

STUDENT-CENTERED APPROACH AS AN EFFECTIVE TEACHING-
LEARNING OF MATHEMATICS: CHALLENGES AND OPPORTUNITIES IN
SOME SELECTED SECONDARY SCHOOLS OF EAST WOLLEGA ZONE
(OROMIA REGION)

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This is to certify that this thesis prepared by Solomon Gadisa Oda, entitled:
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requirements for the Degree of Masters of Education in Mathematics Education
compiles with the regulation of the university and meets the accepted standards
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Title:-Student-Centered Approach as an Effective Teaching-Learning of Mathematics: Challenges and Opportunities in Some Selected Secondary Schools of East Wollega Zone (Oromia Region).

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Abstract

The objective of the study is to assess the status of application of student-centered approach as an effective teaching-learning mathematics: Challenges and Opportunities in Some Selected secondary Schools of East wollega zone (Oromia Region). The study explored problems in the teaching and learning of mathematics from the following perspectives: problems related to school facilities, teachers, students, and the extent to which the school is conducive for practical activities. The research method employed in the study was a mixed approach. Descriptive survey design was employed to accomplish the study. Purposive sampling techniques were used to select mathematics teachers' and principals. Random sampling techniques were used to select students. Availability sampling techniques were used to select supervisors. Educational administrators (principals and vice principals), mathematics teachers, students, and supervisors at woreda levels were the subjects of the study. Questionnaire, classroom observation and interview were the major data gathering instruments used for this study. Besides, document analyses were made to get additional evidences to the study. Numbers, percentage, mean values and grand mean were the statistical tools used to analyze the data obtained from the subjects. The findings of the study in general showed problems that include: Poor background of the students in mathematics skills, weak ability to think, in ability to pose questions, weak English language proficiency, lack of interest and motivation to learn mathematics in those sample schools. The finding also showed that, teachers' lack of competency in their subject and method of teaching as well as lack of interest and motivation to be engaged in their professional task, poor supervision (frequent follow up) from concerned bodies, inadequate availability of instructional materials, lack of enough time provided for discussion after instruction to make the lesson more clear and poor school facility were the chief problems encountered in the teaching and learning of mathematics in the secondary schools of East wollega zone. But in contrary if the student-centered method of teaching-learning approach implemented properly: learners draw up on their own knowledge, understanding, ability, experience and organize and finally give interpretation. Conclusions of the result indicates that there are lack of school facilities, low level of students interest to involve in the method, insufficient supervisory assistance to the schools were found factors that influence the implementation of student-centered approach. To fulfill school facilities following classroom standard population (class size), making frequent supervisory assistance to schools and organizing short term workshops, seminars as well as to encourage staff training were also recommended.

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CHAPTER ONE

1. Introduction

1.1. Back ground of the Study

Education plays a great role for the development of human society. It helps to solve political, economical, social and cultural problems of a society. Therefore, without education the development of any country is unexpected. In general, education is the foundation for the prosperity (wealth practice) of a country that enables a society to meet its needs. It is also believed to be a primary prerequisite for an individual participation in the advanced sectors of the society (Chombe Anagaw, 2005).

Moreover, education is the main means to bring changes in values and attitudes conducive to progress (Rajmalhreye, K. 1982). That is, education does not only enables an individual to adjust himself or herself to the changes that has already takes place, but also an instrument that enables the individual to contribute towards the acceleration of such development.

Education can be fully realized only when all citizens of a country have equal opportunity and access to education. The overall social, cultural and economical development of a country depends up on the degree to which ensures the access and opportunity of education to all social groups without disparity.

However, in the developing countries including Ethiopia, many factors affect the progress of education. The researcher is going to observe the implementation of student-centered approach as an effective teaching-learning of mathematics in active-learning instruction of the current situation in some selected Secondary Schools of East wollega zone.

If new educational goals are set, one of the key elements in their success are teachers. This is so because; an insufficiently equipped teaching force will not be effective in implementing change, (Graham-Brown, Sarah.1991: 272). It seems with intention that Ministry of Education (MOE) of Ethiopia has designed a new curriculum for teacher education incorporating best practices in initial teacher preparation, such as focus on school experiences (practicum), use of active-learning method and the use of continuous assessment.

In this new approach to education, often called learner-centered education, the students are not passive recipients of knowledge, rather they are active learners. They are not only receiving information from lectures and books but also collect information, record systematically, discuss, compare, identify, draw conclusions from and communicate about it. When they are given information and facts from their teacher or their text books, they are asked to do something actively and they are able to creative with the information to analyze it, think about, discuss it, make charts or pictures that show the information in different ways and make reports on it. In the student-centered classroom, the teacher is not less important. In fact, the teacher is much more important. He/she even has greater responsibilities and the role of the teacher is somewhat different. It is his/her role to organize the activities through which students will gather or use information, guide the students though these activities, help them and find additional sources of information, make sure they are really thinking and analyzing and check there progress to make sure that all students are learning.

Moreover, the learners are responsible for raising questions, producing hypothesis, gathering relevant data, organizing information and drawing conclusions. That is through active-learning any learners discover things from themselves and learner-centered instruction provides the experience for learners to develop the independent and critical learning skills necessary for problem-solving.

From the above facts, the researcher is interested in carrying out the study to identify whether the implementation of student-centered approach takes place or not and also see the challenges and opportunities of teaching-learning mathematics and search solution to factors that affect teaching-learning process in mathematics particularly.

1.2. Statement of the Problem

Mathematics is one of the subjects offered in the secondary schools. It is true that, knowledge obtained from the mathematics education is applicable in technological and engineering work, and benefits for development.

However, the teaching and learning of mathematics in the secondary schools of the country in general and the East wollega zone in particular have been encountered by different problems. May the existing problem which is to be considered here are teaching-learning methods,

motivational orientation in the classroom, personality type, attitudes and interests are other problems. Student-centered method of teaching-learning mathematics may consider as wasting of time. Especially active students resist the method. Some students are not willing to participate in group work. Even, sometimes students quarrel (disagree) each other during group works. The teaching-learning mathematics class room may also dominate by the traditional lecture method due to school facilities and class size. The researcher give due attention to investigate whether these factors have significant impact on the implementation of student-centered method of teaching-learning mathematics in the context of East Wollega Zone of Secondary Schools. However, from my experience I have seen some schools, which are not applying the student-centered approach instruction by considering students as one of stakeholders in the classroom teaching-learning process.

In considering the above ideas Secondary schools of East wollega zone is not far from the above stated problems. There are also different factors, which are being obstacle to practice the student-centered approach as an effective teaching-learning method. The problem may arise from teachers' side, students' side, families, principals, government and curriculum itself. If this method of teaching is not investigated or exercised, the problems should continue. Accordingly, the study also tried to assess and treat the basic research questions stated.

In view of the above, it is clear that there are many challenges in promoting teachers' use of active learning/student-centered approaches (Alexander, S. 2002:36-38). It is in consideration of the above that the researcher became interested in exploring the nature of the teaching-learning aprocess in line with the active learning approaches and investigating the problems related to the implementation of active learning/student-centered approaches in mathematics education in the secondary schools of East wollega zone.

1.3. Objectives of the Study

The Ethiopian education and training policy of 1994 emphasizes the implementation of active learning/ student-centered approaches in teaching (MoE, 2002:31). As indicated, this approach promotes higher order thinking and problem-solving capacities in order to produce problem-solving citizens. It is also a way of improving the quality of education (MoE, 2001:40). Hence, the objectives of the study is to search the nature of the teaching-learning process in line with the

student-centered approaches and identify the challenges that hinder the implementation of this approaches in mathematics education in secondary schools.

Generally, the study try to assess the implementation of student-centered method of teaching and learning Mathematics: challenges and opportunities in some selected Secondary Schools of East wollega Zone.

The specific objectives of the study are:

1. To assess students and mathematics teachers have the necessary awareness about the values of student- centered approach in teaching and learning mathematics.
2. Specify the status of the implementation of student- centered approach in teaching-learning mathematics classroom.
3. To analyze the challenges and opportunities of the implementation of student- centered approach to mathematics in the context of East wollega zone of Oromia Region.

1.4. Research Questions

Based on the objectives the following research questions were attempted to be answered:

1. Do students and mathematics teachers have the necessary awareness about the values of student-centered approach in teaching and learning mathematics?
2. What is the status of the implementation of student-centered approach in mathematics classroom?
3. What are the challenges and opportunities of the implementation of student- centered approach in mathematics in the context of East wollega zone of Oromia Region?

1.5. Delimitation of the Study

In order to carry out any research, it is important to delimit the scope of the study to manageable size. Accordingly, the scope of this study was delimited to four (4) weredas and four (4) secondary schools of East wollega zone by purposive sampling technique. To make the study manageable and specific its content was delimited to assess whether the student-centered method of teaching-learning mathematics was properly implemented or not. Based on this the research was conducted in Oromia Region of East Wollega zone, which is far away about 321 km west of Addis Ababa particularly around Nekemte town of Secondary Schools by the year 2006 E.C.

1.6. Limitation of the Study

The researcher strongly agrees that inclusion of a large part of the East wollega zone secondary schools and total population in the study could help to get more relevant and broader information. However, because of time, financial and other resource materials constraints the researcher could not be able to conduct the study in all secondary schools of East Wollega Zone.

Conditions beyond the control of the researcher were some of the major challenges in this study: influence of work pressure that restricted me the research work, lack of reference materials around my work place related to the topic, lack of accurate information from some respondents especially from the students and the school personnel's. This is because they may consider the questionnaires as evaluation paper. Some respondents were not interested to turn back the filled questionnaire paper and some items of the papers are left incomplete.

In addition, the amount of money allotted to the study restricted the researcher from getting adequate data from all secondary school students of east Wollega Zone. Thus, only respondents of the sampled schools were involved in filling questionnaire prepared.

1.7. Significance of the Study

The result of this study is very significant in that it clearly pointed out the main problems of teaching and learning of mathematics in secondary schools of East wollega zone. This will help mathematics teacher, students, the curriculum designers, and other concerned bodies to take corrective measures, to lay reliable and appropriate solutions to solve the problems in teaching and learning mathematics. It may also help mathematics teachers to analyze and select the methods and material in mathematics lesson. And, this research can serve as a baseline for further detailed study on issues related to teaching and learning mathematics.

In addition, the study was expected to provide that the student-centered approach of teaching-learning mathematics prepares the learners to solve problems, makes them creative and use information from their environment and other sources to make a better life for themselves, families and societies. Based on this notion, assessing the status of implementation of student-centered approach of teaching and learning and identify the major factors that hinder or facilitate the application of the learner-centered approach is very important.

Therefore, the result of the study has the following significances:

It helps to guide the concerned educational officials and teachers to gain valuable information on the actual status of teaching-learning process and application of learner-centered approach. The study was expected to identify the factors that affect the implementation of student-centered approach, it may indicate areas that need remedies and may create awareness among mathematics teachers, educational officials and concerned bodies to take corrections. It might contribute to the improvement of teaching and learning process in the classroom, create awareness regarding students to discover, to solve problems. Create hopes that after the recommendations proposed by this research paper implemented by detail observation with beneficence organs, students, mathematics teachers, governmental organs and the society as a whole. Initiate students to change their idea in problem solving approach. Students were benefited by getting an actual class experience and not only the students but also the mathematics teacher is another beneficiary.

The study makes the opportunity to the students, mathematics teachers, the curriculum designers and the whole society to use material, methodological and mental readiness as a whole and draw backs around the new approaches (active method of teaching and learning mathematics).

1.8. Definition of Terms

- ❖ **Active learning:** - refers to active involvement of the learner on different learning tasks within and out of the classroom. It includes group work, role-playing, discussion, etc.
- ❖ **Assessment:** - is a student evaluation system that operates at the class room level and is integrated with the instructional process.
- ❖ **Constructivism:** - is a view of learning based on the belief that knowledge is constructed by learners through an active, mental process of development, and learner are the builders and creators of meaning and knowledge.
- ❖ **Curriculum:** - Consists of all the planned experiences refer to the materials with which students will interact for achieving identified educational outcomes.
- ❖ **Education:** - The process of gaining knowledge, experience, new findings, and values accumulated for years through generation.

- ❖ **Implementation:** -is how teaching-learning activity put into practice in/out of classroom by teachers/instructors in educational institutions.
- ❖ **Instructional Materials:** - refers to all forms of materials or devices with which students and teachers interact for the purpose of teaching and learning. This includes graphs, pictures, charts, solid models, textbooks, teacher's guide, syllabuses, compasses, set squares, color chalk, blackboard, bulletin boards, and etc.
- ❖ **Learning:** - The act of acquiring development of new knowledge, skills, and attitude or convictions as individually interacts with information and environment.
- ❖ **Perception:** -the view/feeling of teachers or students on the implementation of student-centered method of teaching-learning.
- ❖ **Secondary School:** - Education level from grade 9-10. It is the school division following the primary school (1-8), comprising of grade 9 to 10. It is a school of two years duration or two years general secondary education (9-10).
- ❖ **Student-Centered:** - A method of instruction that provides experience for students to develop the independent and critical learning skills necessary for problem solving.
- ❖ **Teaching:** -An organized process of instruction and learning.
- ❖ **Teacher-centered method:** - The traditional method of teaching in which teachers talk and students listen.
- ❖ **Woreda:** - An area marked of and developed for administrative purpose with defined authority and responsibility representing a population of up to 100,000 people.
- ❖ **Zone:** - An intermediate administrative level between Woreda and Region.

CHAPTER TWO

2. Review of Related Literature

The new education and training policy has been guided by a new view of education known as student-centered instruction. The need for such active learning method in the classroom comes out of a view of knowledge is called constructivist (i.e. Students interact in the classroom by themselves independently).

2.1. The need of relevant and meaningful Education

Meaningful learning is a process through which new knowledge is absorbed by connecting it to some existing relevant aspect of the individual's knowledge structure (Orton, A. 1992). The student centered active learning process within which teacher is merely a guide is the central point of modern education system and is a learning process in which the learner takes the responsibility of his/her learning and she/he is given the opportunity to make decisions about various dimensions of the learning process and to perform self regulation. One of the reasons why students attitude towards Mathematics is negative is that students are not able to see its relevance in their daily life or in relation to other sciences, and hence the feeling that why learn if it has no use prevails among most students (Fennema, & Sherman, 1976:14).

How is Mathematics applied to various professions in which most of the members of the society lead their life? How is it related to other sciences? What practical application does it have in the scientific world? What contributions can it have to the farmers, to the weavers; to the potters etc might not be well addressed during the implementation of the text books currently used in the Ethiopian schools. This has an impact in bringing positive attitude towards Mathematics and hence a better achievement.

2.2. Active Learning Approach in Mathematics Instruction

Active learning is a process in which students are actively engaged in building understanding of facts, ideas and skills through the completion of instructor directed tasks and activities. It is any types of activity that gets students involved in the teaching-learning process (Bell and Kahrhoff, 2006:1).

As Stern and Huber (1994:19) active learning is defined in one sense to mean that the learner uses opportunities to decide about aspects of the learning process and also, refers to the extent to which the learner is challenged to use his or her mental abilities while learning.

According to Leu (2005:26) suggested, active learning practice has the potential not only to improve students' performance, but also to create the processes that enable them to learn useful knowledge, skills and attitudes allow them to solve authentic problems, not only in the learning situation, but also in their real lives. Supporting this idea Prince (2004:223) suggested that, the core element of active learning is the student actively and engagement in the learning process. Active learning is often contrasted to the traditional lecture method where student passively receive information from the instructor.

Moreover, Leu (2005:26) argued, within the active learning model, there is general agreement on many elements of effective teaching, such as conceptual learning that goes beyond memorization, the use of cooperative learning through which students constructs knowledge together, the ability to communicate independently, students' original work used to demonstrate learning, minimal teacher lecturing or direct transmission of factual knowledge, multiple small group activities that engage students in discovery learning or problem solving and frequent student question and discussion.

In general, active-learning can be more attractive for learners than the passive one because they can become more motivated and interested when participating in their own learning and mental activity is challenged. Active learning is important for teachers. It shares the responsibility of teaching-learning process to students.

2.3. Methods of Teaching-Learning Mathematics Subject

Effective mathematics teaching-learning in secondary schools is essential for ensuring a satisfactory degree of scientific literacy in society at large and for equipping the next generation of scientists and engineers to progress in to higher education and beyond. During teaching-learning mathematics subject in classroom, there is a systematic selection, design and application of different instructional approaches and effective teaching-learning methods. There are different instructional approaches in teaching-learning mathematics education. For the sake of this study the research was discussed the two approaches of instruction in teaching-learning mathematics, namely teacher-centered approach and student-centered approach. The teacher-centered

approach underlying positivist epistemology while student-centered approach is grounded in constructivist epistemology.

2.3.1. Student-Centered Approach To Teaching-Learning

Student-centered approach as an effective teaching-learning method develops skills among students and abilities in independent learning and problem solving. In these method students share their opinions in solving the problems and discovering new things in the teaching learning process.

The process of teaching-learning in student-centered method is different from teacher-centered method in the activities of teachers, students and in the way learning takes place. The teaching-learning in the student-centered approach is the product of interactions among the learners knowledge, information in the environment and the learners activities. Key components in learning new information include the framework for learning and the learners, activities. The underlying assumption here is that learning becomes meaningful when learners use it and relate it with their lives. Regarding this Aggarawal, (1995:229) noted that whatever students learn in educational instructions is useful only when they can apply the same in everyday life. It is assumed that whatever taught in schools, children will use that knowledge, skills, attitudes and information to solve problems of life after completing their formal education. The student-centered methods facilitate and make practical these assumptions.

Many educators believed that the learner-centered method of teaching gives more emphasis to the learner and how to learn than what is taught. For example, Temechegn (2001) indicate that student-centered method stresses the need for taking care of the child, its growth and development. This is possible by using number of teaching techniques and strategies to study the child carefully and observes over period of time his growth and development in intellectual, language, sensory motor skill and emotional concepts.

Regarding students role in student-centered classroom, Plass (1998) indicated that the learners are active participants in the process of teaching-learning. They are actively involved in the learning process. In this method according to him the learners are encouraged to articulate their ideas and opinions. Since the learning styles of learners vary, no one style of teaching dominates, a variety of approaches, catering for different learning styles is used. In this method students

actively work in groups collaborating, share their own ideas, and benefit from each others, individual styles of strategies and skills. Much of learning is task based (oriented). Task is defined as a learner-centered activity that has clear learning to an outcome.

According to Temechegn (2001:32) learning in a student-centered method setting is not purely individualistic. Rather students learn through cooperation, active involvement and participation.

In general, student-centered teaching-learning can be characterized by the following features:

- ✓ A climate of trust in which curiosity and natural desire to learn can be nourished and enhanced.
- ✓ Participatory mode of decision making in all aspects of learning in which students, teachers and administrators have their part.
- ✓ Helping students to achieve results they appreciate and consider worthwhile, to building their self esteem and confidence.
- ✓ Uncovering in intellectual and emotional discovery, which leads students to become lifelong learners.
- ✓ Developing in teachers' attitudes that research has shown to be in facilitating learning.

2.3.2. Teacher-Centered Approach To Teaching-Learning

Teachers are defined as the school instructors who are responsible for teaching. Teachers control what happens in class such as the flow of questions and answers from one group or individual to another.

Zhao (as cited in Zerihun Takele, 2012) stated it; traditional positivist teacher-centered teaching-learning is the process of the transmission of knowledge from a teacher to student. It is essentially a one way process and students represent empty mugs to be filled up with knowledge from the teachers. Thus, this teaching method can hinder the development of individual students' active and creative abilities.

It assumes that all students need the same information and learn at the same speed. However, according to Schofield (1972:57) all learners are not a like. They have different speed of learning, different skills, concepts, rules, etc. Therefore, it is foolish to believe that the teacher can teach the same material by the same method with the same degree of effectiveness to all students.

In teacher-centered method, the emphasis is on theory rather than practice and the successful students are those who can display their knowledge of the facts that have been fed in to them. Strengthening this, Lue (2000:11) stated that, in this kind of education there is a little time for practical activities, discussions, group work, experiments or other alternative methods. Since the emphasis is on memorizing the maximum amount of information, there was no time for activities. There is not enough time to let students discover and use information for them, because all information or facts contained in the book must be covered. Plass (1998:310) further indicated that, the role of learners in teacher-centered approach is to demonstrate their power of memory and not their skills in processing that knowledge. According to Plass in teacher-centered approach the product is important than the process of arriving at the product. In this method the students listen, take notes, digest and then reproduce. Regarding the limitation of this approach Melese (1999:5) also noted that text book based on teacher-centered method is often overcrowded and too different for the level of the learners, for there are usually too many subjects and each subject is overcrowded with the presentation of facts and information. They tend to be long and contain many pages of information followed by questions that ask pupils to recall or repeat the information. These affect the activities of the learners.

On the other hand, though a shift from teacher-centered method to student-centered method is essential to overcome all problems mentioned above, still teacher-centered approach dominates teaching-learning activities in schools. For instance, Pollard, et al., (2000: 60) indicated that teaching in today's secondary schools is very much a matter of teacher's talking and learners' listening. Classroom practices in secondary schools are intense and more teachers controlled. Pupils are less autonomous in their use of space and time and in their choice of activity. Whether the same experience exists in our country or whether there are some improvements now a day need some investigation.

2.4. The Role of Teachers and Students in Student-Centered Approach as an Effective Teaching-Learning Method

According to the new approach to education of student-centered method of teaching-learning, there are so many tasks in the classroom that should be done by students and teachers.

Hilary Plass (1996: 69) described this as follows:

Students bring with them their own sets of beliefs and values, their cultural, ethical and social backgrounds, their knowledge. They also bring their learning styles and strategies, personal interests, like and dislike attitudes towards teachers and area of study. They also come with a desire to knowledge, willingness to learn and their own expectations. All these can be considered as a resource in the classroom. Then in the student-centered classroom, the learners will be expected to contribute, draw up on their own knowledge, beliefs and experience. The teacher also takes on the role of a monitor to ensure that students are proceeding in the correct way and direction. He/she helps students to organize their learning or perhaps participate as a group member.

As said in the above description, students and teachers have their own areas of tasks. In the task sharing or classroom role, the students should be ready and willing to practice so many activities. The teachers must not act as a dominant person in the classroom but as guider. Then the student-teacher relationship will becomes smooth as a partnership.

2.5. The Advantage of Student-Centered Approach as an Effective Teaching-Learning Method

According to Borich, G. (1992: 537) explained the advantage as follows: Student-centered approach used to encourage critical thinking and help students to examine alternatives, judge solutions, make predictions and discover generalizations.

As the above points indicate, though active-learning students control their learning and develop a sense of responsibility for the action which is taking place. They also feel independent. This in turn will make them ready for challenging; developing a sense of satisfaction and self-direction are other gains of the new model. For instance, we can take the benefits of peer parts of students. They can learn the use of reaching an agreement, regenerate ideas, and observe things from different sides and perspectives. All these are the reasons why I prefer student-centered approach as an effective teaching-learning method: challenges and opportunities of instruction.

2.6. Factors Affecting Students-Centered Approach as an Effective Teaching-Learning Method

In the student-centered instruction there have been many problems that may lead up to the termination of the method. Most school teachers are not observed in applying the active-learning method. For this they usually attribute the reasons to external factors. But surprisingly the factors may be they themselves. This is because change should start from the vacuumed in which there

is nothing. Like this, mathematics teachers should start the initiation even if any difficulties are there.

In relation to factors outside the teacher that are being obstacles for the application of the active model are lack of materials, class management problem, large class size and lack of paper training.

The materials in classroom are teacher oriented so they need to be student oriented. In addition to this the scarcity of the necessary materials is another headache to the method to be implemented. In class management the teachers may fail to manage the instructional process. Then when ever teacher want to dominate and tend to be an authoritarian manager, the student-centered approaches will lose its sense of participatory approach.

Lack of training on the part of teachers has an adverse effect. If teachers do not involve in workshops, seminars and educational conferences, they may face lack of knowledge about student-centered approach.

On the other hand the classroom settings are also the source of problems. There is less conducive situation in very crowded one. This is true as group discussion and other active-learning approaches are difficult to conduct in crowded classrooms. And it is difficult to move desks, chairs and also difficult for management.

In general; to avoid these problems, everyone should have to work cooperatively. The teacher, the school principals and the governments as well should work together. The materials should be fulfilled. Teachers also should have the knowledge of class management and class arrangement and number of students should have to be properly adjusted to keep the application of the active learning method healthy.

2.7. School Facilities

The nature of classroom is one of the most important facts that should be considered in the teaching-learning process. According to Silberman (1996:9), the physical environment in a classroom can make or break active learning. The interior of classrooms can challenge active-learning especially when the furniture is less than ideal. According to Henveld and craig (1996:111) there should be adequate well maintained and furnished classrooms to effectively

conduct teaching-learning process. Classrooms are adequate when there is desk for every pupil and when it is well ventilated with good light and there is a standard chalkboard for every class.

As indicated by Temechehn (2001:41) the physical layout of classrooms in Ethiopian schools is mentioned as a factor that not conducive to learner-centered applications. It is generally true that attention to the classroom teaching-learning environment in student-centered method may include changing the physical layout of the room allowing for seating changes. If the furniture movable it is possible to arrange different layouts or sitting arrangements that can facilitate learner-centered method of teaching-learning. Some of layouts or sitting arrangements used in learner-centered method according to Silberman (1996:10) are U-shape, team styles, conference tables, circle, etc. To use these different sitting arrangements, the nature of classroom teaching-learning environment that allow for the learners to participate and interact easily with others in the group are considered as student-centered arrangements.

2.8. Support from Education System

To implement student-centered method of teaching-learning, support to individual schools by the education systems management structure is very important. The literature suggests that in terms of demonstrating its support, the system needs:

- To delegate authority and responsibility for improvement to the school themselves.
- To provide services to the schools to help them succeed, including information and training regarding instructional practices.
- To monitor and evaluate schools teaching-learning methodology and academic performance and the efforts of schools director particularly as instructional managers (Heneveld, and craig, 1996:19 & 20).

Therefore, it is obvious that the role of the educational system in supporting schools is very important to enhance the expected students' competences and promote higher academic standards.

The educational system supports school staff by providing advice, training and resources. Through these support school directors are supervised and students' academic performance and methods of teaching-learning is monitored regularly. Schools perform better in teaching-learning process to the extent that the education authorities outside school provide support

that includes information and training regarding instructional practices (Henveld, and craig, 1996:31).

This support of education system is given to the schools based on supervision. Supervision can play a role in teaching-learning process by providing professional assistance and guidance to classroom teacher. Regarding the importance and role of supervision, Melese (1999:8) emphasized that, the major focus of supervision is on the provision of technical assistance in order that organization or an individual will be improved and be able to accomplish necessary duties and responsibilities. The intent of supervision is not inspecting, faultfinding, reporting and taking disciplinary measures. Rather, it focuses on providing feedback, mentoring, guiding, redirecting and giving professional assistance for the purpose of solving problems and improving the teaching-learning environment and the process in order that the desired goals are achievement. Therefore, supervision strongly plays a role in facilitating and solving problems in implementing the newly exercised student-centered method of teaching-learning in Ethiopian schools.

To properly implement the student-centered method of teaching-learning in schools, the responsible bodies found at different level should supervise teaching-learning methodology, coach teachers, evaluate and monitor instructional activities. But according to Henveld and craig (1996:31) in sub-Saharan Africa countries, the facilities for providing supervisory support to schools and teachers are very limited or non-exist. Some factors that affect supervisory support in this region according to the report are that supervisors and pedagogic are often stationed far from the schools under their charge. Transportation frequently is not available and the number of school for which each supervisor is responsible can be excessive. Even if school supervision is facilitated, the supervisor does not communicate expectations for performance in terms of students' competencies, teaching-learning methodology and criteria that define effective school. Therefore, from the role supervision plays in supporting teachers by providing advice, training and resources on the process of teaching-learning methods, its improper utilization affects the application of student-centered method.

2.9. Conditions related to human and material resources

Teacher related

In most Ethiopian Educational institutions, teachers are not trained according to their interest. That is they are forced to study subjects other than their choices. It is hard to expect motivated and creative teacher who is forced to join the department and even the teaching profession unwillingly. The training institutions are not well organized and the training of teachers does not address properly the handling of students with different abilities in general and students with disabilities in particular.

There is a high turnover of teachers due to various reasons. The poor working conditions, low salary, low social acceptance of the profession by the society and other additional factors are forcing qualified and competent teachers to leave the teaching profession and look for other occupations, which is contributing to the steady decline of the quality of education.

Teachers must have access to continuous professional development through in-service programmes, short term seminars and workshops. This is believed to create an opportunity for them to introduce themselves to new findings of teaching methods, knowledge and skill on how to handle and help their students, to promote their capacity in the subject knowledge area, exchange of experience with other teachers.

The classroom management in the school is in such a way it is worth to assess how teachers are confident enough to teach Mathematics and whether they spent enough time on it or not as this stage could be the base for developing a positive or negative attitude towards Mathematics.

Teaching materials

In spite of the attention given to education by the government the budget allocated to schools is limited and is not sufficient enough to fulfill the basic needs of the schools. There are not enough teaching materials in schools and teachers are forced to teach with almost no additional teaching materials. It is hard to find even simple materials such as protractors, solid figures, rulers etc in schools. Text books are scarce so that each child cannot have one book of his own; one book may be shared with 2 or 3 other students. Since Mathematics by its nature is full of home works and assignments, not having a book on one to one basis has a big impact on the learner's education.

The shortage of relevant, low-cost books for use inside and outside the school continues to create challenges to provide quality education for all. Low access to teaching and learning materials, inadequate provision of additional reference books, not well equipped resource centers are some of the problems, which can be mentioned as barriers to teaching. The absence of the above mentioned resources make the teaching and learning of Mathematics more problematic to the students and teachers as they are forced to deal with only theoretical aspect and can't learn in a more concrete way.

2.10. Some aspects of curriculum

Curriculum should be flexible enough in order to meet the need of the individual learner, however, the existing practice of preparation of curriculum does not allow teachers to involve and participate in the preparation. In every class, there most certainly is a need for high degree of flexibility in order to adapt the learning environment to all pupils' level of mastery, learning possibilities and barriers (Johnsen, B.H. 2001). The preparation of elementary school and secondary school curriculum are highly centralized at the regional government and federal government levels respectively to limited experts. As in other subjects, the syllabus of Mathematics in most grades is very vast and is expected to be covered at the end of each academic year which forces the teacher to proceed whether the students understood or not.

Methods of teaching

The existing method of teaching in schools is old fashioned which is highly dependent on the performance of the teacher only. It is teacher-centered, that is teachers are expected to explain, demonstrate, illustrate give detailed note and the students have a minimal participation in the teaching learning process (Dean, P.G. 1982). Engagement and motivation are critical elements in student success and learning. Engaged students learn more and retain more, and enjoy learning activities more than students who are not engaged (Akey, T.M. 2006). In subjects like Mathematics, students benefit more from active participation and they can learn more things by doing than listening only to the teacher, they can learn more from their peers and advantaged from group dynamism.

Since the composition of students in a class varies in different aspects such as level of mastery, economic background, cultural background etc each learner should be treated according to

his/her individual need. Different strategies and teaching methods shall be used and individual plan should be adapted to meet the student's requirements.

The style of teaching of some teachers is to prepare students only for examination purposes. This exam oriented approach may be fruitful at the end of each semester or term, but it will not be lasting as once the exams are finished the study of the subject will be also finished. Teachers should implement combination of various teaching styles to attract their students and make them understand the subject with interest.

Teachers in general place heavy reliance on the text books and regular testing, which makes the students value only those activities that would contribute to their end of year grade (Barnes, M. 2000).

Home Works

Mathematics by its very nature requires a lot of exercises in order to master it. Students should be involved in class discussions, group discussions and class works should be given to give them opportunity to involve themselves in the practicing.

Home works are the common and frequent alternative ways of engaging students in the learning of Mathematics. However, many things, which should be taken into consideration, do not get enough attention the quantity of home work given; level and topic do not provide useful Mathematical work for the people (Dean, P.G. 1982). Home works must be given in such a way the level of understanding of the students is taken into consideration. If the quantity is too much and if the level is beyond the capacity of the students it is easy for the students to develop negative attitude to home works and to the subject.

When a home work is given it should have a clear purpose either to reinforce what the child has learnt or to prepare him/her for the next lesson. Home works should be discussed at the beginning of the next lesson as this provide the child a feed back and give him/her a chance to learn from his mistakes. Available research shows that homework facilitates achievement and attitudes of students, especially if teachers provide their feedback (Walberg, H.J 1985). Marking home works need due attention, care should be taken not to make many big crosses which affect the self esteem of the students, and comments which provide guidance and encouragement are likely to help the children in making better progress (Dean, P.G. 1982). Mistakes committed by

students can be used as indicators of the areas where Mathematical understanding of the child needs to be improved.

Parents' involvement in school activities is essential for the success of the school objectives. Besides parents have a lot to contribute in helping their children to do their home works by providing proper study area, help them with their difficulties, supervising time for homework and study (Henry, M.E. 1996).

2.11. Class room size and arrangement

Many studies indicate that reduced class sizes leads to improved student achievement (Finn, J.D. & voekl, K.E. 1992; Glass, G. Cahen, L.S. Smith, M.L. & Filby, N.N. 1982). There has been a vigorous debate about class sizes in schools. On one side of the debate are the enthusiasts who feel very strongly that smaller classes lead to better teaching and more effective learning. On the other hand of the debate are the skeptics who argue that the evidence for efficacy of class size reduction is in doubt and that there are likely to be other more cost-effective strategies for improving educational standards (Blatchford, p. et al, 2003).

Class size reduction changes numerous features of the classroom situation. There are fewer students to distract each other. Each student in a reduced size class gets more attention on average from the teacher, and more time to speak while the others listen.

Reduced class size also reduces the level of noise in a class. One theory offered to explain the positive effects of class size reduction on student achievement simply argues that in smaller classes each student receives a larger portion of the educational resources represented by the teacher's instructional time, and consequently, learns more.

Currently the average class size in the Ethiopian primary schools is 50 - 60 and in high schools it is 70 - 80. From my experience, teachers teaching in the lower grades where the number of students in a class is relatively low agree that the classroom atmosphere is better. Students can receive more individualized attention, and that the teachers have more flexibility to use different instructional approaches and strategies.

The teachers found themselves with more classroom space to work with, because they are using the same classrooms with smaller numbers of students. Researchers also have suggested that

smaller classes are more likely to be "friendlier" places, where students develop better relationships with their classmates and with the teacher, encouraging students to become more engaged in classroom learning activities. The smaller the class, the harder it is to escape the positive influence of the classroom educational experience.

Large class size affects the interaction between the teacher and the students. The students are expected to do class works, home works and assignments frequently and the teacher is expected to correct these assignments and give feedback to the students, but when the number of students in a class is very large it makes this task impossible and it affects the progress of each child because of not getting the correct feedback timely. The large class size has also other impacts such as suffocated class rooms, hinder active participation of all students in class discussions, inconvenience in assessing each student, uncomfortable sitting and writing conditions etc.

School officials and policymakers also have to face the problem of the effect of class size reduction on the supply of teachers and more class rooms. If the supply of teachers remains the same and class size reduction increases the demand, then it would seem that class size reduction policies would result in the hiring of less qualified teachers or shortage of teachers.

Collaborative learning - Students working together usually in small groups, on a shared activity and with a common goal - has been widely recommended in recent years as a strategy to enhance Mathematics learning for all students (Barnes, M. 2000). The traditional way of teaching is based on competitive and individualistic learning, which makes students work against each other to show who the best is.

Cooperative learning is advisable particularly in Mathematics class as Mathematics concepts and skills are best learned as a dynamic process with active engagement of the students, talking through Mathematics problems with classmates helps students understand how to solve the problem correctly, it helps them to communicate effectively, it develops confidence in their individual Mathematics abilities, it helps them to learn more about future carriers from peers. In general cooperative learning creates more positive attitude towards Mathematics (Trafton, P.R. & Shulte, A.P. 1989). It also helps students to develop self discipline and good social habits, while providing opportunities for language development and concept growth (Irving, J. 1972).

However, attention should be given to back draws of cooperative teaching such as less able members leaving all the tasks to the able ones, more able students may be reserved in the assumption that they are always sucked by the others, uneven division of labor, negative reaction among the group members and other possible barriers.

2.12. Impact of Language and Culture in the Learning of Mathematics

Mathematics is a subject with its own language. Different Mathematical symbols and figures which make it hard for the child to understand the concept, besides if a child is from a language group other than the language used as medium of instruction in the school, the situation becomes more complicated.

For students learning in their second language particularly when the teacher and the students have no common language it is hard to understand the concepts easily even sometimes the wordings teachers use could be confusing and not easy to understand. When children are learning in a second language they are supposed to do the thinking in their first language and then the communication in the second, which is of course, is additional burden for the children. Some Mathematical terminologies and symbols are not easy to translate to other languages (example no Amharic words for symmetry and octagon). These problems are summarized by Berry, J.W. (1985, p20) as

“In general it is likely to be easier for a student to function effectively in a second language which is semantically and culturally close to his mother tongue than in one which is remote for the structure of person’s language has a determining influence on that person’s cognitive processes such as classification and recognition of equivalences-processes which are central to the understanding of Mathematical concepts”.

Ethiopia is a multilingual country and significant numbers of residents in the surrounding area of the school are people who came from rural areas and they have their own language. Students of these parents use a language other than the language used in the school as medium of instruction and hence they face the challenges discussed above.

CHAPTER THREE

3.1. Research Design and Methods

This chapter presents the method used in the study. Descriptive survey was used for the study as the research design; hence the source of data, sampling procedures; data collecting instruments and the procedures followed for data collection and data analysis are included.

Designing the research methods and procedures is very essential in answering research questions, so in order to answer the basic research questions posed earlier. The researcher used the following research methodologies.

In general, the researcher employed mixed approach (both qualitative and quantitative) descriptive survey design. The aims of this study were: to identify the challenges and opportunities of student-centered method of teaching-learning mathematics and obtain information about its importance, to assess the status of the application of student-centered approach in teaching - learning mathematics in Government secondary school of East wollega zone.

Descriptive survey design were employed because, it helps to explain educational phenomena in terms of the conditions or relationships that exist and opinions that are held by the students, mathematics teachers and experts, processes that are going on, effects that are evident, or trends that are developing. At times descriptive survey is the means through which opinions, attitudes, suggestions for educational practices can be obtained (Kaul, 1996:403).

In addition to this, the qualitative approach were used to supplement or to get an in-depth understanding of complex process especially related to human behavior that affects the implementation of student-centered method of teaching-learning mathematics.

3.2. Source of Data

The primary sources of data collection for this study were the students, mathematics teachers, principals, and supervisor of the woreda officials (curriculum workers) of randomly selected five secondary schools of East Wollega Zone. And the secondary sources were research papers, articles and publications, websites, relevant books and journals.

3.3. Population and Sampling Technique

Accordingly, samples were taken from students, mathematics teachers, principals and supervisors (curriculum workers). This mainly obtained by various factors. Such as: large number of respondents and scope of the schools. Therefore, it is necessary to draw representative sampling using different sampling techniques. In this case, availability, random sampling and purposive sampling technique were employed to select respondents. Moreover, purposive sampling also used to select Secondary schools of East Wollega Zone.

In addition: Availability, random sampling and purposive sampling technique was used in selecting the subjects of the study. Availability sampling enables the researcher to select subjects based on availability. It is often appropriate to get some sense of prevailing attitudes (Chambuss and Schutt, 2007).

Even though there were private secondary schools in the Zone, only government schools were taken for the study assuming that the samples from the government schools can best represent the total population of the schools in the zone. As the researcher observed from East wollega Zone office there were 30 Government secondary schools in the Zone, which were widely scattered. Because of this reason, it was difficult to complete the work under the limit of time if all high schools were included in the study. So that only four high schools, (13.3% of the total secondary schools) were selected by purposive, namely, Gute, Darge, Sire, and Ifa high schools were selected using purposive sampling to make the sample representative of the population. The sample woredas, schools and source of data are summarized in tables bellow:

3.3.1. Summary of Total population (Students, Mathematics Teachers, Principals, Supervisors) and Their Samples

Random sampling was the best way to obtain good representative sample of a population; for it gives equal and independent chance of being selected for each and every member of a population purposive sampling is also used when a researcher wants to select a sample population on his/her own judgment, based on his prior information, that he/she believed to provide him/her the data he/she needs (Fraenkel, J.R. and Wallen, N.E. 2000).

3.3.1.1. Sample of mathematics teachers

The main reason that the sample used is to make the data collection process manageable.

Accordingly, samples of mathematics teachers were taken from sample schools to make the study manageable by purposive sampling; because of mathematics teachers are small in number and with different experiences.

Table-1: Sample of mathematics teachers included in the study.

No	Name of sample schools	Woreda	No. of mathematics teachers in schools			No. of sample teacher taken		
			Male	Female	Total	Male	Female	Total
1	Gute	Wayu Tuka	5	-	5	2	-	2
2	Darge	Nekemte Town	9	3	12	3	1	4
3	Sire	Sibu Sire	8	2	10	3	1	4
4	Ifa	Diga Ifa	5	1	6	2	1	3
Total			27	6	33	10	3	13

As indicated in the above table, from four sample woredas, there were thirteen (13) mathematics teachers from the total of thirty three (33) mathematics teachers located in the sample schools were selected by purposive to complete the study under the limited of time.

Mathematics teachers in the sample schools filled the questionnaire using purposive sampling hence they were small in number. Moreover, to make the study manageable, the researcher used compiled closed-ended, open-ended and rating-scale questionnaire were used and mathematics teachers complete the questionnaire and filled their ideas on the space provided.

3.3.1.2. Sample of Principal and supervisor

Samples of principals were taken by purposive sampling technique, whereas availability for supervisors was used. The major cause for including different individuals from different levels is that to make the study reliable and understandable.

Table-2: Sample of Principal and supervisor included in the study.

No	Name of sample school	Woreda	No. of principals in school			No. of sample principal taken			No. of sample supervisor taken		
			Male	Female	Total	Male	Female	Total	Male	Female	Total
1	Gute	Wayu Tuka	3	-	3	1	-	1	1	-	1
2	Darge	Nekemte Town	3	-	3	1	-	1	1	-	1
3	Sire	Sibu Sire	3	-	3	1	-	1	1	-	1
4	Ifa	Diga Ifa	2	1	3	1	-	1	1	-	1
Total			11	1	12	4	-	4	4		4

In table 2 above, from four sample woredas, there were four (4) principals from the total twelve (12) were interviewed and based on questionnaires with close-ended and open-ended questions were prepared for four (4) supervisors of sample schools. In addition to this, the case of female principal not included in the study was the absence during the researcher observing the schools.

3.3.1.3. Sample of Students

Samples of students were taken using random sample from selected schools to make the study manageable. Different individuals with different roles and responsibilities would generate different ideas on the problems in the teaching and learning mathematics in the secondary schools of the Zone.

Table-3: Sample of Students included in the study.

No	Name of sample school	Grade level	No. of students in school			No. of sample students taken		
			Male	Female	Total	Male	Female	Total
1	Gute	9 th	304	219	523	13	9	22
		10 th	313	235	548	16	13	29
2	Darge	9 th	385	227	612	19	12	31
		10 th	326	256	582	15	11	26
3	Sire	9 th	439	329	768	20	14	34
		10 th	496	373	869	25	20	45
4	Ifa	9 th	246	174	420	12	9	21
		10 th	231	177	408	11	8	19
Total			2740	1990	4730	131	96	227

Based on the above table 3, questionnaires were prepared for sample students; 227 students were randomly selected from the total of 4730 students from the sample high schools grade nine (9) and ten (10) students. These numbers of students were used due to large number of students in the school to facilitate the representativeness of the sample. The selected students were: 51 from Gute, 57 from Darge, 79 from Sire and 40 from Ifa high schools based on random sampling hence different number of students are in the school.

3.4. Tools of Data Collection

The data for the study were collected using four data collecting instruments, namely questionnaire, observation, interview and document analysis.

3.4.1. Questionnaire

A questionnaire is a means of collecting different kinds of data in research. It is widely used in educational research to obtain information about certain conditions and practices, and to inquire in to opinions and attitudes of individuals or groups (kaul, 1996: 142). Based on these facts to get valuable information from students, mathematics teachers, principals and supervisors; both closed (restricted) and open (unrestricted) form of questionnaires were employed.

For mathematics teachers a questionnaire with four parts were prepared. To get information about mathematics teachers training and availability and usage of instructional materials two types of questionnaires were prepared. To get information about mathematics teachers understanding and the application of different strategies of student-centered method of teaching-learning mathematics, rating scale were used. To get information from supervisors and students questionnaires and rating scale were used as well. The questionnaire prepared was presented with the advisor of the research.

Finally, the modified and improved questionnaire was distributed among sample schools of the respondents with the necessary explanations on how to complete it. Thus, 13-questionnaires to mathematics teachers, 227-questionnaires to the students, 4-questionnaires to the supervisors and interviews for principals; thus a total of 244-questionnaires were distributed among respondents. From the distributed students' questionnaires, 28 students didn't complete correctly the questionnaires and 213 questionnaires (93.8%) were returned from students.

Based on this the researcher organized carefully the questionnaires of mathematics teachers, students and supervisors to analyze and interpret the practicability of the student-centered approach as an effective teaching-learning instruction of mathematics in their respective schools.

3.4.2. Classroom Observation

To gather more reliable information, observation in the actual classroom teaching-learning process was used as additional data gathering instrument. Observation checklist was also employed to collect the data. A minimum of 40 minute observation time was taken for collecting information in each sample schools focusing mainly on mathematics teacher and students' interaction, classroom population and facilities. Observations for mathematics subjects were given enough emphasis on teachers and students activities in relation to the classroom instruction.

The main advantage of this method is that biases can be eliminated, if observation is done accurately and the information obtained under this method relates to what is currently happening. Observation methods have occupied an important place in descriptive educational research (Kaul, 1996).

Therefore, classroom observation was one of the supplementary data collecting instruments in this study to assess the type of instructional methods being applied during classroom instruction. Hence, structured observation was conducted, to undertake descriptive studies.

Check list prepared for classroom observation was contained four major parts namely, the activities of teachers, the activities of students, availability and usage of instructional materials and school facilities.

The observation totally focused on how the strategies of the student-centered method of teaching-learning mathematics were applied in the real classroom situation. The researcher recorded the presence and absence of activities listed in the checklist.

In general, through observation the researcher get full opportunity to see the actual classroom instructional activity. This helps to know whether the student-centered approach is practically implemented in the classroom or not. Also the researcher tries to observe the feeling and condition on the side of students.

3.4.3. Interview

The interview permits greater depth of response, which is not possible through any other means. It also enables an interviewer to get information concerning feelings, attitudes or emotions in relation to certain questions (Kaul, 1996: 168). In this study, interview was used to collect supplementary information, about the application of student-centered method of teaching-learning mathematics from the principals. It was used to get an in depth and more information, which were of great value in interpreting results. Principals were selected for interview because; they were responsible for the whole activities that are going on in schools. They are also the once who follow-up, evaluate and report the application of the student-centered method of teaching-learning mathematics in their schools and they can have detailed information on the application. This helped the researcher to gather more and significant information that can strengthen the study.

Based on this, from four (4) sample schools four principals were interviewed. The interview was conducted for 50 minutes to an hour with each principal. Note was taken carefully during the interview.

In general, interview method is used in order to fill the gap which might be left by the questionnaire. In addition, through this method the researcher has the chance to see face feeling while the respondents responding. This interview was open-ended which invite to reflect any of their felling and understanding around the implementation of student-centered mathematics instruction and its challenges in their school and the interview data used as direct quotation during analysis.

3.4.4. Document Analysis

Best and Khan (1993:191-193) discussed that document analysis are important and relevant sources of qualitative study. That means, document sources could serve as useful purpose in yielding information that is helpful in explaining social or educational practices. Therefore, to collect information about the student's results, the number of teachers and their total teaching load, number of students in a class, number of students-textbook ratio and the availability of curricular materials, the availability of instructional materials and reference books in the library and how it is utilized was searched (conducted) using document analysis.

3.4.5. Focus Group Discussion

It is rapidly becoming one of the major research tools to understand people's thoughts and feelings. Accordingly, the researcher conducted by inviting 11-students together for a few hours to share their ideas on how the work is done. The meetings were held in an enjoyable place, and snacks are served to create a relaxed situation (environment) of the school. The researcher starts with a broad question before moving to more specific issues, encouraging open and easy discussion to bring out true feelings and thoughts. At the same time, the interviewer focuses the discussion, hence the name focus group interviewing and often held to help to determine the subject areas on which questions should be asked in a later.

3.5. Procedure of Data Collection

The researcher adopted three steps in collecting the data for the study. First, relevant literature was reviewed to get adequate information on the topic. Second, objectives and research question were formulated to show the direction of the study. Third, data gathering tools were developed and piloted. After the questionnaire was distributed and collected, classroom observations and document analysis have taken place. Finally the interview with principals was conducted.

3.6. Piloting the Questionnaire

Once the researcher constructed the questionnaires, he should pilot it. This means that the researcher must test it out to see if it is obtaining the result required. So the pilot study was conducted to check the validity and reliability of the items in the questionnaires and to make necessary corrections based on the feedback obtained. Accordingly, a draft of questionnaire was administered to 20-students, 3-mathematics teachers and 1-supervisors of Garjo Fite high school other than the sample schools before fully used in the actual study. The participants in the pilot study were informed about the objectives of the pilot study and how to fill, evaluate and give feedback on the relevance of the contents, length, types of questions, and lay out of the questionnaire. Respondents were given to provide feedback in which all of them did. On the basis of their comment, questions which were not responded by the respondents were rejected and shortening of length of questions, restating unclear statements were made. The questionnaires were also given to my advisor and comments were taken into consideration. Moreover, all the respondents in general evaluated the questionnaires and commented on the clarity of objectives, use of simple language and to minimize the length of the questions. Their suggestions also helped the researcher to modify the questionnaires before the final copies of the questionnaires were distributed.

To test the reliability of the items in the instruments Cronbach coefficient of alpha and kuder-Richardson formula 20 (K-R 20) methods were used and the results of the test were stated.

The reliability of students' questionnaire was checked in two ways depending on the nature of the questions.

The reliability of 'Yes' or 'No' items was calculated in the kuder-Richardson formula 20 (K-R 20) methods and it was satisfactory i.e. 0.87. Whereas, the reliability of rating-scaled items of

students' questionnaire was calculated by the cronbach's alpha was 0.69. This is recommended. The reliability of the mathematics teachers' questionnaire was analyzed using the same method. The reliability of 'Yes' or 'No' items was 0.92 by kuder- Richardson formula 20 (K-R 20) methods and the rating-scaled items had the cronbach's alpha reliability of 0.76. Hence, the reliability of the questionnaire is recommended. The reliability of the supervisors' questionnaire was also analyzed in the same way by the same tool. The reliability of 'Yes' or 'No' items was 0.73 by kuder- Richardson formula 20 (K-R 20) methods and the rating-scaled items had the cronbach's alpha reliability of 0.80. Hence, the reliability of the questionnaire is recommended.

3.7. Methods of Data Analysis

The descriptive survey design quantitative and qualitative methods of data analysis were used. The gathered data were tabulated in to numeric and organized and interpreted. In order to express ideas to the reader in a way easily understandable, tables showing, the item alternative responses and the respondent's number were converted in to percentile.

In order to analyze the challenges and opportunities of teaching and learning mathematics in secondary schools of East wollega zone; first relevant literature was reviewed to see what has been done in relation to the study, second, data gathering tools were prepared. And my advisor gave relevant comments about the instruments.

Then, pilot testing was conducted before the questionnaires were administered to the actual respondents. A pilot study was conducted in Garjo Fite Secondary School to check the relevance of each item. Then the questionnaires were distributed to 20-students, 3-mathematics teachers, 1-principal and 1-supervisor. Based on the pilot study results, the instruments were improved. Items that were detected as confusing to participants to respond were paraphrased and some of them were totally omitted.

After improving the questionnaire on the bases of the feedback from the pilot test, it was administered to the respondents with the necessary explanations on how to complete it. Finally, the data were collected from respondents. Therefore, a descriptive survey design qualitative and quantitative methods were employed. The data collected through questionnaire was analyzed quantitatively: percentage, mean value, and grand mean were used. On the other hand, the data

collected through the interview, observation and documents analysis were analyzed using qualitative method. The information obtained from the respondents of rating scales, closed-ended and open-ended questions, the recorded information in the checklist during observation and opinion gathered through interview were structured, organized and framed to suit analysis and interpretation.

In general, depending on the data analysis, interpretation, summary, and conclusions were given with careful recommendations.

CHAPTER FOUR

4. Presentation and Analysis of Data

This chapter deals with presentation and analysis of data that are divided in to two main parts. The first part deals with the background information of the respondents and the second, with the analysis and presentation of the data related to the application of student-centered method of teaching-learning mathematics: challenges and opportunities in secondary schools of East Wollega Zone (Oromia Region).

4.1. Background Information of the Respondents

4.1.1. Background information of, mathematics teachers, principals and supervisors

The respondents of this study were students, mathematics teachers, principals and supervisors of the selected secondary schools of East Wollega Zone (Oromia Region). The background information of students, mathematics teachers, principals and supervisors respondents is summarized below.

Table: 4. Background information of mathematics teachers, principals and supervisors.

No	Respondents	Characteristics'		N	%
1	School Principals	Sex	Male	4	100
			Female	-	-
		Age	20-25	-	-
			26-30	1	25
			31-35	1	25
			36-40	1	25
			>40	1	25
Qualification	Dippiloma	-	-		
	Degree	4	100		
	Masters	-	-		
	Total Experience	0-5	-	-	
		6-10	-	-	
		11-15	1	25	
		16-20	2	50	
		21-25	-	-	
		26-30	1	25	
		Year of Experience as a director	0-5	2	50
6-10	2		50		
2	Supervisor	Sex	Male	3	75
			Female	1	25
		Age	20-25	-	-
			26-30	1	25
			31-35	1	25
			36-40	2	50
			>40	-	-
Qualification	Dippiloma	-	-		
	Degree	1	25		
	Masters	3	75		
	Total Experience	10-15	1	25	
		16-20	-	-	
		21-25	1	25	
		26-30	2	50	
		Year of Experience as a supervisor	0-5	1	25
6-10	3		75		
3	Mathematics Teachers	Sex	Male	10	76.9
			Female	3	23.1
		Age	20-25	2	15.4
			26-30	4	30.8
			31-35	3	23.1
			36-40	1	7.7
			>40	3	23.1
		Qualification	M.sc/M.Ed	-	-
			B.Sc/B.Ed	13	10
			Diploma	-	-
		Total Experience as a mathematics Teacher in Secondary school	1-5	2	15.4
6-10	6		46.1		
11-15	1		7.7		
16-20	1		7.7		
21-25	1		7.7		
>25	2		15.4		

As indicated in table 4 above out of total 13 teachers, 10(76.9%) were males and 3(23.1%) were females. Compared with male teachers, the number of female teachers in secondary schools was lower. The same table also shows that from total number of supervisors and principals assigned in sample schools or weredas education offices, 75% and 100% were males respectively. This

shows that the participation of females as teachers in secondary schools is low. In these schools females' involvement in education management was not also seen. These data clearly implies the need for some kind of strategies to promote female participation both teachers and as managers of education system.

Table 4 indicates that more than 53.9% of mathematics teachers, 75% of the principals and 75% of the school supervisors included in this study were between the ages of 31-50. Qualification wise, 100% of the teachers teaching mathematics and principals in secondary schools were degree (B.Sc/B.Ed) graduates. Of the supervisors included in this study, 25% were also graduates of degree (B.Sc/B.Ed) and the majority 75% of the graduates are Masters. This implies that through the New Education and Training policy of Ethiopia requires everyone to have Masters to teach in secondary schools.

Concerning experience, 61.5% of the teachers have an experience that ranges between 0-10 years, whereas, the remaining 38.5% have experience above 10 years. Thus, the experienced and new teachers were well intermingled (mix together with some else) and can share experience from each other. In the case of principals and supervisors, though they have long years experience, the experience they have on their current position is low. About 25% of the supervisors and none of the principals have served for 0-5 years.

3.1.2. Background Information of Students

As mentioned earlier in chapter three, the students were the subject of the study. Here below is the analysis of the data obtained from students' background information.

Table: 5. Background information of students

Respondents	Characteristics'		N	%
Students	Sex	Male	115	57.8
		Female	84	42.2
	Grade Level	Grade-9	81	40.7
		Grade-10	118	59.3
	Age	≤15	23	11.6
		16-20	176	88.4
		≥21	-	-

As indicated in table 5, 57.8% of the students included in the study were males while 42.2% were females. This shows that as there is a gap between male and female students in enrolment.

Regarding age 88.4% of the students were between 15-17. This age is an average school age for grade 9 and 10.

4.2. Analysis of Application of Student-Centered Method of teaching and learning mathematics in Secondary Schools.

This part deals with the analysis of data obtained from questionnaires, observations and interviews. The analysis gives emphasis to teachers' understanding of principles of student-centered method, student-centered methods towards teaching-learning mathematics, the support of wereda and zone education offices to school in applying student-centered method of teaching-learning, the way student-centered strategies are designed and applied in the classrooms and factors that affect the application of student-centered method and its opportunities in secondary schools.

4.2.1. Teachers understanding of Student-centered Method of teaching and learning mathematics.

It is obvious that, the instructional methods used in schools are highly influenced by implementers' understanding towards that method than any other factor. That is, as implementers of any innovation (origination) of classroom teaching, teachers are the influential factors in any education system. The success or failure of any instructional method ultimately depends on the attitudes, values, skills and ability of classroom teachers. From this point of view, teachers' understanding of principles of student-centered method is very crucial in application of the method.

For the analysis and interpretation of understanding of teachers about student-centered method Likert scale was used. The responses indicating degrees of strength of understanding of teachers were strongly agree, agree, undecided, disagree and strongly disagree.

Arbitrary scoring weights of 5, 4, 3, 2 and 1 were used for strongly agree, agree, undecided, disagree and strongly disagree, respectively for statements favoring a point of view of student-centered method. On the other hand, the scoring weights of 1, 2, 3, 4 and 5 were used for respective responses for statements opposing the points of view of learner-centered method (Kaul, 1996:166).

Table: 6. Responses of teachers on the student-centered method.

Item III	strongly agree		agree		undecided		disagree		strongly disagree		Σf.v
	N	%	N	%	N	%	N	%	N	%	
learner prior knowledge determine about new topics they learn in the class.	8	61.5	4	30.7	-	-	1	7.7	-	-	58
learning is self-initiated.	4	30.7	7	53.8	-	-	1	7.7	1	7.7	51
student-centered method of teaching and learning mathematics helps the learners to share experience and learn from each other.	10	76.9	2	15.3	1	7.7	-	-	-	-	61
student-centered method of teaching-learning mathematics develops self-confidence and independent learning for the learners solving problems.	9	69.2	4	30.8	-	-	-	-	-	-	61
teachers and texts are the source of knowledge in teaching and learning mathematics.	4	30.7	6	46.1	-	-	-	-	3	23	47
learning occurs when learners are silent and receive information from teachers.	2	15.3	4	30.8	-	-	2	15.3	5	38.4	35
learning is the responsibility of the students.	3	23	8	61.5	-	-	2	15.3	-	-	51
the role of the mathematics teacher is facilitating the learning process rather than controlling.	4	30.8	6	46.1	-	-	-	-	3	23	47
teacher's task is to prepare learners to absorb the subject matter in the text book to select it effectively in the exam.	2	15.3	8	61.5	1	7.7	2	15.3	-	-	49
learners should participate in deciding what should be learned and what methods should be used in the classroom.	4	30.8	7	53.8	-	-	2	15.3	-	-	52
student-centered method of teaching-learning mathematics prepares the learners to solve real and practical problems of the society.	12	92.3	1	7.7	-	-	-	-	-	-	64
it is impossible to implement student-centered method of teaching and learning mathematics in a large class size.	6	46.1	4	30.8	2	15.3	1	7.7	-	-	54
since student-centered approach of teaching and learning mathematics takes time, it is difficult to implement it.	2	15.3	4	30.8	1	7.7	3	23	3	23	38
teacher's role is less important in student-centered method of teaching-learning mathematics than in teacher-centered method.	2	15.3	2	15.3	2	15.3	4	30.8	3	23	25
lecture method is advantageous for long-term relation of knowledge and motivation in teaching-learning mathematics.	2	15.3	1	7.7	2	15.3	5	38.4	3	23	33
learning mathematics is effective when teachers have good knowledge of teaching mathematics.	9	69.2	4	30.8	-	-	-	-	-	-	61
Aggregate Mean											

Table 6 presents the responses of teachers on student-centered method of teaching and learning mathematics: challenges and opportunities. Item 1 says “Learner prior knowledge determine about new topics they learn in the class”. About 92.2% of the respondents strongly agreed and agreed with this statement. The mean value was 4.4. Regarding the role of prior knowledge play in student-centered approach, Temechegn Engida. (2001:69) indicated that learners construct knowledge by integrating new information and experiences in to what they have previously came to understand revising and re-interpreting old knowledge to reconcile it with the new one. Similarly Plass, H. (1998) emphasized that learner prior knowledge and experience is an integral part of the teaching-learning process. On contrary to these assertions about 7.7% of the respondents disagree on this item and this reflects that, almost none of teachers still have low understanding on the role of prior knowledge.

Items 2, 3 and 4 were stated as “Learning is self-initiated”, “Student-centered method of teaching and learning mathematics helps the learners to share experience and learn from each other”, and “Student-centered method of teaching-learning mathematics develops self-confidence and independent learning for the learners solving problems”, respectively. As can be seen from the table these items were better understood by the respondents relatively than any other items in the rating scale. 84.5%, 92.2% and 100% of the respondents strongly agreed and agreed on the assertions, respectively. The mean values for these items were also relatively higher than the others that are 3.9, 4.6 and 4.6, respectively. Even though, these items were relatively well understood than other items, still the result implies the number of respondents lack to implement the basic principles of student-centered method of teaching-learning mathematics. For instance, 7.7% of teachers strongly disagree or didn’t accept what we self-initiate teaching-learning mathematics and teachers strongly disagree with the idea that student-centered method develops self-confident and independent learning on students.

Item 5 is about the source of knowledge. The statement says “Teachers and texts are the source of knowledge in teaching and learning mathematics”. Regarding this item, nearly all teachers (76.8%) included in this study strongly agree and agree that the source of knowledge are teachers and text books. Item 6 which says “Learning occurs when learners are silent and receive information from teachers” was also strongly agree and agreed by the respondents, that is 46.1%

of the respondents said students learn by receiving information from teachers. Their mean values are 3.6 and 2.6 respectively.

What can be said from the above finding is that knowledge is not something that can be simply given by teachers from the text book to students who are passive and silent in their desk. Rather, it is constructed by the learners through an active, mental process of development. Learners are the builders and creators of meaning and knowledge through active participation in teaching-learning process.

Items 7 and 8 “Learning is the responsibility of the students” and “The role of the mathematics teacher is facilitating the learning process rather than controlling” were strongly agree and agree by 84.5% and 76.9% of the respondents, respectively. Their mean values were 3.9 and 3.6 respectively. The responsibility of learners in student-centered classes Temechegn Engida. (2001:43) emphasized that the learner has full responsibility for his /her own learning. Learning is self-initiated and often involves the process of inquiry and discovery. Similarly; concerning the role of teacher as a facilitator, Amare Asegedom. (2000:75) emphasized that the appropriate role of teachers is accepted to be managerial rather than pedagogical. They are expected to facilitate students learning. They do so by encouraging student’s activities and student’s performance and by discovering teachers’ performance in the classrooms. In addition, these basic principles of student-centered method were not properly implemented by 15.3% and 23% of the respondents.

Item 9 which say “Teacher’s task is to prepare learners to absorb the subject matter in the text book to reflect it effectively in the exam” was strongly agree and agreed by 76.8% of the respondents. Moreover, the mean value for this item was 3.7. This result that teachers’ task is to prepare students to learn effectively and teachers teach in a proper method.

The teacher must encourage learners to investigate, to understand the world around them, to analyze, to draw conclusions and communicate. However, this basic task of teachers in student-centered method of teaching-learning mathematics was not properly implemented by some of the teachers included in the study.

Item 10 says “Learners should participate in deciding what should be learned and what methods should be used in the classroom”. This was strongly agreed and agreed by 84.6% of the

respondents. This is consistent with Temechehgn's Engida. (2001:44) idea that asserts learners' involvement and participation is necessary for learning. If the learner is fully involved, he/she doesn't have to seek outside approval, approval seeking negates unhampered participation. If learners participate in determining goals, procedures and process of evaluation, they tend to have a sense of commitment and personal agency. They develop feeling of responsibility for what is done and for the outcome. It is these basic concepts that were misunderstood by some of the respondents of this study.

Item 11 which reads "Student-centered method of teaching-learning mathematics prepares the learners to solve real and practical problems of the society" was strongly agreed and agreed by 100% of the respondents. Items 12 and 13, which says: "It is impossible to implement student-centered method of teaching and learning mathematics in a large class size" and "Since student-centered approach of teaching and learning mathematics takes time, it is difficult to implement it", respectively were strongly agreed and agreed by the respondents. That is out of the total respondents, 76.9% and 46.1% was agreed with items 12 and 13, with mean values of 4.1 and 2.9 respectively. This clearly shows that contrary to Lue's , E. (2000:15) assertion, which says student-centered, method or active-learning is also probably the most productive approach for teachers with large class size and few resources. Majority of the respondents indicated the impossibility of implementing student-centered method in large classes. On the other hand, item 14 in the above table indicates that about 30.6% of the respondents strongly agreed and agreed with the statement that says "Teacher's role is less important in student-centered method of teaching-learning mathematics than in teacher-centered method". However, as indicated above, the respondents understand the role of teachers play, 53.8% of the respondents disagreed and strongly disagreed in the student-centered method of teaching-learning mathematics stated in the item 14. As indicated in literature part of this paper, in student-centered method the teacher is no less important than in the teacher-centered classroom. He has a great responsibility to guide and manage the activities and make sure that all students are working productively on the activities and monitor the progress of all pupils.

Item 15 in the same table reads "Lecture method is advantageous for long-term relation of knowledge and motivation for teaching-learning mathematics". This was strongly agreed and agreed by 23% of the respondents with mean value of 2.5. Though scholars like Schofield, H.

(1972) clearly criticized lecture for it decreases student's attention and appeals only to auditory learners and promotes lower level of learning of information, majority of the respondents not clear with the advantages and disadvantages of lecture method. As clearly indicated by these scholars during lecturing, student's attention decreases with each passing minute.

The last item in the Likert scale reads "Learning mathematics is effective when teachers have good knowledge of teaching-learning mathematics", this was strongly agreed and agreed by 100% of the respondents with mean value of 4.6, which is the highest one. The teachers effectively related learning with subject matter knowledge of teaching-learning of mathematics. But for effective teaching-learning, the role of the learners plays in their learning should be considered. Amare Asegedom, (2000) indicate that good teachers' qualities and good teachers' knowledge of subject matter don't necessarily result in effective learning. Students learn more when they have internal commitments and they needs to learn as the process of learning is an active process and not a passive one. It is the learner's activities' and not the activities of their teachers that result in learning. Thus, these basic concepts of student-centered method of teaching-learning mathematics were not implemented properly by the majority of the teacher respondents in this study.

As a whole from the discussion made one can understood that mathematics teachers included in the study show something not clear the use of student-centered method of teaching-learning mathematics. The grand mean score of 3.73 on the scale is also nearer to agreement. This means understanding of teachers about methods of instruction is very important. Nevertheless, scholars advised that knowledge about different approaches to teaching will give the power to choose ways to teach that will help to achieve the highest goals. Moreover, understanding different approaches offers ways to think about what one is doing and what relation exists between what one intends as a teacher and what actually he does with learners. Finally, the low understanding of the student-centered method of teaching-learning mathematics by teachers has an impact on the implementation of the method.

4.2.2. Support of Wereda and Zone Education Offices to High Schools

As indicated in literature part of this paper, education systems provide services to schools to help them succeed. This includes providing information and training regarding instructional

practices and also monitoring and evaluating schools teaching methodology and academic performances. Schools perform better in teaching-learning process when the education authorities outside school provide the necessary support to instructional practices. This support is given to school based on the results of supervision. That means, supervision can play a great role in teaching-learning process by providing profession assistance guidance to classroom teachers. In addition to these, qualified teachers and sufficient budget are also among the important factors that enhance the teaching-learning process in schools that has to be provided by the education offices. In order to analyze the support of wereda and zone education offices data gathered from education supervisors is organized as follows.

Table: 7. Response of supervisors to the support of wereda / zone offices

No.	Items	Response	N	%
1	Do offices assign adequate budget to secondary schools?	a.yes	-	-
		b.no	4	100
2	Have you had training on how to supervise schools?	a.yes	4	100
		b.no	-	-
3	If your answer for question 2 is yes, did the training help you to effectively supervise schools?	a.yes	3	75
		b.no	1	25
4	Have you ever taken training about student-centered method of teaching and learning?	a.yes	4	100
		b.no	-	-
5	If you have taken training on student-centered method, did it help you to provide effective support to schools on how to implement the method?	a.yes	4	100
		b.no	-	-
6	Do all schools get adequate supervision in your woreda / zone?	a.yes	1	25
		b.no	3	75
8	Do the woreda / zone education office provide short and long-term training to teachers regularly?	a.yes	2	50
		b.no	2	50
10	How often do supervisors supervise one school in one academic year?	a.once	-	-
		b.twice	1	25
		c.3-times	-	-
		d.4-times	3	75
11	Do supervisors have transport facility to supervise schools?	a.yes	-	-
		b.no	4	100
13	Do numbers of schools affect supervisory activities?	a.yes	3	75
		b.no	1	25
14	Do schools exercise in staff training?	a.yes	3	75
		b.no	1	25

As indicated in the above table 7, 100% the respondents from the sample schools replied that, the concerned offices don't assign adequate budget to secondary schools. Regarding training on how to supervise Schools 100% of the supervisors noted that they had taken training on how to support schools. From those who have taken the training most of them 75% replied that the training helped them to effectively supervise schools. Also 100% of the supervisors had taken training on the learner-centered method of teaching-learning. Again those who have taken

training on the learner-centered method of teaching-learning, 100% replied that the training they have taken help them to provide effective support to schools on how to implement the method. As indicated above, the supervisors taking the training help them to provide effective support to schools. The knowledge of supervisors on their profession and their understanding about student-centered method can affect their activities in giving professional assistance in helping, facilitating and solving problems in implementing learner-centered method of teaching-learning mathematics.

Most of the supervisors, 75% replied that, all schools in their wereda/zone did not get adequate supervision. About 50% of the supervisors also replied that wereda and zone education offices provide short and long term training to teachers. This can provide the application of student-centered method of teaching-learning in schools. Regarding the extent of supervising one school in one academic year, 75% of the supervisors replied that supervisors supervise one-school 4-times in one academic year and the remaining 25% replied that one school is supervised twice in one academic year. Concerning transport facility to supervise schools all the supervisors 100% replied that, there is no transport facility to supervise schools. Also 75% the supervisors responded that the number of schools in their wereda / zone had affected their supervisory activities. This indicates that in addition to their knowledge of supervision that affected their role of supervising schools, transport facilities and number of schools also affected the role of supervisors. This considered with the problems of facilities for providing supervisory support to schools. Similarly, these factors affected the role of supervisors in providing support to schools in the zone.

On the other hand, 75% of the sample school supervisors replied that schools exercise in staff training and 25% of them are did not exercise in staff training.

4.2.2.1. Supervisors Emphasis on Activities of schools during supervision

The basic purpose of this section is to explain and to discuss the supervisors' emphasis on activities of schools during supervision makes motivated students and teachers as well as different teaching-learning styles considered in this study. To analyze the data descriptive statistics was used.

Table: 8. Supervisors Response to their Emphasis during Supervision

No	Items	1 st		2 nd		3 rd		4 th		5 th		6 th	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Teacher discipline	-	-	2	50	1	25	1	25	-	-	-	-
2	Students discipline	2	50	1	25	-	-	1	25	-	-	-	-
3	The activities of the director	1	25	-	-	2	50	-	-	-	-	1	25
4	Content coverage	-	-	1	25	-	-	-	-	3	75	-	-
5	Method of instruction	1	25	-	-	-	-	2	50	-	-	1	25
6	School resource management	-	-	-	-	1	25	-	-	1	25	3	50

The data in table 8 shows the emphasis supervisors give when supervising schools. Accordingly, 50% of the respondents replied that they give 1st emphasis to students discipline during school supervision. About 50% of the respondents replied the supervisors ranked the teacher discipline on the 2nd level during supervision. The activities of the director were ranked 3rd by 50% of the respondents. The method of instruction which is very important in teaching-learning process is ranked 4th level by 50% of the respondents. From this one can concluded that supervisors don't give priority to method of instruction during school supervision. In addition, Content coverage and school resource management were ranked 5th and 6th respectively by 75 % and 50% of the respondents.

As far as school supervision is concerned, supervisors should focus on providing feedback, mentoring, and guiding, redirecting and giving professional assistance for the purpose of solving procedures and improving the teaching and learning environment. To properly implement the student-centered method of teaching-learning mathematics instruction in schools, the supervisors should supervise the teaching-learning methodology, coach teacher, evaluate and monitor instructional activities. However, this was not practiced according to the response of the supervisors. To exercise these activities the supervisors don't have adequate training on their profession and student-centered method of teaching-learning. This was reflected by the emphasis they have given to their activities while supervising schools. They ranked method of instruction on 4th level. This indicated that the supervisors were not giving much emphasis to the instructional method. This was supported by the principals during the interview. The director noted that the supervisors give more emphasis to administrative issues than instructional activities. According to the response the supervisors and principals, wereda and zone education

offices are not providing necessary support to schools in applying student-centered method of teaching-learning mathematics: challenges and opportunities.

4.2.3. Factors Affecting the Application of Student-Centered Method of Teaching-Learning Mathematics

This section tries to show, briefly, some of the factors that influence students-centered method of teaching-learning mathematics. The academic learning process of students, especially in physics, can be affected by a number of factors. The factors that hinder the teaching learning process could be qualification of teachers (training), availability of instructional material, class size, school leadership, teachers' motivation and commitment, conduciveness of the school compound, background of students, parental expectation and the amount of work that the students do for their families; all these factors are assumed to have an impact either positively or negatively on the teaching-learning approach.

4.2.3.1. Mathematics Teachers Training

Mathematics teachers' training has a great effect on instructional activities. Especially, to implement student-centered method of teaching-learning mathematics instruction, proper pre-service and in-service training programmes are very important. Responses of teachers regarding this issue were summarized in table 9.

Table: 9. Responses of Mathematics Teachers to Teachers Training.

No.	Items	Response	N	%
1	Did you come to teaching mathematics profession based on your interest?	a. yes	12	92.3
		b. no	1	7.7
2	Have you ever taken training on how to teach learner-centered method of teaching and learning mathematics?	a. yes	9	69.2
		b. no	4	30.8
3	If you have taken training on student-centered approach of teaching-learning mathematics, on which type of training have you participated?	a. pre-service	9	69.2
		b. In-service	4	30.8
4	If you have trained in pre-service training, did the training help you to master the strategies of implementing student-centered method of teaching-learning mathematics?	a. yes	6	66.7
		b. no	3	33.3
5	Did the training in the pre-service help you to apply the student-centered approach in real world of teaching-learning mathematics?	a. yes	5	55.6
		b. no	4	44.4
6	Did the pre-service training help you to apply proper classroom management which helps constructive student inquiries and interaction?	a. yes	4	44.4
		b. no	5	55.6
7	Did the training in the pre-service help you to acquire knowledge and skill to produce appropriate instructional materials that facilitate student-centered method of teaching-learning mathematics?	a. yes	6	66.7
		b. no	3	33.3
8	If you have taken in-service training on how to use student-centered method of teaching and learning mathematics, which type of training have you taken?	a. summer	2	50
		b. In staff training	1	25
		c. workshop	1	25
9	If you have taken one of the above trainings, who prepared it?	a. oromia ed/n burea	2	50
		b. zone/ wereda ed/n offices	1	25
		c. school	1	25
10	If you have taken in-service training, the contribution of the training in applying student-Centered approach of teaching-learning mathematics is?	a. high	1	25
		b. moderate	2	50
		c. low	1	25
11	Do you use student-centered method of teaching-learning mathematics?	a. yes	10	76.9
		b. no	3	23.1
12	If your answer for question no.11 is yes, how often do you use?	a. always	1	7.7
		b. sometimes	10	76.9
		c. rarely	2	15.4

As indicated in the above table, 92.3% of the respondents came to teaching profession based on interest they have for the profession. The remaining 7.7% came to the profession without interest. The interest of people towards profession is very important because, people can be motivated to perform effectively to the profession, which they have interest.

From total respondents, 69.2% have taken training on how to use student-centered method of teaching-learning mathematics, where as 30.8% of the respondents didn't take training on the method. From those who have taken training 69.2% of them were trained in pre-service training where as 30.8% were trained through in-service training.

From those who have trained in pre-service training, the majority 66.7% replied that the pre-service training has helped them to master the strategies of student-centered method of teaching-learning mathematics; whereas only 33.3% responded that pre-service training didn't help them

to master the strategies of student-centered method of teaching-learning mathematics. Similarly from those who trained in pre-service training 55.6% replied that the training helped them to apply student-centered method in real world of teaching-learning mathematics and only 44.4% replied that the training didn't help them to apply the method in the actual teaching-learning process of mathematics. Therefore, the response from the majority of the respondents indicate that teachers training in pre-service did help them to master the strategies of student-centered method of teaching-learning mathematics and also help them to apply the method in real world of teaching-learning mathematics. Though the majority of the teachers responded that they benefit much from the earlier training, teachers must develop the knowledge and skill that would help them later to enable their students to learn. Training should get prepare them to confidentially promote active-teaching and the development of problem solving skills through student-centered method of teaching-learning mathematics. That is why in the general objectives of teacher education program, training that promote student-centered method was emphasized.

Besides this if properly conducted, training equip teacher with knowledge and ability in class management, which fosters constructive student inquires and interaction. However, table 9 indicates that only 44.4% of the respondents replied that the pre-service training helped them to apply proper classroom management which help to use constructive inquires and interaction; but 55.6% of them not.

Regarding the production of instructional materials, the same table indicates that 66.7% of the respondents replied that the pre-service training helped them to acquired knowledge and skill on how to produce appropriate instructional materials, where as the remaining 33.3% replied that the training didn't help them in this regard. This implies that though teachers are required to select, produce and make use of local resources to enrich student-centered classroom, still significant number of teachers are lacking the required knowledge and skills in this regard. In addition to pre-service, in-service training plays a great role in improving and facilitating the learning teaching process. As Henveld and Craig (1996) quoted, changed attitudes and new skills and strategies of teachers are the result of most in-service training. In-service teachers training also help to make schools move effective. Also it can train large number of teachers to improve classroom teaching-learning mathematics directly. Regarding the contribution of this training in applying student-centered method of teaching-learning mathematics, 25% of the respondents

replied that the contribution of the training was high, 25% said low, while the majority 50% replied that the contribution of the training was moderate. According to the response the majority of the respondents, the contribution of in-service training in applying the student-centered method of teaching-learning mathematics is moderate. That means, in-service teachers training program was used to bring a change among teachers in applying the student-centered method of teaching-learning mathematics.

In pre-service training and in-service training with the presence of some teachers who didn't take part in the above training, 76.9% of the respondents replied that, they are using student-centered method of teaching-learning mathematics currently. But, when asked the extent of usage, only 7.7% used the method always, where as the remaining 76.9% were using sometimes and 15.4% were using rarely. However, the observation made and the interviews conducted with the principals disprove the response of the respondents regarding the usage of student-centered method of teaching-learning mathematics. Because classroom observation the teaching-learning mathematics largely dominated by traditional lecture method and the interview conducted with the principals stated that the usage of student-centered method of teaching-learning mathematics were not suitable to implement the method due to class size and course content.

As indicated in table 9, more than 50% of the in-service training was given by the Oromia Education Bureau whereas, 25% by school and the contribution of zone/ wereda is 25%. This to some extent negates the role local in-service training plays. Local in-service training particularly those that focused on pedagogical skills were key determinants for teachers mastery and students achievement.

In general, as the response of respondent teachers indicated, the contribution of pre-service and in-service training in applying student-centered method of teaching-learning mathematics was high as indicated. Regarding the pre-service 55.6% of the respondents stated, that the training help them to apply the method in real world of teaching-learning mathematics whereas 50% of the respondents replied that the contribution of in-service training was moderate in applying the method. To implement student-centered method of teaching-learning mathematics, teachers must need training properly. As noted by Plass, (1998:17) they should have access to training through workshops, videos, model project and up to date literature. In addition to this the training techniques should include group discussion at a practical level, macro-teaching, peer observation

and peer group appraisal and acquisition of the necessary tools for reflection and self-evaluation. Contrary to this, the majority of the respondents in an open-ended question expressed that, the training given was not related to practical problems teachers face in actual classroom teaching-learning mathematics. Most of the time; the training given were theoretical, not practical. The trainers told teachers to use student-centered method but, they didn't make them apply or do practical applications. Teachers were using lecturing method to complete courses. Similar situation was reported by Amare Asegedom (2000) who stated about student exposure to new perspectives in teachers training program that is the conflict what prospective teachers are told to do and what their instructors actually do.

From this, we can conclude that the teachers training greatly affected the knowledge and skill of teachers about student-centered method of teaching-learning mathematics which definitely affected the application of the student-centered method of teaching-learning mathematics.

4.2.3.2. Instructional Material

The quality of teaching and learning mathematics, especially the application of student-centered method can be highly influenced by the availability and usage of instructional materials. As indicated, the modest teaching tools such as classroom instructional materials, textbooks and libraries are significant determinants of student's achievement. The data obtained from teachers on this issue that is, availability and usage of instructional materials are summarized in table 10 below.

Table: 10. Teachers Response to Availability and Usage of Instructional Materials

No.	Items	Response	N	%
1	According to your view, are there instructional materials in your school that can help you to implement student-centered method of teaching-learning mathematics?	a.yes	5	38.5
		b. no	8	61.5
2	Do teachers and students prepare instructional materials (teaching aids) to facilitate teaching-learning mathematics?	a.yes	11	84.6
		b. no	2	15.4
3	If your answer for question 3 is yes, how appropriate they are?	a.high	1	9.1
		b. moderate	9	81.8
		c.not appropriate	1	9.1
4	Is there pedagogical center in your school?	a.yes	8	61.5
		b. no	5	38.5
5	If your answer is yes for question 4, is the pedagogical center effective in preparing teaching-learning materials?	a.yes	2	25
		b. no	6	75
6	How often do you use teaching aid during teaching-learning mathematics?	a.always	1	7.7
		b. sometimes	10	76.9
		c.not at all	2	15.4
7	According to your experience can instructional materials (teaching aids) facilitate student-centered method of teaching-learning mathematics?	a.yes	11	84.6
		b. no	2	15.4
8	What is the student-mathematics textbook ratio in your school?	1:1	11	84.6
		1:2	2	15.4
		1:3	-	-
		1:4	-	-
9	Do mathematics textbook have teacher's guide in the school?	a.yes	13	100%
		b. no	-	-

As indicated in table 10, only 38.5% of the respondents replied that there are instructional materials that can help to implement student-centered method of teaching-learning mathematics of instruction in their schools; whereas the majority of the respondents 61.5% replied that there are no instructional materials in their schools that can help the implementation of the method. 84.6% of the respondents replied that teachers and students are preparing instructional materials (teaching aids) to facilitate teaching learning where as 15.4% replied that teachers and students were not preparing instructional materials. Regarding the appropriateness of instructional materials, 9.1% of the respondents replied that the materials prepared were highly appropriate, 81.8% moderately appropriate and 9.1% not appropriate. Response regarding pedagogical center shows that about 61.5% of respondents replied that their schools have pedagogical center where as 38.5% of them indicated that their schools don't have pedagogical center. Regarding the effectiveness of pedagogical center in providing teaching materials, 25% showed that the pedagogical centers were effective, whereas 75% replied that the pedagogical centers were not effective in preparing teaching-learning mathematics.

Regarding the utilization of instructional material other than textbooks only 7.7% of the respondents replied that they were using teaching materials other than textbook always or when necessary, 76.9% were using sometimes and 15.4% were not using at all. This implies that majority of teachers were not using instructional materials always. On the other hand, (84.6%) of the respondents replied that instructional materials can facilitate student-centered method of teaching-learning mathematics instruction.

As indicated earlier textbooks are also among the majority instructional materials that can influence student's achievement and the method of instruction used. Concerning student textbook ratio, 84.6% of the respondents replied that the student mathematics textbook ratio in their school was 1:1 and 100% of them replied that both 9th and 10th grade mathematics textbook have teacher guide, but the proper use of teachers side obviously affect the application of the method.

In general, according to Henveld, and Craig, (1996) instructional materials also support instruction in individual subjects and contribute to teaching-learning effectiveness when they are available and observable in the classroom, when they are made and used by the teachers and by the students and when they are related to the content of syllabus, textbooks and teachers guide. Instructional materials are more prominent (famous) than any other at classroom level because they are the tangible demonstration of curriculum in action. Instructional materials are essential in teaching-learning process since they lubricate the wheel of learning. They facilitate active-learning, encourage creative thinking and concretize abstract experiences. Instructional materials make learning more functional by increasing retention and encourage the responsibility of the learner. Thus, the student-centered method of teaching-learning; the modern method of instruction is unimaginable without the use of instructional materials. In spite of this, instructional materials play a great role in applying student-centered method of teaching-learning instruction, the response of the teachers in the questionnaire and the observation made revealed that the necessary instructional materials were not available in schools and teachers were not necessarily use instructional materials. In all observed classrooms, no mathematics teachers were seen using models of instructional materials other than using on the chalkboard and no instructional materials were seen in the classroom, except the basic furniture. As replied by the majority of the respondents in open-ended questions, the non-availability of materials, absence of

budget and knowledge of mathematics teachers to prepare and use local materials were among the majority problems to use instructional materials. Thus, the non-availability of instructional materials, shortage of reference materials in the library, problems faced inside classroom situation and class size, played their part in affecting the application of student-centered method of teaching-learning mathematics.

4.2.3.3. School Facilities

The nature of classroom, the availability of teaching aid, library and pedagogical center are among the important facilities that should be fulfilled in teaching-learning process. The physical condition of a classroom can facilitate or affect the application of student-centered method of teaching-learning mathematics. In relation to this, Henveld, W. and Craig, H. (1996) indicated that there should be adequate well maintained and furnished classrooms to effectively conduct teaching and learning process. Classrooms are adequate when there is desk for every pupil and when it is well ventilated with good light and there is standard chalkboard for every class. The researcher also observed classrooms of sample schools and summarized the data as follows:

Table: 11. Observed School Facilities

No	School Facilities	S1		S2		S3		S4		Total			
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	%	No	%
1	Availability of the desk for every student.	√	-	√	-	√	-	√	-	4	100	-	-
2	Well ventilated classroom with good light.	-	√	-	√	-	√	-	√	-	-	4	100
3	Free space to facilitate different sitting arrangement.	-	√	-	√	-	√	-	√	-	-	4	100
4	Standardized chalkboard.	√	-	-	√	-	√	√	-	2	50	2	50
5	Neatness of the class.	-	√	√	-	-	√	-	√	1	25	3	75
6	Pedagogical center.	-	√	√	-	-	√	√	-	2	50	2	50
7	Library with different mathematics reading materials.	-	√	√	-	√	-	-	√	2	50	2	50

As indicated in table 11, from 4 schools observed, 100% of them have desk for every students. In all observed schools, 100% of the classrooms were not ventilated and well bright. There was no free space to facilitate different sitting arrangement in all 100% of the observed schools. Almost in all schools the blackboards were small and even difficult to write on them. All the observed schools don't have models teaching aids with necessary materials were not conducive to implement the student-centered method of teaching-learning mathematics. In this regard,

emphasized that the physical layout of classrooms in schools of East wollega zone is mentioned as a challenge that hinder the student-centered method of teaching-learning mathematics.

Classroom teaching-learning environment in student-centered method of teaching-learning mathematics include the change of the physical layout to make change in sitting arrangements. If the desks are movable, it is possible to arrange different sitting arrangements that can facilitate student-centered method of teaching-learning mathematics. However, since the desks are not easily movable, some schools formed a fixed sitting arrangement for group works. Within this fixed group sitting arrangements some students regularly give their backs to the teacher and chalkboard. Movement in the class is difficult for the teacher to follow the activities of the students during group work. This contradicts what has been suggested by different Scholars. Some of the sitting arrangements for student-centered method are U-shape, team style, conference table, etc. To use these different sitting arrangements, the nature of schools observed was not conducive. In general, all the observed schools lack appropriate facilities that can facilitate student-centered method of teaching-learning mathematics instruction. That is, school facilities were among the factor that negatively affected the application of student-centered method of teaching and learning mathematics in secondary schools of East Wollega Zone.

4.2.3.4. Teachers and Students Attitude

Teachers and students attitude towards certain instructional methods can affect or facilitate the implementation of that instructional method. The success or failure of the application of student-centered method of teaching-learning mathematics depends on the attitudes, values, skills and ability of classroom teacher. Students also affect the application of student-centered method of teaching-learning mathematics, since they make a great input in classroom process and significantly influence the way teachers carry out their teaching-learning mathematics tasks.

4.2.3.4.1. Data Compiled From Interview

The selected sample schools activities were analyzed based on the interview conducted with principals. The data obtained from the interview was compiled and analyzed as follows:

Table: 12. Interview Informants and Their Code

No.	Schools	Principals Code
1	S ₁ (Gute)	P ₁
2	S ₃ (Darge)	P ₂
3	S ₄ (Sire)	P ₃
4	S ₅ (Ifa)	P ₄

Response of the Informants (see Appendix-V)

Regarding the issues of trained principals (P₁, P₂, P₃, P₄) reported that, “the training we have taken was on how to use learner-centered classroom management, continuous assessment, how to motivate students (interaction in the classroom), and how teachers develop their continuous professional development (CPD) and how action research was implemented on problems faced”.

Informants (P₁, P₂, P₄,) indicated that they are highly concerned about the student-centered method of teaching-learning especially on science and particularly on mathematics, because it is advantageous for the students to learn effectively. It motivates students if properly applied. Also they replied that they are responsible for the application in their schools.

School principals also reported that they cannot say all mathematics teachers are using student-centered method of teaching-learning mathematics in a proper way. With respect to this, principals (P₂, P₃, P₄) replied that, “the student-centered method of teaching-learning mathematics was not properly implemented in all side of the teachers due to miss-conception and students interest about the method”. Teachers lack awareness and willingness to use the student-centered method of teaching-learning mathematics. They relate student-centered method only with group work, home work and assignment work without proper guidance of a teacher. Other strategies of student-centered method of teaching-learning mathematics are not exercised. Mathematics teachers assigned students in groups to do activities in the classroom without support and follow up of activities of the students. In general, informants reported that, “teachers used group work when they were not prepared and felt tired and they try to use the student-centered method of teaching-learning mathematics during classroom observation for evaluation and the like”.

Informants (P₁, P₂) reported that their school environments are not conducive. “There are not enough reference materials in the libraries, lack of teaching aids, large class size, lack of

mathematics teachers are great problems to use student-centered method of teaching-learning mathematics". And all informants (P₁, P₂, P₃, P₄,) reported that, "wereda and zone education offices don't give access properly regarding instructional activities, professional support; and advice teachers on instructional methods". "They only discuss on administrative issues with directors and they do not supervise teachers in the classroom properly".

All the informants replied that, "the great factors are the nature of classrooms, the number of students in the class, absence of budget to employ mathematics teachers, and attitudes of students faced towards learning mathematics are among the factors that affect the implementation of the method". "Students don't satisfy unless teachers teach them for the whole period in the class". "They relate teaching-learning with teachers talk and solve".

In general, to the above factors, teachers attitudes and students resistance (interest) are a serious problems. They consider student-centered method of teaching-learning mathematics as wasting of time. Especially active students resist the method. Some students are not willing to participate in group work. Even, sometimes students quarrel (disagree) each other during group works. According to the informants' (P₂, P₃, P₄), "teachers' awareness and attitudes towards the method is a serious problem most of the time and the teachers have no concern about the method". They consider as the government imposed or forced the method on them without its significance. Informants (P₂, P₄) reported that, "teachers training are another problem". Only a few members of teachers got training on the method. There was no appropriate training related to practical problems with student-centered method of teaching-learning mathematics and the training given most of the time was theoretical not practical.

As already seen under teachers understanding of student-centered method of teaching-learning mathematics and perception or awareness of students towards student-centered method of teaching-learning mathematics, in the previous section teachers understanding of student-centered method of teaching-learning mathematics was low and the perception of students towards the method was unfavorable. This implies that the attitude of teachers and students towards student-centered method of teaching-learning mathematics was also unfavorable. This was supported by the interview made with the principals.

According to the response of the principals, in addition to teachers' awareness, shortage of instructional materials and poor school facilities, the resistance of students is also the other important factors that affect the application of student-centered method of teaching-learning mathematics. And students relate learning with teachers talk and they are satisfied when teachers talk much. Therefore, the results of rating scales and the interview made with the principals revealed that both the attitudes of the teachers and students affects the application of student-centered method of teaching-learning mathematics in secondary schools of East Wollega Zone.

4.2.4. Application of Strategies of Student-Centered Method of Teaching-Learning Mathematics

The new education and training policy of Ethiopia demanded a new paradigm or model of teaching and learning, the development of new strategies of teaching-learning based on an active-learning and student-centered method of teaching-learning mathematics. Based on this an attempt was made to shift traditional teacher dominated method of teaching-learning of mathematics to student dominated methods of teaching-learning mathematics. The core interest of this study was to assess whether or not student-centered method of teaching-learning mathematics is being adopted by teachers. To meet this series of questions were asked and the response of teachers regarding the extent of plan and usage of different strategies of instructional methods was summarized in the following table.

Table: 13. Response of Teachers to Application of Different Strategies of Instruction

No	Items	Extent of plan and usage of d/t strategies of instruction					
		Always		Sometimes		Not used at all	
		F	%	F	%	F	%
1	Explanation / lecturing	7	53.8	5	38.5	1	7.7
2	Problem solving	6	46.2	7	53.8	-	-
3	Discovery method	-	-	5	38.5	8	61.5
4	Inquiry method	-	-	4	30.8	9	69.2
5	Project method	-	-	7	53.8	6	46.2
6	Group work	4	30.8	9	69.2	-	-
7	Role playing	-	-	5	38.5	8	61.5
8	Field trip	-	-	-	-	13	100

As indicated in table 13, teacher were asked to indicate to what extent they plan and use different strategies of instructional method. Accordingly, from all strategies listed 53.8% of the respondents replied that they were using explanation / lecturing method always. This was also

supported by the observation made in the classroom. In majority of observed classrooms teachers were using this method for most of the periods. This implies that still the traditional teacher dominated, teacher-centered method of instruction governs teaching-learning activities in secondary schools of East Wollega zone.

As indicated in the same table, problem solving method of teaching-learning mathematics which helps learner to generate solutions to problems that are new to them was not planned and used by the majority of teachers. 46.2% of the respondents replied that they were using at all and 53.8% were using sometimes the problem solving method.

As can be seen from the table, discovery and inquiry method of teaching-learning mathematics which are very important for learners to draw conclusions and generalization from some form of induction, observation of principles and help the learners to develop their higher order and critical thinking skills, were not used by the majority of the respondents. 38.5% of the respondents replied as they were using discovery method sometimes, where as 61.5% of the respondents replied that they were not using this strategy at all. Similarly, only 30.8% of the respondents replied that, they were using sometimes inquiry method, whereas 69.2% replied as they were not using the inquiry method of teaching-learning mathematics.

The above table also indicates that from different strategies of student-centered method of teaching learning mathematics listed in the table, group work was better used than other strategies. 30.8% of the respondents replied that they were using group work always, 69.2% used some times.

Moreover, the project method which gives the class a real life and results in doing and problem solving was not used by the majority of the respondents. About 53.8% of the respondents replied that they were using sometimes, whereas 46.2% of the respondents not using project method. In addition to this, also field trip that helps the learners to acquire knowledge and skills directly from the real world was not planned and used by the teachers. 100% of the respondents responded that they were not using field trip at all. Finally, role play which is useful for motivating learners, for deepening understanding and preparing learners for real life situation was also not used by the majority of the respondents. About 61.5% of the respondents replied that they were not using role play at all. This reveals that the strategies of student-centered

method of teaching-learning mathematics were not applied in secondary schools. To practically see the activities of teachers in applying student-centered method of teaching-learning mathematics instruction a series of classroom observation were also made and the obtained data was organized as follow.

Table: 14. The observed activities of Teachers

1. Activities of the teacher	Yes		No	
	F	%	F	%
1.1. Assess learner's prior knowledge and experience before starting mathematics class.	1	25	3	75
1.2. Motivating students to articulate their experience and practice during mathematics class.	1	25	3	75
1.3. Making mathematics class democratic and interactive.	3	75	1	25
1.4. Ask questions:				
1.4.1. Asking close-ended mathematics questions.	2	50	2	50
1.4.2. Asking open-ended mathematics questions.	1	25	3	75
1.5. Give time for the students to think on open-ended questions.	1	25	3	75
1.6. Making clear how to identify problems to be solved.	2	50	2	50
1.7. Asking students if they came with problem.	1	25	3	75
1.8. Relating problems in the class with local problems.	3	75	1	25
1.9. Discussing on alternative strategies of how to solve problems.	1	25	3	75
1.10. Providing information from which learners draw conclusions or generalization.	1	25	3	75
1.11. Motivating students to actively participate in learning mathematics.	3	75	1	25
1.12. Assigning group work in the classroom and outside the class.	3	75	1	25
1.13. Using methods of brainstorming in groups and whole class.	-	-	4	100
1.14. Involving students to decide on mathematics activities.	-	-	4	100
1.15. Explanation lecture.	4	100	-	-

Accordingly, in all observed classrooms, 75% of teachers were not assessing the prior knowledge and experience of the learners before starting the subject matter of the day. 75% of the observed teachers were not motivating students to articulate their experience and practice to the topics they teach. Instead, the teachers were repeating what they have taught in the past period and ask recalling questions. Regarding questioning techniques, in almost 50% of observed classrooms, teachers were asked close-ended questions which were based on recalling and memory. However, according to Plass, (1998:317), teachers' questions should be open-ended, help students to articulate and defined or modify their opinions to feel confident about their knowledge. Nevertheless, this was not recognized by the teachers. Since the questions usually asked and occupy significant class time were close-ended and based on recalling, reasoning questions which requires time to think were not asked. 50% of observed classrooms were asked close-ended questions whereas 75% not asked open ended questions. Moreover, 75% of observation results show that there was no wait time or time given for the students to think on open-ended questions asked. The responses of the students were immediate.

As seen in table14, from the observation list, the most commonly used and observed strategies was group work. However, 75% of the observed classrooms were not asking students if they came with problem. Though group work is one of the most important techniques used in student-centered method of teaching-learning mathematics classroom and is one of the best ways of encouraging active-learning, simply putting students in to groups doesn't ensure effective and active-learning. If students are not engaged in meaningful learning, using higher thinking skills, then the benefits of working in groups is lost. This was what observed in all schools in all classrooms when they were using group work. In three of observed schools (S_1 , S_3 and S_4), fixed group sitting arrangement was used. In the remaining one schools (S_4) the group was formed on each desk.

Teachers were teaching using lecture method for 25-30 minutes on certain topic. After lecturing students were asked to discuss in group on topics already taught in fixed groups formed. During group discussion, all students were not involving in group discussion. Some students were reading their textbooks or take notes independently and some others were even playing. There was no pre-planned task for students to discuss on. There was no job assigned to group members such as group leaders or facilitator, time keeper, recorder and process observer to facilitate active-learning in group work. The teachers were not involved in the classroom during group work. They were not going around making sure that all students were actively involved in group work or not. That means, though all teachers were using group work regularly in teaching-learning mathematics process, but the strategies only used is group work which is not effective. This was again supported by the interview made with the principals. According to the response of the respondents in an interview, the only Student-centered method of teaching-learning mathematics strategy used by teachers was group work and teachers were not using it properly. The interviews conducted with all principals also indicate that it is difficult to say that the student-centered method of instruction is applied in their schools.

Finally, the finding of the questionnaires, rating scales, and observation made and interview conducted or discovered that the student-centered method of teaching-learning mathematics was not properly applied in government secondary schools of East Wollega Zone (Oromia Region).

4.3. Result Of Document Analysis

The researcher analyzed documents from the sample schools:

- The students' mathematics result is an average of between 55-60.
- Mathematics teachers' load to section of students' is 1:4.
- The average number of students in each class is 65.
- The ratio of students-textbook is 1:1.

In addition, the researcher analyzed that there is a great problem with the availability of curricular materials, the availability of instructional materials and teaching aid equipments, reference books in the library and how it is utilized was conducted using document analysis.

CHAPTER FIVE

5. Summary, Conclusion and Recommendation

This chapter deals with summary, conclusion and recommendations. In this section first, a summary of the study and the major findings are made. Second, conclusions of the fundamental findings are drawn. Lastly some possible recommendations are forwarded on the basis of the findings of the study.

5.1. Summary

The main purposes of this study were to access the status of application of student-centered method of teaching-learning mathematics: challenges and opportunities of the application of the method in government secondary schools of East Wollega Zone. In order to meet these purposes four basic questions were set.

The basic questions set were:-

1. Do students and mathematics teachers have the necessary awareness about the values of student- centered approach in teaching and learning mathematics?
2. What is the status of the implementation of student- centered approach in mathematics classroom?
3. What are the challenges and opportunities of the implementation of student- centered approach in mathematics in the context of East wollega zone of Oromia Region?

To find solutions for these basic questions, the study was conducted in five weredas on five secondary schools. The data were collected from: 199 students, 13 teachers, 4 principals and 4 supervisors. The major data collecting instrument was questionnaire which was supported by observation, interview and document analysis. The data obtained were analyzed using percentages, mean values and grand mean values to assess the application of the student-centered method of teaching-learning mathematics: challenges and opportunities. Based on the analysis made the following major findings were found:

The result of the questionnaire administrate to the students and teachers which measure the relationships between students mathematics background achievement and their current

mathematics ability to solve problems that indicates most student who achieve less in mathematics result also have less mathematics problem solving. The analysis of teachers' questionnaire and directors' interview also indicates the challenges to understanding mathematics concepts.

Most mathematics teachers used lecture method in their classrooms frequently which mean largely dominated by the traditional lecture method because of lack of school facilities, large class size, shortage of time, lack of interest. Discussion and group work are the two mainly employed student-centered strategies in the secondary school next to lecture method.

100% of the respondents replied that the schools didn't have free space to facilitate different sitting arrangements. Almost all schools didn't have necessary materials and libraries with sufficient reading materials.

Unavailability of instructional materials also affected the application of the student-centered method of teaching-learning mathematics process. 61.5% of the respondents replied that, there were no instructional materials in their schools that can help the implementation of the method.

Although problem solving strategy as student-centered method of teaching-learning is believed to promote learners critical thinking ability, it has been employed rarely. Field trip, role-playing and brain storming are not frequently employed in the secondary schools of East Wollega Zone.

Mathematics teachers' do not actively engage students in doing class works, home works, assignments and project works properly. Teachers also do not offer necessary supports to students in the class room and outside the class room. It has been inferred from the study that, teachers have low understanding about the principles of student-centered method of teaching-learning mathematics.

As the interview from the school principal confirmed, one of the problems in the teaching and learning of mathematics is associated with the academic competences of some mathematics teachers. In contrary, some of the mathematics teachers in the schools were not competent enough to teach mathematics.

Students' score in mathematics, based on the documents analysis obtained from the sample schools, is intermediate.

The nature of student-centered teaching and learning approach fostered reading, writing, speaking and listening skills of students.

The study also discovered that Wereda and Zone education offices were not providing necessary support to schools to implement student-centered method of teaching-learning mathematics. 100% of supervisors replied as wereda and zone education offices do not provide adequate budget for transportation as they responded. More emphasis was given to content coverage and administrative issues, where as lower emphasis was given to instructional activities by zone and wereda education office supervisors during school supervision.

Teachers training (pre-service and in-service) were found to be other opportunity in the implementation of student-centered method of teaching-learning mathematics of instruction in the study. 55.6% of the respondents replied that, the pre-service training help them to apply student-centered approach in real world of teaching-learning mathematics and 50% also replied, the contribution of in-service training was moderate in applying the student-centered method of teaching-learning mathematics.

The finding of the study indicated that most of the students in the secondary schools of East Wollega Zone were poor in their mathematics background (science background), ability to think and posing questions scientifically, familiarity with general formulation of mathematics. There is language barrier to understand the lessons as students' proficiency in English language is low.

In the study it was found that majority of students had low group work practice and some students with poor and very poor group work and individual activities.

5.2. Conclusions

The following conclusions are made based on the findings obtained from the study.

According to the study the school facilities and classroom teaching-learning environment were not conducive to implement the student-centered method of teaching-learning mathematics in the schools, because the average class size was 65. Strategies like problem solving, discovery, inquiry, project, role play and field trip were not used by the mathematics teachers. Rather, the mathematics teachers were using the old and traditional teacher-centered or lecture method most of the time.

Concerning the key factors that affect the implementation of student-centered method of teaching-learning mathematics were: teachers and students' tendency to favor traditional lecture method, large class size, lack of resources, and shortage of time and the design of the teaching instructional materials.

As far as the class room teaching-learning methods are dominated by the traditional lecture methods. A body of knowledge transferred to students while the learners passively receive the content of mathematics lesson transmitted by the teacher. This results in students' low interest in studying mathematics or mathematics related fields for their future career. Therefore this could have negative impact on quality of education particularly in mathematics.

The low involvement of students in classroom participation leads the teacher disinterested to teach the subject in the class. The students' lack of prior knowledge of mathematical concepts makes them not effectively solve mathematics problems this is one of the main factors which affects the students ability to solve mathematics problems. The students' traditional belief of the mathematics subject as difficult & the student background experience is the best predictor of their difficulty.

The training given to teachers (pre-service and in-service) help them to apply the student-centered method in real world of teaching-learning mathematics properly due to different factors or school facilities.

The instructional materials that can facilitate student-centered method of teaching-learning mathematics were not available properly in secondary schools. Respondents replied that zone and Wereda education offices were not providing the necessary support to secondary schools to implement the student-centered method of teaching-learning mathematics.

The only mathematics teachers commonly used as student-centered method of teaching-learning mathematics strategies was group work. And some mathematics teachers also do not offer necessary supports to students in the class room and outside the class room.

Based on the above facts, this study concluded that, the student-centered method of teaching-learning mathematics process was not properly implemented in government secondary schools of East Wollega Zone.

5.3. Recommendation

Finally based on the data collected and conclusions drawn, the following recommendations were forwarded:

Some of mathematics teachers may face student resistances when trying to implement student-centered strategies in the classroom but they are advised to cope up with any problems and get their students activities in all necessary contexts.

It is also important that mathematics teachers able to implement student-centered method of teaching-learning activities in line with the time available to make student interactions productive.

In order to arrive at more reliable conclusions it is better to conduct more research to see the attitudes of other grade levels and sites towards student-centered method of teaching-learning mathematics.

This study provides that student-centered is more effective method of instruction for teaching and learning mathematics as compared to traditional (lecture) method if properly implemented. So that it is important to use student-centered method to improve the academic achievements of the students.

Student-centered method of teaching-learning mathematics helps students to reach at the target points, and encourage their cooperation and joint learning. However, if it is not well managed and organized it may promote errors, noise, ill-discipline, frustration and anxiety.

Student-centered method of teaching-learning improves mathematics achievement and attitudes towards mathematics lesson among students. Therefore, teachers in schools, especially teachers who teach mathematics need to be aware of the benefits and importance of active- learning and thus changing the practice of teacher-centered teaching methods to student-centered teaching methods.

Average class size was 65, which is one of the major factors that hinder the implementation of student-centered method of teaching-learning mathematics. The condition of the classrooms and the number of students do not match in the study area and this affects the implementation of

active learning. Therefore, it is believed that the implementers of student-centered method of teaching-learning mathematics see alternative solutions such as, dividing students into groups. This will give good opportunities for the teachers to assist students in a class room and there will be effective communication between students and teachers.

It is better to develop students' interest in mathematics by just teaching them facts. We need to make mathematics relevant to their lives. One way of doing this, is by talking about recent scientific developments and tracing these back to scientific principles and historical discoveries. And teaching-learning mathematics is effective only when students can use it, connect it to their day-to-day life, or actively participate on it.

It is important to give emphasis to help students by giving additional support like makeup class and tutorial class and worksheet.

Mathematics teachers and students should get relevant time in the teaching-learning classrooms so that they can discuss the learning materials in depth and thereby develop different skills. It is better that mathematics teachers and students should have friendly relationship between them to interact with their day-to-day activities.

References

- Aggarwal, J.C. (1996:55). *Principles, Methods and Techniques of Teaching*. Vikas.
- Akey, T.M. (2006). *School context, student attitudes and Behavior and academic achievement: An exploratory analysis*.
http://www.eric.ed.gov/ERICDocs/data/ericdocs2/content_storage_01/00000000b/80/31/25/01.pdf cited on April 3, 2006.
- Alexander, S. (2002:36-38). *Making the most effective use of homework*. *Mathematics teaching*, 178:36-38.
- Amare Asegedom. (2000:75). "An Anderagogic Approach to Teaching and Learning." *IERFLAMBEAU*, Vol. 8 No. 1. Addis Ababa: IER.
- Barnes, M. (2000). *Effects of Dominant and Subordinate Masculinities on Interactions in a Collaborative Learning Classroom*. In Boaler, J. (ED). *Multiple perspectives on Mathematics teaching and learning: international perspectives on Mathematics education*. London: Ablex publishing. 145 – 169.
- Bell, D. and Kahrhoff, J. (2006). *Active learning Handbook*. Missouri: Webster University.
- Berry, J.W. (1985,P20). *Learning Mathematics in a second language: some cross cultural issues*. *For the learning of Mathematics* 5(2), 18-23.
- Best, J.W Kahun. J.V (1993:191-193). *Research in Education* (7th ed). New Delhi: Prentice Hall Indian Privet Lid.
- Blatchford, p. et al. (2003). *The class size debate. Is small better?* Philadelphia: Open University press.
- Borich, G. (1992:537). *Effective teaching Methods*. Second Edition, New York: Merrill.
- Chambuss, and Schutt, (2007). *Making sense of the Social World: Methods of Investigation* (2nd ed). London: Pine Forge press.
- Chombe Anagaw, (2005). *The participation and performance of female students in engineering field M.A Thesis (Unpublished)*. A.A.U.
- Collhan, J. Clark, I. and Kellough, R. (1992). *Teaching in the Middle and Secondary Schools*.
- Dean, P.G. (1982). *Teaching and Learning Mathematics*. London: Woburn press.
- Fennema, E. and Sherman, J. (1976:14). *Sex related differences in Mathematics learning Myths, realities and related factors*. A paper presented at the annual meeting of the American association for the advancement of science, February, Boston.
- Finn, J.D. & Voekl, K.E. (1992). *Class size. An overview of research*. Occasional paper No. 92/1. Buffalo, N.Y: State university of New York at Buffalo- department of Counseling and Educational Psychology.

- Fraenkel, J.R and Wallen, N. E (2000). *How to Design and Evaluate Research in Education* (4thed). Boston: Mc graw-Hill.
- Glass, G., Cahen, L.S., Smith, M.L. & Filby, N.N. (1982). *School class size: Research and Policy*. Beverly H, C.A: Sage.
- Graham-Brown, Sarah (1991:272). *Education in the developing world: Conflict and crisis*. New York: Long Man Inc.
- Heneveld, W. and Craig, H. (1996). *Schools Count: World Bank Project Designs and the Quality of Primary Education in Sub-Saharan Africa*. World Bank Technical Paper Number 303 (Africa Technical Department Series). Washington DC: World Bank.
- Henry, M.E. (1996). *Parent-school Collaboration*. New York: Albany.
- Hilary Plass. (1996: 69); *The Learner-Centered Classroom Approach*.
- Irving, J. (1972). *Mathematics for the slow learner*. In *overcoming learning difficulties*. Edited by Crouch, B. London. Ernest Benn limited. p81.
- Johnsen, B.H. (2001). *Curricula for the plurality of individual learning needs: some thoughts concerning practical innovation towards an inclusive class and school*.
- Kaul, (1996: 142, 166, 168,403) Methods of Educational Research. New Delhi: Hindustan offset Printers.
- Leu, E. (2005). *The role of Teachers, schools, and communities in Quality Education: A review on the literature*, Washington, DC: AED, Global Education Center Publication.
- Lue, E. (2000:9, 15) "Implementing The New Curriculum, Issues of Theory and Practice of Curriculum Developers and Teacher Education." Mekele: BESSO Project. (Unpublished).
- Melese Bedana (1999). "Active Learning, Notions, Methods and Examples". Addis Ababa: Oromia Education Bureau (unpublished).
- Ministry of Education [MoE]. 2001. *Indicators of the Ethiopian education system*. Addis Ababa :Ministry of Education.
- Ministry of Education [MoE]. 2002. *The education and training policy and its implementation*. Addis Ababa: Ministry of Education.
- Orton, A. (1992). *Learning Mathematics: Issues, theory and classroom practice*. London:
- Plass, H. (1998:17, 317). "The Learner-Centered Classroom." Quality Education in Ethiopia Vision for 21st Century. Addis Ababa: IER.

- Pollard et al., (2000). *What pupils say, changing policy and practice in primary education?* London: T.J. International.
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93 (3), 223-231.
- Rajmalhreye, K. (1982:249). *Women work and science in India*. New Delhi: Deep and deep Publishers Private Limited.
- Schofield, H. (1972). *The Philosophy of Education*. London: Allen and Unwin Ltd.
- Silberman, M. (1996). *Active Learning, 101 Strategies To Teach any Subject*. Boston: Allyn and Bacon.
- Stern, D. and Huber, G.L. (1994). *Active learning for students and teachers*. OECD, paris.
- Temechegn Engida. (2001:43, 44, 69). “*Issues, Methods and Materials in Teaching primary School subjects*.” Addis Ababa: A.A.U. (Unpublished)
- Trafton, P.R. & Shulte, A.P. (1989). *New Directions for Elementary School Mathematics*. Virginia: The National council of teachers of Mathematics, Inc.
- Walberg, H.J. (1985). Homework’s powerful Effects on learning. *Educational leadership*. Vol 42. No 7 pp 76-79. www.ncld.org/LDInfoZone/InfoZone_FactSheet_Dyscalculia.cfm cited on Feb, 20, 2006.
- Zerihun, T.A. (2012). *Preparing students in science and mathematics subjects in Bedesa Preparatory school of East Hararge*. Addis Ababa University M.A Thesis (Unpublished).
- Zhao, S. (2003). *The use of a constructivist teaching Model in Environmental science at Beijing*. China: Beijing Normal University Publication.

APPENDICES
ADDIS ABABA UNIVERSITY
COLLEGE OF EDUCATION AND BEHAVIORAL STUDIES
DEPARTMENT OF MATHEMATICS EDUCATION

General Direction to the Respondents

The aim of this questionnaire is to obtain relevant information for the study on the application of student-centered approach as an effective teaching-learning mathematics: Challenges and opportunities in East Wollega Zone. The information gathered will be confidential and will not be used for any other purpose than the study. Your identity including your name will be kept confidential. It is the co-operation of all the respondents to answer the questions carefully and willing that makes the study effective and meaningful. Therefore, you are kindly requested to provide the necessary information that is very useful for the quality of the study.

Thank you!

APPENDIX-I
ADDIS ABABA UNIVERSITY
COLLEGE OF EDUCATION AND BEHAVIORAL STUDIES
DEPARTMENT OF MATHEMATICS EDUCATION

Questionnaire to be filled by high school students

Dear students

This questionnaire is designed to collect information for research purpose only. Its objective is to assess your opinions on student-centered method of teaching and learning mathematics in your school. 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.

Thank you in advance.

For your kind cooperation.

Direction: -1. Do not write your name in this paper.

2. Check (✓) on the space provided corresponding to the item of your choice.

3. In place where your response is to be given in writing, please try to be brief.

1. Name of the school _____ Woreda _____ Zone _____

2. Sex: - Male ☐ Female ☐

3. Age: - _____

4. Grade level: - A. 9th ☐ B. 10th ☐

5. How much is your interest in learning mathematics? A. very high ☐ B. high ☐

C. moderate ☐ 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 very difficult ☐ B. Poor teaching method of teachers ☐

C. Plasma instruction is not clear for me ☐ D. Mathematics is not important subject in high school ☐

E. If there is other reason please specify

7. Are there available reference materials for mathematics in your library?

A. yes ☐ B. no ☐ C. not sure ☐

8. If your answer is 'yes' for item number 7 are the reference materials sufficient for teaching-learning of mathematics? A. yes ☐ B. no ☐ C. not sure ☐

9. How often you use library to study mathematics reference books? A. always ☐

B. frequently ☐ C. sometimes ☐ D. rarely ☐ E. never ☐

10. If your response to item 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 ☐ C. Do not have enough time ☐

D. Lack of experience to use library ☐ E. Improper facility of the library ☐

F. Please specify if there is any other reason?

11. How often does your mathematics teacher explain the mathematics concept? A. always ☐

B. frequently ☐ C. sometimes ☐ D. rarely ☐ E. never ☐

12. Is there 'group work' practice in your mathematics classroom?

A. yes ☐ B. no ☐ C. not sure ☐

13. If your response for item number 12 is 'yes' what is your experience in group work during mathematics learning A. very good ☐ B. good ☐ C. poor ☐ D. very poor ☐

14. If your response for item number 13 is 'C' or 'D' which of the following is/are reason/s do you think? A. Because mathematics teacher do not initiate me to work in group activities ☐

B. Group work is not convenient for mathematics ☐ C. Plasma instruction is not suitable for group work ☐ D. I do not like group work ☐ E. It is time consuming ☐

15. How often does your mathematics classroom teacher give you class work or class activities?

A. always ☐ B. frequently ☐ C. sometimes ☐ D. rarely ☐ E. never ☐

16. If your response for item 15 is 'D' or 'E' which one of the following is the reason?

A. Shortage of text book in class room ☐ B. Plasma instruction is not suitable for these activities? ☐ C. The teacher is not interested to give class work or class activities ☐

D. If there is any other reasons please specify

17. How often does the mathematics classroom teacher give you home work?

A. always ☐ B. frequently ☐ C. sometimes ☐ D. rarely ☐ E. never ☐

18. If your response for item 17 is 'D' or 'E' what is the reason? Please specify in brief

19. How often does your mathematics classroom teacher use problems to demonstrate practical activities? A. always ☐ B. frequently ☐ C. sometimes ☐ D. rarely ☐ E. never ☐

20. If your response for item 19 is 'D' or 'E' which of the following is/are the reason/s? A. The teacher is not interested to demonstrate practical activities? ☐ B. All practical activities are displayed in the plasma instruction, so that doing the same activities in the classroom is unnecessary ☐ C. Lack of interest to do in the classroom ☐ D. If there is any other reasons please specify

21. How do you suggest learning mathematics by the plasma (instructional television)? A. It is very nice and I like it ☐ B. It is better if I learn mathematics by only class room teacher ☐

C. It is good but the time provided for class room teacher after the plasma instruction is not enough ☐

D. If you have any other suggestion please specify it

22. Does the mathematics teacher assess your mathematics performance based on?

A. Continues assessment like: class work, home work, assignment & test/quiz etc ☐

B. Mid- exam and final exam in a semester ☐ C. Only one final exam per semester

D. If any other way specifies it? ☐

23. How often does your mathematics teacher relate mathematics lesson to your real life situation in the class room? A. By participating students in doing group work ☐

B. by using instructional materials ☐ C. By using lecture-method ☐

D. If any other please specify

24. How does your mathematics teacher know whether or not you understand the lesson he teach in the classroom? A. By asking question one by one ☐ B. By waiting for 'yes' answer ☐
C. By asking 'are there questions' ☐ D. By checking the class activities or class work ☐
E. If he used any other mechanism please specify it

25. What other problems (if any) you faced in the teaching learning of mathematics in your school? Please write it briefly

APPENDIX-II
ADDIS ABABA UNIVERSITY
COLLEGE OF EDUCATION AND BEHAVIORAL STUDIES
DEPARTMENT OF MATHEMATICS EDUCATION

Questionnaire to be filled by high school Mathematics teachers

Objective: - The purpose of this questionnaire is to gather data for a study leading to student-centered method of teaching-learning Mathematics: Challenges and opportunities. It is administrated to survey your views and to collect first hand information on the problems in teaching and learning of Mathematics in the secondary schools of East wollega zone. It also looks for plausible solutions to improve Mathematics education (instruction) in the secondary schools. 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 your kind cooperation

Directions:-

1. Do not write your name
2. Check (✓) on the space provided corresponding to the item of your choice.
3. In place where your response is to be given in writing, please try to be brief.

A. Background Information of Teacher

1. Name of the school _____
2. Sex: - male ☐ Female ☐
3. Age _____
4. Academic qualification A. M. sc/ M. Ed ☐ B. B. Sc / B. Ed ☐
 C. Diploma ☐ D. other please specify _____
5. Total year of service as a mathematics teacher in the secondary schools.
 A. 1-5 years ☐ B. 6-10 years ☐ C. 11-15 years ☐
 D. 16-20 years ☐ E. 21-25 years ☐ F. about 25 years ☐
6. During this semester, how many periods do you teach per week.
 A. below 10 period's ☐ B. 10-15 periods ☐
 C. 16-20 periods ☐ D. above 20 periods ☐
7. Number of sections you are teaching currently _____
8. Which grade level are you teaching now? (More than one answer is possible)
 A. 9th grade ☐ B. 10th grade ☐ C. 9th and 10th grade ☐
9. On average how many students do you have per section?

10. What do you think are the objectives of mathematics teaching-learning at the secondary school level?
 a. _____
 b. _____

- c. _____
d. _____

B. Main Data

Instruction-I: - Issues related to teaching-learning training are indicated below. Please, mark “√” in the box provided based on the experience you have on the training.

1. Did you come to teaching mathematics profession based on your interest?
a. Yes ☐ b. No ☐ C. If no, justify _____
2. Have you ever taken training on how to teach learner-centered method of teaching and learning mathematics? a. yes ☐ b. no ☐
3. If you have taken training on student-centered approach of teaching-learning mathematics, on which type of training have you participated?
a. Pre-service training ☐ b. In service training ☐
4. If you have trained in pre-service training, did the training help you to master the strategies of implementing student-centered method of teaching-learning mathematics?
a. Yes ☐ b. no ☐
5. Did the training in the pre-service help you to apply the student-centered approach in real world of teaching-learning mathematics? a. yes ☐ b. no ☐
6. Did the pre-service training help you to apply proper classroom management which helps constructive student inquiries and interaction? a. yes ☐ b. no ☐
7. Did the training in the pre-service help you to acquire knowledge and skill to produce appropriate instructional materials that facilitate student-centered method of teaching-learning mathematics? a. yes ☐ b. no ☐
8. If you have taken in-service training on how to use student-centered method of teaching and learning mathematics, which type of training have you taken?
a. summer ☐ b. In-staff training ☐ c. workshop ☐
9. If you have taken one of the above trainings, who prepared it?
a. Oromia education Bureau ☐ b. zone education office ☐
c. woreda education office ☐ d. the school ☐
10. If you have taken in-service training, the contribution of the training in applying student-Centered approach of teaching-learning mathematics is?
a. high ☐ b. moderate ☐ c. low ☐
11. Do you use student-centered method of teaching-learning mathematics? a. yes ☐ b. no ☐
12. If your answer for question no.11 is yes, how often do you use?
a. always ☐ b. sometimes ☐ c. rarely ☐
13. According to your experience, what are the factors that affect the implementation of student-centered method of teaching-learning mathematics in your school?

14. What are the opportunities of implementing student-centered method of teaching-learning mathematics? _____

15. If you have comments about the training on student-centered approach of teaching-learning mathematics (pre-service and in-service) please, justify?

Instruction-II: - Strategies of implementing instructional methods of teaching and learning mathematics are listed below. Please, mark√" in the space provided in accordance to your application of the strategies or methods.

No	Strategies	How often do you plan and use instructions?		
		Always	Sometimes	Not at all
1	Explanation / lecturing			
2	Problem solving			
3	Discovery method			
4	Inquiry method			
5	Project method			
6	Group work			
7	Role playing			
8	Field trip			

Instruction-III: - Some basic concepts about instructional methods of teaching and learning mathematics are listed below. Please, read each of them and indicate the rating that you think corresponds to your understanding.

No	Items	Strongly agree	agree	undecided	disagree	Strongly disagree
1	Learner prior knowledge determine about new topics they learn in the class.					
2	Learning is self-initiated.					
3	Student-centered method of teaching and learning mathematics helps the learners to share experience and learn from each other.					
4	Student-centered method of teaching-learning mathematics develops self-confidence and independent learning for the learners solving problems.					
5	Teachers and texts are the source of knowledge in teaching and learning mathematics.					
6	Learning occurs when learners are silent and receive information from teachers.					
7	Learning is the responsibility of the students.					
8	The role of the mathematics teacher is facilitating the learning process rather than controlling.					
9	Teacher's task is to prepare learners to absorb the subject matter in the text book to reflect it effectively in the exam.					
10	Learners should participate in deciding what should be learned and what methods should be used in the classroom.					
11	Student-centered method of teaching-learning mathematics prepares the learners to solve real and practical problems of the society.					
12	It is impossible to implement student-centered method of teaching and learning mathematics in a large class size.					
13	Since student-centered approach of teaching and learning mathematics takes time, it is difficult to implement it.					
14	Teacher's role is less important in student-centered method of teaching-learning mathematics than in teacher-centered method.					
15	Lecture method is advantageous for long-term relation of knowledge and motivation for teaching-learning mathematics.					
16	Learning mathematics is effective when teachers have good knowledge of teaching mathematics.					

Instruction-IV: - Statements about the instructional materials are listed below. Please mark “/” in the boxes based on your experience.

1. According to your view, are there instructional materials in your school that can help you to implement student-centered method of teaching-learning mathematics? a. yes ☐ b. no ☐
2. Do teachers and students prepare instructional materials (teaching aids) to facilitate teaching-learning mathematics? a. yes ☐ b. no ☐
3. If your answer for question 2 is yes, how appropriate they are?
a. Highly ☐ b. moderately ☐ c. not appropriate ☐
4. Is there pedagogical center in your school? a. yes ☐ b. no ☐
5. If your answer is yes for question 4, is the pedagogical center effective in preparing teaching-learning materials? a. yes ☐ b. no ☐
6. How often do you use teaching aid during teaching-learning mathematics?
a. Always ☐ b. sometimes ☐ c. not at all ☐
7. According to your experience can instructional materials (teaching aids) facilitate student-centered method of teaching-learning mathematics? a. yes ☐ b. no ☐
8. What is the student-mathematics text book ratio in your school?
a. 1:1 ☐ b. 1:2 ☐ c. 1:3 ☐ d. 1:4 ☐
9. Do mathematics text book have teacher's guide in the school? a. yes ☐ b. no ☐
10. If there are problems related with mathematics instructional materials. Please, Justify

APPENDIX-III

Questionnaire to be filled by supervisors

This questionnaire is designed to collect information for research purpose only. Its objective is to assess your opinions on “student-centered method of teaching and learning mathematics: Challenges and Opportunities” in your school. 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.

Tank you in advance.
For your kind cooperation.

I. Background information of supervisors

1. Woreda _____
2. Age 20-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ >40 ☐
3. Sex Male ☐ Female ☐
4. Qualification TTI ☐ Diploma ☐ Degree ☐ Master ☐
If any other, please specify _____
5. Total experience _____
6. Experiences as a supervisor _____

II. Main Data

Instruction: - Items related to the activity of supervision are listed below: Please, read each of them and give appropriate answer for each of them based on the experience you have.

1. Do offices allocate adequate budget to secondary schools? a. yes ☐ b. no ☐
2. Have you had training on how to supervise schools? a. yes ☐ b. no ☐
3. If your answer for question 3 is yes, did the training help you to effectively supervise schools? a. yes ☐ b. no ☐
4. Have you ever taken training about student-centered method of teaching and learning?
a. yes ☐ b. no ☐
5. If you have taken training on student-centered method did it help you to provide effective support to schools on how to implement the method? a. yes ☐ b. no ☐
6. Do all schools get adequate supervision in your woreda? a. yes ☐ b. no ☐
7. When schools are supervised, for which of the following items more emphasis is given please, rank them according to the emphasis given starting from one in an ascending order.
a. Teacher discipline ☐ b. Students discipline ☐ c. The activities of the director ☐
d. Content coverage ☐ e. Method of instruction ☐ f. School resource management ☐
8. Which instructional method teachers used mostly?
a. explanation /questions and answer/ lecturing ☐
b. active-student participation / problem solving/ discovery and inquiry of knowledge by students ☐
c. others _____
8. Do the woreda / zone education office provide short and long-term training to teachers regularly? a. yes ☐ b. no ☐
9. If training is given to mathematics teachers, Please indicate the focus's area of the training.

10. How often do supervisors supervise one school in one academic year?
a. Once ☐ b. Twice ☐ c. 3-times ☐ d. 4-times ☐
11. Do supervisors have transport facility to supervise schools? a. yes ☐ b. no ☐
12. If your answer for question 12 is no, what other possibilities are used to supervise schools?

13. Do numbers of schools affect supervisory activities? a. yes ☐ b. no ☐
14. Do schools exercise in staff training? a. yes ☐ b. no ☐
15. According to your experience, what other factors affect the activities of supervisor?

16. According to your experience, what are the factors affecting the application of student-centered method of teaching-learning mathematics? _____

APPENDIX-IV
Classroom Observation Checklist:

I. General Information

1. Woreda _____
2. School _____
3. Grade/ Section _____
4. Subject _____
5. Number of students in the class: M _____ F _____ Total _____

II. Information about the teacher

1. Qualification _____
2. Experience _____
3. Sex _____

III. Lesson Plan

1. Related to the lesson _____
2. Is it prepared according to student-centered method of teaching-learning mathematics? _____

3. Is there any difficulty to implement student-centered method of teaching-learning mathematics? _____

4. What are the opportunities during implementing student-centered method of teaching-learning mathematics? _____

IV. Observation about classroom Instruction

2. Activities of the teacher	Yes	No	Remark
2.1. Assess learner's prior knowledge and experience before starting mathematics class.			
2.2. Motivating students to articulate their experience and practice during mathematics class.			
2.3. Making mathematics class democratic and interactive.			
2.4. Ask questions:			
2.4.1. Asking close-ended mathematics questions.			
2.4.2. Asking open-ended mathematics questions.			
2.5. Give time for the students to think on open-ended questions.			
2.6. Making clear how to identify problems to be solved.			
2.7. Asking students if they came with problem.			
2.8. Relating problems in the class with local problems.			
2.9. Discussing on alternative strategies of how to solve problems.			
2.10. Providing information from which learners draw conclusions or generalization.			
2.11. Motivating students to actively participate in learning mathematics.			
2.12. Assigning group work in the classroom and outside the class.			
2.13. Using methods of brainstorming in groups and whole class.			

2.14. Involving students to decide on mathematics activities.			
2.15. Explanation lecture.			
3. Activity of the learner			
3.1. Students interact with teacher.			
3.2. Student-centered interaction during mathematics classroom.			
3.3. Involving in determining methods of teaching-learning instruction.			
3.4. Willingness to freely express ideas on different issues.			
3.5. Willingness to participate in group work.			
3.6. Active participation in teaching-learning process in the mathematics classroom.			
4. Instructional materials (Teaching aids)			
4.1. Observable in the classroom.			
4.2. Instructional materials done by students.			
4.3. Instructional materials done by teachers.			
4.4. Instructional materials (Teaching aids) related to the contents.			
5. School facilities			
5.1. Availability of the desk for every student.			
5.2. Well ventilated classroom with good light.			
5.3. Free space to facilitate different sitting arrangement.			
5.4. Standardized chalk board.			
5.5. Neatness of the class.			
5.6. Pedagogical center.			
5.7. Library with different mathematics reading materials.			

APPENDIX-V
Interview to the Directors
Basic Guiding Interview Questions:

1. Age _____
2. Qualification _____
3. Total experience _____
4. What is your experience as a director? _____

5. Do you have training on student-centered method of teaching? _____. If yes, Please mention the issues? _____

6. Do you have concerns about using student-centered method in your school? _____. If yes, how you explain? _____

7. Do mathematics teachers in your school use the student-centered method of teaching-learning approach? _____. If yes, Please mention the issues? _____

8. Is your school environment conducive for the application of student-centered method of teaching-learning mathematics? _____. If yes, how you explain? _____

9. Do woreda and zone education offices give support to implement student-centered method of teaching-learning mathematics? _____. If yes, Please mention the issues? _____

10. In your view what are the factors that affect the implementation of student-centered method of teaching-learning mathematics? _____

11. In your view what are the opportunities in the implementation of student-centered method of teaching-learning mathematics? _____

12. Did you have any other comments to make about the student-centered method of teaching-learning mathematics effective? _____

APPENDIX-VI
Document analysis:

1. Analysis of student's achievement in mathematics at grade 9 and grade 10 in relation to other subject.
2. Opportunities documented to implement student-centered method of teaching and learning Mathematics.
3. Challenges/ difficulties documented to implement student-centered method of teaching and learning Mathematics.
4. Mathematics Teachers Performance appraisal on student-centered method of teaching and learning mathematics.
5. Students and mathematics-text book ratio.
6. Average class-size.
7. Adequacy (or enough) worked examples and practical activities in Mathematics text books.
8. Analysis of plasma lesson in teaching and learning Mathematics instruction.