	The other two TVET institutions	Total
Above mean	3	4	7
Below mean	1	4	5
Total	4	8	12

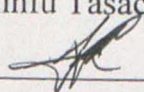
Calculating the observed and expected frequencies the Chi-square

f_o	f_e	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
3	7/3	4/9	4/21
1	5/3	4/9	4/15
4	14/3	4/9	4/42
4	10/3	4/9	4/30
$x^2 = \sum \frac{(f_o - f_e)^2}{f_e} = \frac{144}{210} = 0.686$			

Thus, $x^2 = 0.686$

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university.

Name: Kinfu Tasachew
Signature: 
Place: Addis Ababa University
Date of Submission: _____

This thesis has been submitted for examination with my approval as a university advisor.

Name: Solomon Areaya (Dr.)
Signature: _____
Date of approval: _____