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GENDER DIFFERENCES IN MATHEMATICS LEARNING AND ACHIEVEMENT IN SOME SELECTED SECOND CYCLE PRIMARY SCHOOLS OF BENCH-MAJI ZONE (SNNPR)

By

Masresha Kassa

Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Education in Mathematics

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Gender Differences in Mathematics Learning and Achievement in Some Selected Second Cycle Primary Schools of Bench-Maji Zone (SNNPR)

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Acronyms

BMZ: Bench-Maji Zone.

BMZED: Bench - Maji Zone Education Department.

E.C: Ethiopian Calendar.

EFA: Education for All

ESDP: Education Sector Development Programme.

FDRE: Federal Democratic Republic of Ethiopia.

GEQAEA: General Education Quality Assurance and Examinations Agency.

GOE: Government of Ethiopia.

JRM: Joint Review Mission.

MOE: Ministry of Education.

PSLE: Primary School Leaving Examination.

NOE: National Organization for Examinations.

SES: Socio Economic Status.

SNNPR: South Nations Nationalities and People's Region.

SNNPRS: South Nations Nationalities and People's Regional State.

TIMSS: Trends in International Mathematics and Science Study.

TVET: Technical and Vocational Education and Training

UNESCO: United Nations Educational, Scientific, and Cultural Organization.

WEO: Woreda Education Office.

ZED: Zone Education Department.

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Abstract

This study was aimed at investigating the gender differences in mathematics learning and achievement in some selected Primary Schools of Bench-Maji Zone, in order to explain the quality and relevance of education rendered in schools. It used 364 eighth grade students randomly selected from ten primary schools in BMZ to fulfill questionnaire and 10 female students for interview, 13 mathematics teachers, and 10 principals of the sample schools were included. Both quantitative and qualitative research methods were employed in this study. For this end, four instruments were used for the data collection that is achievement test, questionnaires, interview and observation.The finding of the study revealed that most of the male students were outperformed their female counter parts in the study primary schools. However, this was not in all case perfect. Female students in one school, i.e. Temenjayax primary school were competent enough than males. There was no significant difference in mathematics achievement of boys and girls in Aman, Bachuma, and Otuwa schools. These results suggest these schools may be closer to attaining gender equity. In contrast a very significant difference in the achievement score between boys and girls were found in Debre-Work, Edget-Behbret, and Maz primary schools. Furthermore, the composite score of mathematics results vary among schools in the Zone: The sample students from Otuwa and Temenjayax achieved relatively higher mean score than the students in the rest of the Zone. On the other hand, sample students in Edget-Behibret and Bachuma scored the lowest two mean scores. Students in the other schools obtained mean scores that lie between these two extremes. The study, thus, discussed what factors were caused girl's lower performance (achievement) in mathematics. It argued the gender differences in mathematics learning and achievement were caused by social and institutional factors. The study concluded the relationship between mathematics school performance and female achievement in primary schools of Bench-Maji Zone (BMZ) has clearly shown that girls' demand more support than boys'. It has clearly shown that family and school support is desirable so as to gender equity in mathematics learning and achievement. Therefore, stakeholders need to work towards the attainment of gender equity in the provision of mathematics education in their respected schools.

CHAPTER ONE

Introduction

1.1 Background of the study

Educating girls achieves even greater results. When girls go to school, they tend to delay marriage, have fewer but healthier children, and contribute more to family income and national productivity. According to GEQAEA (2008) all the three Ethiopian National learning assessments have demonstrated that girls are at a disadvantage compared to boys. The study has shown that parental conditions, student personal and social conditions, provision of textbooks and learning materials, teacher reforms, school reforms all influence students' learning(P.96). Unfortunately, in many cases schools are risky environments for girls and boys. Schools, especially teachers, can reinforce negative gender stereotypes and replicate systemic inequalities that discourage and marginalize students. This can lead to poor academic performance, absenteeism and high dropout rates. Alternately, teachers can contribute to eliminating gender bias and expanding the choices and aspirations of both boys and girls. In the latter case, schools can be effective in helping young people learn positive and healthy models of behavior by challenging the harmful gender norms that limit academic achievement and influence students' life choices (EQUATE, 2008b:6).

Educational researchers (Yin and Fan, 2003; Cairney, 2000, Feldman and Wentzel, 1990 and Niles, 1981; cited in Admasu, 2004) are concerned with the effects of different factors such as school environment, students' behavior and teachers teaching methodology on the development of students' achievement. Juxtaposed with the internal motives and desires students have for themselves, there are many problems or factors that challenge students' academic performance. School composition, students' behavior, academic self concept, external motives for learning, teacher-student interaction, cultural factors, and school environments are few of them which can affect the overall performance of learning activities in general and student's achievement in particular (Tavani and Losh, 2003 in Admasu, 2004; Halle, 1997; and Kulder & Sinclair, 2000).

As Tadesse (2009) explained girls have heavy burden and a subsequent unclear mind, and increased absenteeism from school, lack of time for school assignments after school attending, lack of understanding the subject matter and commitment to school activities. The effect is

academic underperformance for the girl. This may indicate that females spend more time helping their parents at home than doing their homework and assignments which negatively affects their academic achievement (P.58). On the other hand, scholars Davis-Kean & Eccles said the research has shown only two gender differences in specific sub-areas of spatial and verbal abilities, three-dimensional mental rotation (favoring men), and speech production (favoring women). Other research has also shown a decline in the differences between the genders in the past few decades on standardized test, suggesting that the more exposure that women are getting to math and science classes, the better their scores. Even though this research puts into questions whether gender differences still exist in academic achievement, many researchers are still finding differences in performance as well as general interest in areas related to mathematics and science (Davis-Kean & Eccles, 2002:2). In contrast, as stated by Lasonen et.al (2005: 24) The Jomtien World Conference on Education for All (EFA) reaffirmed the right to education and paid particular attention to the gender imbalance in the growth of the non-literate population. Education for girls and women was set as the most urgent priority in attaining the EFA objectives by ensuring access to and improving the quality of education for girls and women and by removing every obstacle hampering their active participation in education. In contrast, Brophy (2010) stated most teachers have been doing these things in recent years, and along with changes in curriculum materials and pervasive messages about gender equality in the culture generally, they have had a significant effect. Gender gaps in mathematics and science achievement are disappearing rapidly. In fact, gender-related concerns about student motivation and achievement have begun to shift to boys, because recent trends indicate that fewer boys are earning good grades in school, graduating from high school, or attending college (Head, 1999; cited in Brophy, 2010: 292).

On the other hand, there is a dissatisfaction circumstances concerning achievement in students and parents. GEQAEA (2008:91) claimed although there are few variations, there is a clear expressed dissatisfaction with what students achieve and learn in primary school. Even in areas where some quality has been witnessed, there is an expression that shows students does not acquire the expected knowledge, abilities and skills desired. However, the impact of poor quality education can be particularly difficult to overcome for girls because of the overall structural inequalities they face. The teacher to student ratio, the state of the school facilities - sanitation, water, benches and desks - and the processes of teaching and learning may have a different

bearing of girls' and boys' educational attainment and subsequently on their future career prospects. While it is important to ensure that all schools provide quality education, governments can also tackle specific cultural constraints with public campaigns and awareness rising programmes on girls' right to education (CSW, 2010: 4). Mean while, MOE (1994) claimed that Transitional Government of Ethiopia Education and Training Policy and its strategy document states the government will provide support to raise the participation and performance of women in education (P.7).

1.2 Statement of the problem

To understand educational problems, more information is needed and to resolve these problems more research works are required. Therefore, gender difference in mathematics learning and achievement has been studied for many years. However, the studies conducted at different grade level of elementary schools are inconsistent. For example, Wilder & Powell (1989) asserted that the question of gender differences in mathematics achievement has a long history of research with different or contradictory results. Different theories have different explanations for the gender gap in mathematics. The biological theories argue that innate differences in spatial ability, higher order thinking, or brain development produce a gap in achievement. Societal explanations focus on how girls are socialized into believing that mathematics is not important, useful, doable, or part of the identity of a girl (P.2). Mathematics is one of the formal disciplines that help man lay a solid foundation for future survival. It is a vitally important subject in the school curriculum. Yet it is a subject which many students experience difficulty with. Knowledge of mathematics, to some degree, is a necessity in various aspects of everyday life. So it is crucial that this subject be taught effectively without any gender bias. There have been many changes in the twenty five years since research in the field of gender and mathematics began. Progress had been made in closing the gender gap. Legislative changes and government policy initiatives have also played a role in challenging the status quo. Yet, equity in mathematics learning outcomes has not been achieved. Although more females now study more mathematics courses than in the past, participation rates in the most demanding mathematics options remain male dominated. It is also now known that mathematics achievement levels can vary depending on the measure used to assess performance. At the highest levels of mathematics achievement

and on the most cognitively demanding questions, however, gender differences found tend to favor males (Forgasz, 1997:253).

The other scholars, such as Hedges & Nowell, 1995; Hyde, Fennema, & Lamon, 1990; Hyde, Linberg, Linn, Ellis & Williams, 2008 stress gender differences stating: the question of gender differences in mathematics achievement, attitudes, and affect is a continuing concern as scientists seek to address the underrepresentation of women at the highest levels of science, technology, mathematics, and engineering that girls and women lack mathematical ability persist, despite mounting evidence of gender similarities in math achievement (cited in Else-Quest, et.al., 2010:103). On the other hand the contemporary Parental attitudes may exaggerate the situation of gender issues. One area where parental attitudes may interfere with girls' progress in mathematics is gender division of household responsibilities. A number of theories have been advanced regarding the gender gap in mathematics. Equally parents, although not necessarily rating their son's or daughter's abilities any differently, do apparently believe that mathematics is harder for girls and requires more effort to succeed in. This belief undoubtedly helps to shape the feeling, prevalent in different societies, that mathematics is not such an important subject for girls to study. Fortunately many women's' groups are now hard at work dispelling this image, and IOWME (the International Organization of Women and Mathematics Education) has been particularly active. Recent research shows that the creation of a more positive and favorable image for girls who are mathematically able is apparently having some beneficial effects (Bishop et.al., 1993:21).

Educators and parents alike need to become active change agents in fostering positive attitudes in young girls and women in order to enhance their interest and achievement in mathematics. As Clarkson and Presmeg (2008:235) claimed many parents and politicians might initially be concerned about explicit values teaching in mathematics. What parents and others should be concerned about is that values teaching and learning do go on in mathematics classrooms, and because most of it appears to be done implicitly, there is only a limited understanding at present of what values are being transmitted, and of how effectively they are being transmitted. Given the often-quoted negative views expressed by adults about their bad mathematics learning experiences, one could speculate that the values transmitted to them were not necessarily the most desirable, but that they were transmitted rather effectively! The results from the 2006

Programme for International Student Assessment (PISA) illustrate the complexities and the attention required for achieving gender equality. The scores in mathematics indicated that attitudinal differences between girls and boys were far more pronounced than performance differences. Girls reported much lower interest in mathematics, less confidence as mathematics learners, less motivation to use mathematics in the future, and much greater anxiety when learning mathematics. Boys performed slightly better than girls, but were much more confident and less anxious learning mathematics (Schleicher, 2007, cited in EQUATE, 2008a:9-10).

A study conducted by GEQAEA (2008) in Ethiopia showed that on the cumulative result and per every subject area males have a better performance than females. Over the years, research on gender has produced much useful knowledge. As yet, however, the success of equity in mathematics learning outcomes has not been achieved. The movement for continued research in the field is as urgent today as in the past. Society at large has changed over the quarter century of powerful efforts in the field. In some respects, the challenges confronting researchers on gender issues are greater. The focus on boys' issues, although not trivial, overshadows the efforts of those who wish to emphasize that there remain areas of disadvantage for girls. This Special Issue on gender and learning settings is thus particularly timely.

There are many studies that have focused on gender differences in academic achievement (Tadesse, 2009; Else-Quest, 2010; Mullis et.al., 1997; Forgasz, 1997; Driessen et.al., 2005; GEQAEA, 2008), thus, the aforementioned studies result the purpose of this study to investigate gender differences in mathematics learning and achievement. This study attempted to inject more perspectives on mathematics subject. Moreover, I would like to better discuss the dynamics between mathematics and teaching-learning trends of primary schools and subsequently lead to improved students mathematics achievement. Thus these necessitate exploring aspects of the mathematics learning experiences in grade eight in BMZ primary schools. This involves looking at boys and girls mathematics performance, perceptions of their experiences, the nature of the difficulties girls have with mathematics and possible reasons for these difficulties. In order to understand why difficulties may be arising, there is a need to look at what is known about how students learn and the nature of attitudes toward mathematics. At this point, the focus moves to mathematics itself, what is known about how young pupils think of mathematics, as well as the difficulties they experience.

1.3 Objective of the study

The main purpose of this study was to examine and understand whether there is gender difference in mathematics learning and achievement of Primary schools in Bench - Maji Zone, SNNPR. Furthermore, the study examined the nature, extent and effect of gender related features in mathematics learning and achievement, considering school principals, mathematics teachers and eighth grade students, as subjects of the investigation. In line with this general objective the specific objectives of the study are:

a) To illustrate the contemporary trends of mathematics teaching - learning process.
b) To determine the attitude of boys and girls towards mathematics.
c) To assess whether there is achievement difference between boys and girls in mathematics.
d) To identify those factors influencing female students' mathematics achievement.

1.4 Research questions

To achieve the objective(s) of the study stated above, the study has tried to answer the following research questions:

1. What are the contemporary trends of mathematics teaching – learning process?
2. Is there attitudinal difference between boys and girls towards mathematics?
3. Is there a difference between boys and girls mathematics achievement?
4. What are the factors influencing female students mathematics achievement?

1.5 Significance of the study

It is important to study those gender-related factors which hinder students in their academic achievement in an effort to identify improved strategies or approaches to an effective teaching-learning situations vis-à-vis student's mathematics achievement. The study was intended to make contributions to the advancement of knowledge describing whether there is gender difference in mathematics achievement, and gender-related problems of female students in primary schools of BMZ generating awareness to the people directly or indirectly involved in such issue.

The result of this study is expected to deliver information for teachers, since teachers are expected to study the behaviors of their students and encourage the development of the necessary trait, and discourage what is not. Governmental officials and policy makers can also gain

something out of the results. They can introduce the necessary modification, if any; in to the curricular materials and through it transmit the desired change. It is also possible that parents of the students may be served by the findings, for they can foster the traits required while interacting with them.

In general, a conclusion drawn from the analysis of the study is expected to provide information for those concerned bodies to take appropriate measures; to minimize the gender gap and improving learning and achievement of students in mathematics and also it may give some direction for other researcher who will be interested in this area.

1.6 Definition of terms used

- **Learning:** acquiring or gaining knowledge that takes place in school.
- **Achievement:** "... the striving to increase, or keep as high as possible, one's own capability in all activities in which a standard of excellence is thought to apply and where the execution of such activities can, therefore, either succeed or fail." (Heckenhause, 1967, pp. 4 5; cited in Fiore, 2003).
- **Achievement score:** refers to the score obtained by the student. That is, achievement scores of students in the researcher prepared achievement test and/or PSLE on the subject matter.
- **Gender Bias:** refers to the way we favor boys or girls because they are boys or girls, not because of who they are individually.

1.7 Delimitation of the study

The study has focused on gender related factors in Mathematics Learning and academic achievement of students in primary schools on the basis of the data obtained only from 364 students, 13 mathematics teachers and 10 school principals. It is also limited to the information gathered from ten primary schools in Bench-Maji zone.

1.8 Constraints and limitations of the study

However, since the trips to the survey areas were mostly by public transport and sometimes on foot and by horse, it was difficult to follow a plan. Along with other consequences, the shortage of time and research budget had caused the sample survey to be limited to relatively few sample schools.

CHAPTER TWO

Review of Related Literature

All over the world there is growing concern about mathematics education. Mathematics is a key ability in the education of virtually every discipline. In our daily life, Mathematics is important to understand and analyze the flow of information received from the media and is also important in many other human endeavors, since many of these include models that can be mathematically structured. Below are some of the contexts that had been reviewed relating to the proposed study under consideration.

2.1 Academic achievement

According to Porter and Gamoran (2002:121) it has become imperative to study what children "think they are doing and what their reasons are for doing it". Studying children's achievement beliefs has opened a window into why students engage in behaviors that either promote or inhibit their academic achievement. Any study that measures achievement without concurrently examining the context in which this achievement occurs will yield results that may be limited in their use. The necessity to improve our knowledge of the ways that the family, as an institution, affects children's ability and motivation to learn as well as academic achievement. A better understanding of how family background and home environment relate to student learning can help societies formulate policies that may serve to intervene in detrimental family processes or enhance beneficial ones. It is the teacher's competence, ability, resourcefulness, and ingenuity to efficiently utilize the appropriate language, methodology and available instructional materials to bring out the best from learners in terms of academic achievement (Olatunde, 2009:366).

2.2 What is learning?

Learning starts the day we are born and occurs in all areas of life. School learning is only a small part of the learning process. Most of psychologists and educators tend to describe learning as a process by which behavior is either modified or changed through experience or training. Learning refers not only to an outcome that is manifestly observable, but also to attitudes, feelings and intellectual processes that may not be obvious. Gagné stated that: "Learning is a change in human disposition or capability, which can be retained, and which is not simply ascribable to the process of growth" (Gagné 1964; in Amanat, 2008:6).

Anthony (1997, cited in Tesfaye 2009:16) points out that current mathematics learning perspective incorporates three important assumptions. These are seeing mathematics learning as a process of mathematical knowledge construction, mathematics learning as mathematical knowledge dependent, and the student being aware of the process of cognition, controlling and regulating mathematics learning processes. The arguments presented imply that students need to use their own preferred mathematics learning styles to learn mathematics for understanding. There are certain types of learning presented by scholars out of which the one presented below is described by Gagné, (1974). Gagné determined five categories of learning discussed as follows:

i. Information Learning**:** Learning of different facts, principles and generalizations by absorbing and holding them in memory.
ii. Cognitive Strategies: The internally organized strategies and skills governing the learner's own behavior, such as focusing, remembering, attending, and self-management of learning and thinking. These skills are developed gradually with the passage of time as individuals are involved in more studying, learning and thinking. The individual selects a specific mental strategy or is involved in a specific mental process to solve a problem.
iii. Attitudes: A set of beliefs and evaluations. Every individual possesses attitudes of various kinds towards different things, people and situations. Attitude is choosing to behave in a specific way that shows a newly attained belief.
iv. Motor Skills: The individual learns various physical skills in life: the skills of knowing how to do different things in life.
v. Intellectual Skills: An individual interacts with his environment by using symbols. He uses language to deal with his environment symbolically. As the learning of school subjects continues, symbols are used in more complex way: distinguishing, combining, tabulating, classifying, analyzing, and quantifying objects, events, and even other symbols. This kind of learned capability is given the name 'Intellectual Skills' (Gagné 1974, in Amanat 2008:23).

The human learners learn different kinds of simple and complex intellectual skills. The subject matter in school mathematics is virtually an example of intellectual skills. A relatively simple skill of using symbols is to learn the symbols 5, 20 or the addition symbol '+'. A more complex skill is to add two mixed unlike common fractions (Amanat, 2008:23).

2.3 Gender differences

Some of the gender differences in cognitive and social/behavioral outcomes at primary school entry and beyond may in part be attributed to differences in the quality of home learning environment (Ison and Weatherburn, 2007:55). On the other hand EQUATE (2008a:3) suggests that with most efforts focused on closing the primary school enrollment gap between girls and boys, insufficient attention has been paid to the gender dynamics that affect children's larger participation in school. The relationship between gender and educational inputs, such as curricula, textbooks, pedagogy, and teacher training, are rarely made explicit. Similarly, the links among gender inequities, inputs, and outcomes are not sufficiently acknowledged.

Others have focused not on mean gender differences but on gender differences in the upper tail of the distribution and the greater male variability hypothesis. The argument is that greater variance in test scores is displayed by males than females, so that, even if there is no average gender difference, there will still be more males among the very top performers. One statistic used to test this hypothesis is the variance ratio if males are overrepresented in the upper tails of the distribution, gender differences in achievement should be larger on difficult or complex problems than on easy or moderate problems. In their analyses of gender differences on the mathematics portion of the National Assessment of Educational Progress, Hyde et al. (2008) found that gender differences were not larger on the most challenging problems. This finding provided little support for the argument that males outperform females in complex problem solving (Else Quest et.al, 2010:104).

2.4 Gender gap

Girls' access to primary education lags significantly behind boys' access. The gender gap in primary-school enrolment remains at the level of about 20 per cent. Female student numbers should be drastically increased if Ethiopia is to reach the goal of all children having access to primary education by 2015 (EFA Goal 2). The same trend is observed in the goal of gender parity and equality. Both in primary and secondary education, Ethiopia is at risk of not reaching the goal of gender parity even by 2015 (EFA Goal 5). Improving gender parity is the best predicator of achieving the EFA goals in general. Female teachers may encourage female students to stay in school through positive role models. However, the increase of female teachers has been fairly slow (Lasonen et.al, 2005: 10).

NOE claimed on its national study conclusion conducted in Ethiopia that there were 5,262 males and 2,636 females in the national samples. On aggregate, males scored an average of 41.56 percent whereas females had an average of 36.56 percent. This shows that there is a gender gap in student performance in the country (NOE, 2004:105). The study area where this study to accomplish has tangible experience so as to show the gender gap seen on the ground in that there are only limited proportion of females than male mathematics teachers in primary schools which thought to be the consequence of gender gap predisposed by lower enrollment of girls in secondary schools. At the same time all of the mathematics teachers in grade eight where this study conducted are males. In line with this idea, MOE (2004: 39) described that low participation of girls in secondary school has contributed towards low participation of females as teachers at secondary schools. In support of this idea World Bank (2005:165), asserted that for the grade 12 examination, pass rates are available separately for boys and girls, and they show that girls are only 63 percent as likely as boys to pass. In all regions, girls lag behind boys, but the gender gap is widest in SNNPR. Hence, it could be deduced that there is a clear and timely issue regarding gender gap.

FDRE (2010:36) asserted that the proportion of current school attendance in SNNPR show also variations by sex. Like the previous census results in 2007 census also the proportion were higher for males at Southern Nations Nationalities and Peoples Regional level (12 percent against 10 percent) and in all zones the percentage of males who are currently attending greater than females. Especially, in Bench-Maji zone Alaba zones and Konso special woreda the disparities between sexes were quite significant. In addition, a report presented on MOE (2004:89) supposed that in SNNPR, different strategies have been used by the various woredas to try to improve gender equity. All woredas visited have shown a good understanding of the importance of promoting gender-equity and most have encouraged the setting up of girls clubs, and girls counseling committees, in primary schools. In reports on educational statistics, give prominent attention to data which show gender gaps in participation and performance. In the second cycle of primary education and lower secondary up the ladder gender disparity persists. The progress towards parity is undermined by several factors, including distance of school from home, early marriage and household work load. Among the teaching staff, there are more female teachers in the first cycle of primary but less and less as one goes up the ladder.

2.5 Equality of opportunity

Equality of opportunity includes holding the individual accountable for his or her own achievement and expecting society to level the playing field so that all people can develop to their fullest potential and that they are given a fair chance to succeed (Roemer 1998 in EQUATE, 2008b:5). Equality of opportunity in the Gender Equality Framework refers to providing both girls and boys with equal opportunities to go to school, learn, achieve, and succeed as adults. There are four main dimensions of gender equality outlined: equality of access, equality in the learning process, equality of educational outcomes, and Equality of external results (ibid.).

2.5.1 Equality of access

Equality of access means that girls and boys are offered equitable opportunities to gain admission to formal, non formal or alternative approaches to basic education. Actual attendance, rather than enrollment, is a better indicator of whether access has been achieved. Amanat (2008:74) further explained curricular equality and access should account in to consideration saying while constructing mathematics curriculum one of the factors important to be considered is essential that the mathematics curriculum is appropriate for each age and stage. The material presented to the learners must be accessible. In addition as Checkley (2006) describes equity will not be achieved if all students are not given equal access to high-quality, rigorous mathematics instruction (P.17). Moreover school related factors which prevent higher female enrolments include distance to school, lack of experience sex-latrines, and girls being late from school to their domestic responsibilities (MOE, 2004:34). On the other hand Lasonen et.al (2005), asserted that Education and training have particular significance for the reduction of poverty and for strategies of gender equity because they stress the dimensions of opportunities, skills, human resources development and empowerment. However, in Ethiopia an emphasis on developing TVET and skills was introduced only at the turn of the 21st century (P.8-9).

2.5.2 Equality in the learning process

Equality in the learning process refers to pedagogic processes and the school environment, both of which have a significant impact on how and what students learn. Girls and boys should

receive equitable treatment and attention and have equal opportunities to learn. This means that all students ought to be exposed to the same curricula, although the coursework may be taught differently to accommodate the different learning styles of boys and girls. In addition, all learners should experience teaching methods and materials free of stereotypes and gender bias, and have the same freedom to learn, explore, and develop skills in all academic and extracurricular settings. The school environment is molded, in part, by the nature of relationships between teachers and learners and between girls and boys. Students need to be safe from psychological, physical, and sexual abuse. A safe, supportive environment is a prerequisite to effective teaching and learning (EQUATE, 2008b:5).

2.5.3 Equality of educational outcomes

Equality of educational outcomes means that girls and boys enjoy equal opportunities to achieve and outcomes are based on their individual talents and efforts. To ensure fair chances for achievement, the length of school careers, academic qualifications, and diplomas should not differ based on a person's sex. Mechanisms for evaluating individual achievement should also be free of any gender bias. What tests, examinations, and assessments measure tells students what matters and to the extent that these mechanisms reflect a gender bias, they transmit messages to students that can discourage their interest in school or in particular subjects. Results from classroom tests, national examinations, and international assessments can influence boys' and girls' confidence levels and their perceptions of their abilities and what is expected of them. They can also impact what is taught in the classroom and how content is delivered. Where tests or examinations are used to determine promotion into future grades, or other types of educational opportunities, the extent to which there may be bias in these mechanisms is an important consideration when trying to ensure equality of access and equality of outcomes (ibid.).

2.5.4 Equality of external results

Equality of external results is achieved when the status of men and women; their access to goods and resources; and their ability to contribute to, participate in, and benefit from economic, social, cultural, and political activities are equal. This implies that career opportunities, the time needed to secure employment after leaving full-time education, and the earnings of men and women with similar qualifications and experience are equal. While there is no guarantee that outcomes

will be the same for those with the same level of education, ideally, equality in the educational process “unlocks equal opportunities for men and women post-schooling”. The achievement of equality in the broader society will influence which children are able to access school and how gender norms are manifested in the classroom. Likewise, the achievement of equality in education acts as a catalyst and contributes to the realization of equality for men and women in other spheres of life, including the labor market and the home. Consistent with previous research findings and with some feminist perspectives is that consideration should be given to the needs of all students, male and female, in the coeducational classroom in order to achieve equity and benefit all students (Forgasz 1997: 255).

2.6 Parental influence on learning and achievement

Parental influence can play an important role in developing their child's learning and achievement in mathematics. Career aspiration, social and cultural trends may influence parents' expectations and it can indirectly affect their child's learning. Parents’ regular and timely attention can help children to develop a positive attitude and performance towards mathematics. Xin Ma (2001), in a meta-analysis of research findings, showed that: fathers tend to have more influence on their children's' attitudes towards mathematics than mothers; a father’s education has a positive effect on his child's achievement in mathematics; the American data presented a positive effect of the mother’s education on mathematics attitudes (Ethington & Wolfle, 1984; in Amanat, 2008:88).

Parental attitudes may aggravate the situation of gender issues. One area where parental attitudes may interfere with girls’ progress in mathematics and science is gender division of household responsibilities. A number of theories have been advanced regarding the gender gap in mathematics. These include a lack of appropriate female role models for young girls to emulate, parents’ expectations that boys will do better in mathematics than girls as well as parents’ belief that boys find mathematics less difficult than girls. Sriraman and Kaiser (2010:463) agreed that after the children finish their compulsory education, some economically disadvantaged families prefer their sons, rather than their daughters, to continue their education because of the societal roles assigned to boys in families. Also, some families think that girls do not need to continue their education, especially when they are not very successful in primary school.

Parents from high socio-economic milieus have been found to create a more school supportive child-rearing environment. The manner in which the parents in such families function as a role model, the manner in which the parents and children interact with each other and the interests and activities of the parents outside of school all exert a positive influence on the achievements of the children. Parents from high socio-economic milieus are also simply more inclined and prepared than other parents to follow the progress of their children and help their children with their homework (Driessen G et.al, 2005:513). On the other hand, Queensland (2004) stressed the idea that that parental involvement in homework is beneficial to students and positive parental involvement in homework is associated with higher levels of student achievement. The research indicates that most parents expect schools to set homework and that parents of younger children are more likely to be actively involved with their children's homework (P.9).

2.7 Teachers role

Teachers can play powerful parts for girls as role models and supporters of those who want to pursue a career in mathematics. Simultaneously, even small amounts of discouragement from teachers may have powerful impacts on the career directions of girls facing several other powerful social pressures. The quality of the implementation of a teaching practice also greatly influences its impact on student learning. The value of using manipulative materials to investigate a concept, for example, depends not only on whether manipulative are used, but also on *how* they are used with the students (Grouws and Cebulla, 2000:8).

As Solomon (2008) described it, educational change depends on what teachers do and think. At the teachers' level, the success of change is strongly related to the extent to which teachers interact with each other and with others who are providing technical help. Teachers' view on learning styles and strategies of their students is one of the factors that affect the learning of mathematics and has a great implication for learning. The well-trained teachers know how to guide the learning of their students in the teaching–learning process (P.16). Biggs and Moore (1993) have strengthened this idea when argued that, the more the teacher mastered his/her subject, the better he/she will be able to teach it and the more pupils will learn at the end (Biggs and Moore, 1993 in Tesfaye, 2009:22). In addition to more research in mathematics classrooms to document the relationship between teacher attitudes, classroom processes, and student

achievement, there is a need for more conceptual work on teacher attitudes. It may be that other teacher attitudes have an effect on differential student achievement (Hart & George, 1988:34).

Teachers and the instructional approaches they use are fundamental in building students' mathematical understanding. Primary among their many duties and responsibilities, teachers structure and guide the pace of individual, small-group, and whole-class work to present new material, engage students in mathematical tasks, and help deepen students' grasp of the mathematics being studied. Teachers may help students use technology and tools to investigate mathematical ideas, analyze students' work for misconceptions, and promote positive attitudes towards mathematics. They also may assign homework and conduct informal as well as formal assessments to monitor progress in student learning, make ongoing instructional decisions, and evaluate achievement outcomes (Mullis et al., 1997: 143). Teachers must maintain high expectations for girls and take personal responsibility for encouraging them in mathematics. Rather than trying to help by giving girls answers, teachers should encourage girls to solve problems on their own. This promotes self-confidence and research has shown there is a connection between confidence and mathematics participation and achievement (Leder, 1992; cited in NRC/GT, 2007:1-2). "…the larger female entry in the intermediate tier represents an underestimation of girls' mathematical abilities by teachers who perceive girls to be less confident and more anxious of failure in mathematics than boys and more adversely affected by final examinations" (Ison and Weatherburn, 2007:111).

2.8 The contribution of instructional material

Instructional materials are important category to be considered in the teaching of mathematics because they are essential materials in influencing the teaching of the subject matter. Supporting this idea scholars have discussed a lot on the teaching learning process. Among them are (Heinich et al, 1996; Callahan and Clark, 1988:412, Clark and Starr, 1986:23; in Tesfaye, 2011) who discussed that instructional materials serves as a catalyst to change in the whole instructional environment, used to facilitate and help for instructional development (P.36).

Beyond keeping girls in school, greater efforts should be made to mainstream a gender perspective in education curricula. Textbooks, but also teacher training programmes, should be gender-sensitive and promote gender equality (CSW, 2010). Choosing curricular materials to

support a mathematics program has never been easier—or harder: easier because there are so many options available today; harder for the same reason. It's a classic, glass half-full or glass half-empty scenario (Checkley, 2006:18). Structuring Achievement is maximized when teachers not only actively present material, but structure it by beginning with overviews, advance organizers, or review of objectives; outlining the content and signaling transitions between lesson parts; calling attention to main ideas; summarizing subparts of the lesson as it proceeds; and reviewing main ideas at the end. Organizing concepts and analogies help learners link the new to the already familiar. Overviews and outlines help them to develop learning sets to use in assimilating the content as it unfolds. Rule–example–rule patterns and internal summaries tie specific information items to integrative concepts. Summary reviews integrate and reinforce the learning of major points. Taken together, these structuring elements not only facilitate memory for the information but allow for its apprehension as an integrated whole with recognition of the relationship between parts (Hagger and McIntyre, 2006:22).

2.9 Student attitudes and related behaviors

Attitudes and achievement-related behavior are closely related. Confidence in learning mathematics has to do with how sure a student is of her or his ability to learn and perform well in mathematics. Confidence is an important factor because it has a significant positive correlation with mathematics achievement, because it is one of the strongest attitudinal predictors of mathematics course taking, and because sex differences in confidence are usually associated with sex differences in mathematics achievement. Students also vary in how useful they view mathematics to be, both for their current needs and for the future. Perceived usefulness of mathematics has been identified as one of the most important variables in understanding sex-related differences in mathematics achievement (Hart & George 1988:34-35). Student achievement refers not only to scores on standardized achievement tests but also to measures of student performance on non routine mathematical problems. According to the model, student achievement is affected by classroom processes, student attitudes, and student achievement-related behavior; and student achievement has a direct effect on teacher attitudes and on student attitudes and achievement-related behavior (ibid.).

According to Bishop et al (1993) the differences in achievement, attitudes and participation cannot be attributed to (characteristics of) individual mathematics teachers. There is some evidence: however, that the gender of the teacher influences the perception by girls and boys of their teacher's behaviors in a way that might be labeled 'own sex favoritism' (Bishop et al, 1993:70-71). Besides what factors might contribute to gender differences or similarities in mathematics achievement, attitudes, and affect? Dozens of explanations have been proposed, including hormones and prenatal brain differentiation, stereotype threat, and other factors. Of primary interest here is a sociological hypothesis proposed by Baker and Jones (1993), who argued that girls' poorer mathematics achievement and more negative mathematics attitudes are the result of societal gender stratification. The gender stratification hypothesis proposes that in patriarchal cultures, male students link their achievement to future opportunities and outcomes. As a result of the decreased opportunities afforded to females, girls do not perceive such a link and thus do not achieve as boys do in domains that they perceive to be less useful (Else Quest et.al, 2010:106).

As Bowman (2003:5) asserts, girls may view mathematics and science as a male domain that is difficult to reconcile with their sex-role identity. Girls may have internalized cultural ideals about who "belongs" in mathematics. Educators also noted that girls had low self-confidence regarding their performance with mathematics, science and technology. There is an obvious negative feedback loop between social and cultural pressures and girls' self-perceptions that they cannot do well in mathematics, science and technology. The interviews suggested that teachers perceive that girls may feel embarrassed to show that they excel in mathematics and science. Cultural and media images which encourage girls to be "sexy" may act as a barrier to high achievement in mathematics, science and technology at the middle school and high school level. What is acceptable behavior for 'being a girl' often runs counter to success in mathematics and science. Excellence in mathematics and science may be socially stigmatized for all students, particularly if it makes adolescents feel like they stand out.

2.10 The effect of class size

Schools, where they have the choice, prefer smaller classes because it is expected that smaller classes lead to better teaching and learning. In smaller classes pupils are easier to manage and they offer better opportunity for teachers to pay individual attention to children and the expected

results are better achievement in examinations. Most teachers prefer smaller class sizes because it is easier to cope with fewer pupils as teachers tend to spend less time on discipline issues and classroom management. This provides teachers with greater flexibility, enabling them to use a variety of teaching methods. It is also perceived to be easier to socialize children when there are fewer of them in a class. Parents will put pressure on schools to organize classes with fewer students because fewer children can be given more individual attention. Some educators and politicians believe that smaller classes lead to higher achievement, while teachers' unions will campaign for recruitment of more teachers. For teachers there is also the fact that fewer pupils in a class means less preparatory work, test and class exercises to mark (Kariuki and Guantai, 2005: 3).

2.11 Impact of homework

The impact of homework on students is affected by many factors including students' understanding of the purpose of homework, their attitudes towards homework, learning and achievement and their feelings of empowerment in the design and allocation of homework tasks. The research examining time spent on homework, including large-scale international studies, shows wide variation in the amount of time spent on homework and the associated academic benefits. The number of out-of-school hours per day spent on homework is positively related to student academic achievement but reaches a point where too much appears to be detrimental. Research has informed the notion of a point of diminishing returns and that a maximum amount of time spent on homework should be negotiated (Queensland, 2004:4-7).

Queensland summarized on the idea further as the research findings on the impact of homework on students, their attitudes and their achievements were mixed, with both positive and negative effects indicated. Students report positive attitudes to homework, and feel some homework is important in helping them do well at school. Students who complete homework generally outperform students who do not on some measures of academic achievement. Homework can improve students' study skills, improve their attitudes toward school, and demonstrate that learning can take place outside of formal schooling. However, excessive homework may impact negatively on student achievement and reduce student access to leisure activities that can also teach important life skills (ibid.).

2.12 The contribution of tutorial

School characteristics such as the effect of school quality and supportive mechanism in the school as well as teachers' commitment to help female students by providing tutorial program and adequate number of role model female teachers in teaching profession could affect their achievement. Schools should be encouraged to provide progressive gender focused tutorial programmes and to offer complete instructional programs in a cycle or level (Tadesse, 2009: 57-60). Tutor is more important for girls than boys, in support of this idea Amanat (2008) claimed that the place and importance of the tutor is more established for girls than boys and this may be a contribution to their confidence and positive attitudes about the subject. Boys, according to their nature, like to see problems more as a challenge. Seeking help from the teacher again stands out distinctively for both girls and boys. Boys seem to seek more help from their family members which again shows their need of more support. In general, girls at this age seem more willing to seek help (Amanat, 2008: 29).

2.13 Society and other stakeholders

National policies are being adapted to the local circumstances including individual schools. However, these policies are more often seen as given regulations which are applied as such and not turned in to more specific local plans. According to MOE (2004) equality of rights for women is enshrined in the constitution. GOE consider gender as an important focal area, there is a women's affairs office in the office of the prime minister under a state minister and a standing committee in Parliament on women's affairs. Legislation is in place to protect women and while in some regions tradition remains as strong as the law, SNNPR reported cases of gender abuse being dealt with by the social courts and this having a positive impact on girls attendance at school (MOE, 2004:13). A special focus on girl's education is recognized in the Ethiopian calendar 1994 Education Training Policy.

Schools and individual learners exist within societies and in our concern to ensure the maximal effectiveness of school mathematics teaching, we often ignore the educational influence of other aspects of living within a particular society. It is indeed tempting for mathematics educators particularly to view the task of developing mathematics teaching within their particular society

as being similar to that of colleagues elsewhere, largely because of their shared beliefs about the nature of mathematical ideas (Bishop et.al, 1993:3).

Awareness of discrimination based on gender has increased worldwide. Boys and girls have different roles in society. They perform different activities and chores at home and in school that have an impact on their attendance, performance, and retention in school (USAID, 2000:19). Societal Influences begins with societal influences outside of school that may send different messages to and about students of different race, sex, and SES regarding their aptitudes and the appropriateness of their achieving at a high level in mathematics. Societal influences are posited to have a direct effect on teacher attitudes, school mathematics curricula, and student attitudes and achievement-related behavior and an indirect effect, through these factors, on classroom processes and student achievement (Hart and George, 1988:33). There are strong social and peer pressures that discourage girls from pursuing mathematics and science. First, societal pressures may discourage girls from viewing mathematics and science as a socially appropriate field for them. In addition, girls may resist a field which they view as requiring social sacrifices they are unwilling to make (Bowman, 2003: 23).

2.14 Educational context

World Bank (2005:163) stated that in Ethiopia, "National examinations administered previously at grade 8 and 12 which dates back to the days of Emperor Haile Selassie. The grade 8 examinations were regionalized in 1999 but the results continue to be used for selection to grade 9. The examinations at grade 12 were replaced in 2003 by the College Entrance Examination as the mechanism for selection into postsecondary education. National examinations at grade 10 are a recent mechanism, introduced in 2000 to manage access into grade 11. In grades 10 and 12, the passing grade is set at a grade-point average of 2.0. Among the large regions, pass rates for all three examinations are consistently high in Tigray, Amhara, and Oromiya, while they lag behind noticeably in SNNPR. Pass rates are also high in Afar, but the region typically fields very few candidates. In all regions, girls lag behind boys, but the gender gap is widest in SNNPR".

CHAPTER THREE

Research Design and Methodology

In this study, mixed quantitative and qualitative research approaches is conducted since the study seek to understand a research problem in greater depth (qualitative) and breadth (quantitative) which is an advantage that a mixed methods approach offers. In support of this idea, Cohen et al (2007) said that in order to probe beneath the surface of the school's culture, to examine the less overt aspects of the school's culture(s) and subcultures, it is important to combine quantitative and qualitative methodologies for data collection. A mixed methodology will be used for the empirical data collection, using numerical and verbal data, in order to gather rounded, reliable data (Cohen, et.al, 2007: 96).

Moreover, descriptive survey research design was used to obtain contemporary knowledge about gender differences in mathematics learning and achievement in Primary Schools of BMZ. UNESCO (2005) claimed that surveys involve the collection of information at one or several points in time from scientifically designed probability samples of students, teachers or schools. The information is usually collected by means of questionnaires and tests, but also sometimes by means of observation schedules and interviews. The information collected is usually from a probability sample selected from a tightly defined population, but can also be from a full count of schools in the form of census data. The data are generally for descriptive purposes, but may also be analyzed for relationships among variables (UNESCO, 2005: 34).

The study attempted to evaluate the relationship between achievement results of male and female students considering those students who were enrolled in grade eight classes. In addition, the mathematics achievement scores of students who sat for PSLE in the last two consecutive years found from 'Teaching and Learning Assessment Core-Process' roster in ZED has analyzed. The qualitative study was carried out in all schools where quantitative data had been collected. In other words, the study conducted interview to gather qualitative data from school principals and female students for certain aspects of students learning in general and female students in particular such as mathematics learning and achievement situation, socioeconomic status and family background, environmental and school impeding factors of their learning.

3.1 The study area

This study were conducted in Bench Maji Zone (BMZ) which is located in the south-western part of the country within one of the regional states of FDRE known as South Nations Nationalities and People's Region (SNNPR). BMZ is 561 kilometers far from the country's capital city, Addis Ababa; 836 kilometers far from the region's capital Awasa. The capital city of BMZ is known as Mizan Teferi. The study conducted in ten full primary schools two of them are under Mizan-Aman Sub-City administration and the rest of them existed within six woreda administrations; and are a minimum of 9 kilometers and a maximum of 111 kilometers far from the center Mizan Teferi; they are scattered on average of 33 kilometers from Mizan Teferi. Consequently, I traveled an average of 33 kilometers towards sample schools from Mizan-Teferi for the case of data collection.

3.2 The sample and sampling procedure

The study conducted including sampling from enrolled students in 2003 E.C academic year, and from the last two consecutive years (2001E.C and 2002E.C) achievement scores of students who sat in PSLE. The target Population of the study was grade eight students of primary schools in BMZ. There are 48 Full-primary schools throughout BMZ. First of all I have entered the name of all these primary schools in to Microsoft excel document and arrange the names in ascending order, next the data has transformed to fathom[1] document by dragging a collection box. Finally, I have selected sample cases from the collection of fathom window. As a result fathom delivered a randomly selected ten schools and dragging a table for the sample of collection I have found the list of representative sample schools under consideration namely: Aman, Bachuma, Debrework, Edget-Behibret, Genja, Maz, Otuwa, Shai-Bench, Sheko and Temenjayax.

Concerning sampling technique for the quantitative data obtained from students, since probability sampling technique is believed to deliver equal chance for every individual to be selected and be part of the sample I have used proportionate and unproportionate stratified sampling techniques vis-à-vis random generator of computer system. According to the information found from ZED, enrollment rate of eighth grade students within the sampled

[1] A brief description of fathom is presented in Appendix-F.

primary schools in 2003E.C academic year per gender is presented in the following table (Table-1).

Table-1: Enrollment statistics of sampled schools in 2003E.C and sample size

School name	Number of students			Sample size		
	M	**F**	**T**	**M**	**F**	**T**
Aman	319	259	**578**	39	39	**78**
Bachuma	60	43	**103**	7	7	**14**
Debrework	146	71	**217**	15	15	**30**
Edget-Behibret	198	185	**383**	26	26	**52**
Genja	264	102	**366**	25	25	**50**
Maz	66	32	**98**	7	7	**14**
Otuwa	68	43	**111**	8	8	**16**
Shai-Bench	161	147	**308**	21	21	**42**
Sheko	143	157	**300**	20	20	**40**
Temenjayax	144	68	**212**	14	14	**28**
Total	1569	1107	**2676**	**182**	**182**	**364**

As shown in table-1 above there were 1569 boys and 1107 girls the sum total equal to 2676 (N) eighth grade students in the sample schools of study area. Therefore the study considered sample of the population with sampling error of less than 5% and with a confidence level greater than 95% (Cohen, et.al, 2000: Pp. 94-95). Moreover, using sampled primary schools as strata there are ten stratums. Then the proportioned sample size for these ten strata is sorted out proportionally as shown in table-1. Thus, having relative number of students for the respected schools there will found a prospective quantity of proportioned eighth grade students. Therefore, loading student's quantity in to computer which was found from documents existed in the director's office of individual schools, a dichotomize male and female students per each school sampled assisted by fathom dynamic data software. As a result proportional stratified sampling method were conducted to decide the appropriate sample size of sampled schools at the school level followed by unproportionate stratified sampling technique at the grade level to get equal number of girls and boys from individual sample schools.

Follow-on 364(n) students were used for sample of the study. That is, 182 males and 182 females are taken to fulfill a questionnaire and perform the mathematics achievement test. Besides this

the study also included 10 female students taken for interview sampled purposefully from those currently enrolled in grade eight of sample schools one per every school. There are a total number of 13 mathematics teachers who thought grade eight in the sampled schools of the study area, all of them were males. Thus, all of these teachers are included in the study fulfilling the prepared questionnaire. In addition, all ten school Directors of sample schools are included in the study to obtain qualitative data.

On the other hand based on the data filed in the roster which was stored in BMZED sub unit 'teaching and learning assessment core-Process' profile of 936 students[2] from the last two consecutive years PSLE result were sampled using systematic random sampling. Hence, the number of students taken as a sample is presented in Appendix-E.

3.3 Variables of the study

The dependent variable of the study was achievement test scores of students and students' gross academic achievement scores. On the other hand, the independent variable of the study includes some in-school and out school gender related attributes that may influence mathematics learning and achievement of students such as: schooling process, availability of student's text books, and socioeconomic back ground. Achievement test, questionnaires and interviews were developed and adopted to see the influence of the independent variables on the students' academic achievement (dependent variable).

3.4 Data collection instruments

Employing both methods of data collection, quantitative and qualitative, helped the researcher to combine the strength and amend some of the inadequacies of any one of the sources of the quantitative and qualitative data. Hence, both quantitative and qualitative data collection instruments were utilized as listed below. The types of instruments that were developed and used are: questionnaire for teachers' and questionnaire and achievement test for students, semi-Structured interviews for Principals and female students, classroom observation.

[2] Age, gender, and mathematics achievement scores of 560 out of examined 2068 students in 2001E.C plus 376 out of 2482 examined students in 2002E.C academic year are selected and included in this study.

3.4.1 Questionnaire

One of instruments used to collect data was questionnaire, which has developed based on the reviewed literature and administrated to students and their mathematics teachers. The questionnaire was aimed at acquiring necessary information about some of the practical problems, practice and improvement strategies of gender differences in mathematics learning and achievement. Mean while teacher's questionnaire was prepared including 19 questions amassed within three pages. There were 12 items of student's questionnaires and 30 multiple choice items of achievement test assembled on five pages and stapled together, and attempted by each of 364 sampled students of the study; each question worth one point in which the achievement test was scaled out of 30 points. The achievement test is prepared based on the region's (SNNPR) eighth grade curriculum and taken from the released item of TIMSS.

3.4.2 Semi-structured interviews

The interview is a flexible tool for data collection, enabling multi-sensory channels to be used: verbal, non-verbal, spoken and heard (Cohen, L et.al, 2007: 349). In this study there were seven questions requested for ten principals, and eleven questions were interviewed for ten female students (one per every school).

3.4.3 Classroom observation

In order to obtain further information, observation in the actual classroom teaching and learning process was used as an additional data gathering instrument. For the purpose of classroom observation, rating scale was employed. One classroom observations in each of sample schools were made for gathering supplementary information. As Patton (1990; in Cohen, 2000: 305) claimed observation as one of the research tools could serve for a variety of purposes. Observational data are attractive as they afford the researcher the opportunity to gather 'live' data from 'live' situations. The researcher is given the opportunity to look at what is taking place contemporary rather than at second hand.

3.4.4 The achievement test

In order to prepare multiple choice item test, objectives were formulated and table of specifications were prepared using text books and teacher's guide of grades seven and eight. Accordingly, items were selected from the released items of Trends in International Mathematics and Science Study (TIMSS). These activities were accomplished by the assistance of two mathematics teachers. One of them was teacher of grade seven and the other was teacher of grade seven and eight students.

In order to check the content validity, the tests were given to two mathematics teachers of each grade level for their comments. Grade seven teachers commented the items as good. Grade eight teachers suggest that some items should be discarded from unit six (measurement of area and volume). Then based on the suggestion, table of specification of grade eight was revised.

The test were administered to the pilot samples of 68 eighth grade students (males = 34, females = 34) in Kusha primary school. After pilot test, item analysis was carried out. More specifically, indices of item discrimination and the effectiveness of each distracter were analyzed on the upper 27% and lower 27% score (Meherence and Lehman, 1984). The reliability of the pilot test was 0.84. Based on the result of item analysis six items with discrimination index below 0.20 were discarded and substituted by other items.

3.5 Pilot study

Before the actual data collection the instruments developed was tried out in a small scale study to test and improve the instruments in one of primary schools in BMZ; Shai-Bench Woreda Administration area in a school known as Kusha full Primary school in march 2011. The instruments used in the study intended to measure gender difference in mathematics learning and achievement of students within the area under study. They were administered to eighth grade students, mathematics teachers, and school directors. The students were gathered in the room of their respected school and instructions were clarified orally. The achievement test and questionnaire prepared was administered to the selected students. The questionnaire was also administered to mathematics teachers; interview with school's principal and selected female student was held in the school; and classroom observation has conducted by the researcher using

the prepared classroom check-list prepared. Based on the feedback of the instruments an inference was made to change six items of the achievement test in the main data gathering.

3.6 Administration and data collection procedures

I received the letter that formally introduces me and the purpose of my study from BMZ administration office to communicate with all sampled primary schools of the study. Having this letter of access, I made a prior contact with the principals of each primary school and handed them the letter. The principals of the schools cooperated by arranging a schedule to be interviewed, and to meet the students and their mathematics teachers. First of all I perform an interview with every schools principals then I personally met sampled students and their mathematics teachers and explained the purpose of the study to get their consent. I assured the respondents that the information they provide would be kept strictly confidential. This helped to avoid fears and suspicions that might come in the minds of the respondents and enhanced their cooperation for the study.

The questionnaire prepared for students were administered in their respective schools during regular class periods. Students were allowed to fill out questionnaire and perform the achievement test without time limit. Before students start to fill out the questionnaire and attempt the achievement test, I met the sampled students in their respected school's free classroom and I introduced myself to them and explained the purpose of the study. I also guaranteed them the responses would be kept confidential and/or anonym and serve only for research purposes. After getting their consent oral instructions about the specific and general directions of the questionnaire were also given.

Regarding mathematics teachers who were included in the study, the principals of each school cooperated and introduced me to the mathematics teachers[3] of their schools. Using this opportunity of access, I explained the purpose of the study and assured them about the confidentiality of their responses. After getting their consent, I distributed the questionnaire to them and made arrangements as when this completed questionnaires need to be returned. I used purposive sampling technique to select ten principals and ten female students from all sample primary schools for an interview. After securing their consents, we arranged place and fixed date

[3] The mathematics teachers whom I met were those who were teaching in grade eight.

and time for interview. Prior to conducting an interview, I ensured them that their views and opinions are kept confidential. Following this, I explained the guideline of the interview and asked their consent to record their responses, with their affirmative responses the interview was made to proceed[4].

As a result various data sources are used for the data collected as part of an input for the study under consideration including quantitative data collected using questionnaire fulfilled by mathematics teachers as well as questionnaire and achievement test performed by students, the outcome of the past two consecutive year's PSLE scores of students gathered from ZED for analysis by inspecting the aggregate statistics. In addition, there was mathematics classroom observation carried out by the researcher one observation per school using observation rating scale. Moreover, interviews was conducted in Amharic (work language of the area as well as SNNPR) using an audio recorder and translated to English.

3.7 Method and procedures of data analysis

The quantitative data analysis were made using responses and mathematics achievement test scores of 364 grade eight students, 13 mathematics teachers, and achievement test scores of 936 students from PSLE result of the last two consecutive years. I have made a careful inspection of the completed questionnaires during the collection of the questionnaire from each respondent. Quantitative responses' and profiles were loaded in to excel sheets and then transformed to fathom document and then quantitative data analysis has made. The collected data was organized and tabulated according to their similarities under the theme issues raised in the questionnaires. Using fathom dynamic data software, and loading the data including achievement scores of both female and male students' data analysis had been performed. The statistical procedures applied for data analysis included summary descriptive statistics, tests of statistical significances such as t-test, Chi-square (x2), analysis of variance (ANOVA); in addition inferential statistics such as tests of significance, correlation, regression, and multilevel modeling were used.

For the case of qualitative data analysis, after conducting the interview by using an audio recorder, the recorded responses and the field notes taken was transcribed. After transcribing of

[4] Even if I followed similar ethical considerations for the principals and girls of individual schools the discussion and interview was made separately.

translations, a secondary school English teacher who had no knowledge of the participants was listened to the audio recordings to check the accuracy of the researcher's translations. Then responses' gathered through interview were analyzed in detail qualitatively.

3.8 Ethical considerations

In research, ethical consideration is one of the most important points that deserve attention. This is mainly due to:

a) The necessity to strictly respect the consent of the participant whether they are willing to participate in the research or not. Likewise, it is to assure to the subjects of the study that they are free to withdraw from participating in the study whenever they found it necessary;
b) The necessity to protect subjects of the study from possible dangers that might be encountered;
c) Confidentiality, the actual names of participants in the study are kept secret while the sex or age of respondents might be used where it seems appropriate.

Hence, I assured the principals, mathematics teachers and students that the research is strictly governed by the above ethical principles and they have also agreed. This was done during data collection.

CHAPTER FOUR

Presentation, Analysis and Discussion of Results

4.1 Introduction

In this report an examination was made of the achievement outcomes of students by school, gender, pupils' characteristics, and so on. Students' academic achievement in Grade 8 has been examined as proxy measure for learning. This chapter presents the major findings of the study. The data was organized in tabular form and analyzed in line with the basic research question of investigating gender difference in mathematics learning and achievement. The interview data was transcribed and used during the analysis of the results.

4.2 Back ground of the respondents

There were students respondents in two different forms: i) those students selected to fulfill a questionnaire and perform the achievement test, ii) those students selected for interview.

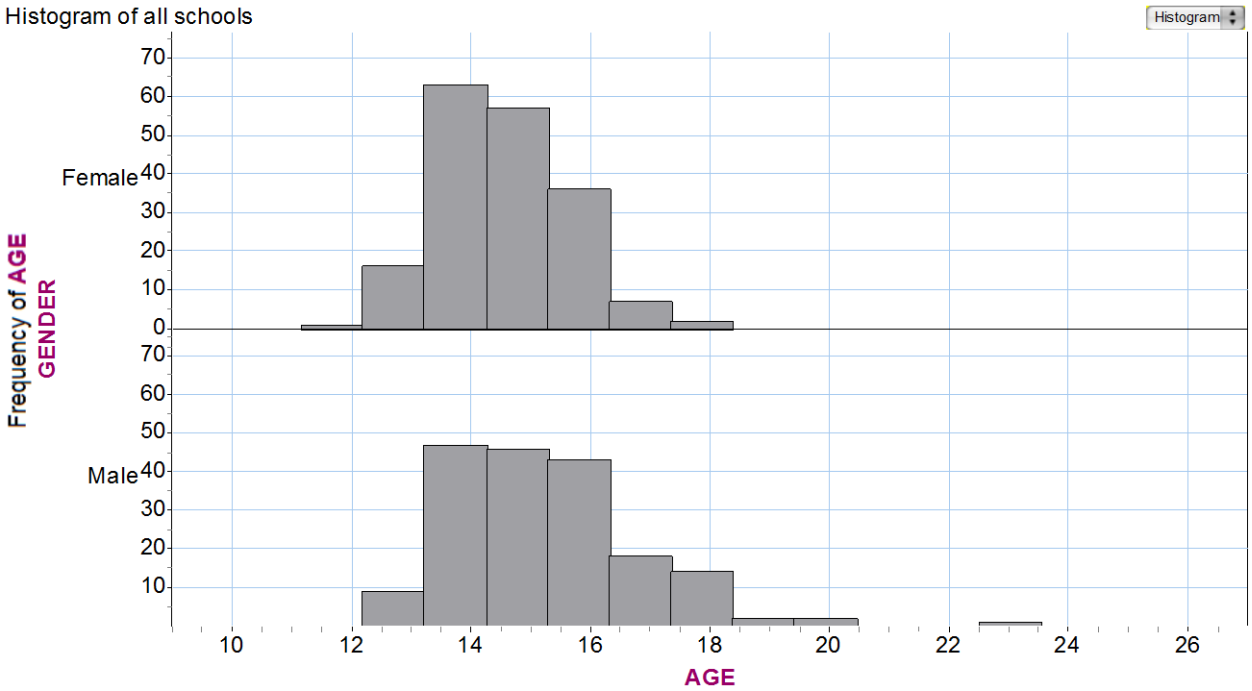


Figure-1. Histogram of age of student respondents per gender

i) Characteristics of those students selected to fulfill a questionnaire and perform the achievement test: As shown in Table-2 below, out of ten schools the smallest average age

of students was found to be Sheko primary school which was 14.65 years old; school's maximum mean age was 15.83 years old of Debre-Work primary school. The Composite mean age was 15.11 years old.

ii) Students selected for interview: ten girls were selected for interview whose age ranges from 13 up to 16 years old; their average age was 14.7 year. Furthermore, all of the interviewees were unmarried.

Table-2. Basic Statistics of Students age per school

School	N	Mean	SD	SI	Min	Q1	Median	Q3	Max
Aman	78	14.72	1.06	0.12	13	14	14	15	18
Bachuma	14	15.79	2.05	0.55	13	14	15.50	18	19
Debre-Work	30	15.83	1.62	0.30	14	15	15.50	16	23
Edget-Behibret	52	15.10	1.32	1.18	13	14	15	16	18
Genja	50	15.18	1.34	0.19	12	14	15	16	20
Maz	14	15.07	1.90	0.51	13	14	14.5	16	19
Otuwa	16	15.69	1.20	0.30	14	15	15.50	16	18
Shai-Bench	42	15.36	1.38	0.21	13	14	15	16	20
Sheko	40	14.65	1.08	0.17	13	14	14.5	15	17
Temenjayax	28	14.96	1.35	0.25	13	14	15	16	18
Composite	**364**	**15.11**	**1.37**	**0.07**	**12**	**14**	**15**	**16**	**23**

Table-2 above shows the basic statistics of the conducted survey with respect to age of student's and per individual schools. The table tells that in the second column there have a number of sampled students of schools which ranges from 14 in Bachuma and Maz primary schools to 78 in Aman primary school. The third column described the mean age which has a composite value of 15.11 years old. Accordingly the fifth column has shown the standard error of every school whose composite standard error was 0.07. The seventh column showed that the first quartile (Q1) of most of schools was 14 year; whereas the ninth column showed the third quartile (Q3) of most schools was 16 year. And the least age were found to be 12 year in Genja primary school and maximum age were found in Debre-Work school.

On the other hand, there were 13 mathematics teachers who thought in grade eight of sample schools where all of them were males; their back ground information was shown in the following table (table-3):

Table-3. Teacher's back ground information

		Teaching experience (service year)				
		1-5	6-10	11-15	Above 15	**Row summary**
Age	Under 25	6	1	0	0	**7**
	25-29	1	1	0	0	**2**
	30-39	0	1	1	2	**4**
	Above 39	0	0	0	0	**0**
Column summary		**7**	**3**	**1**	**2**	**13**

Seven teachers were less than 25 years old, two of them were aged between 25 and 29, and the rest four teachers were aged between 30 and 39 years. Regarding their teaching experience, at the end of this year majority of teachers (53.8%) have served one up to five years, three of them (23.1%) have served six up to ten years, 7.7% of them has served 11 up to 15 years, and the remaining 15.4% served above 15 years (table-3).

Table-4. Teacher's academic qualification

Qualification	**N**	**Percent**
B.Ed/B.Sc	5	38.46%
Diploma	8	61.54%

Furthermore, teacher's back ground information was also analyzed in their academic qualification (table-4). Most teachers, 61.54%, were diploma holders and 38.46% of them were bachelors of education (B.Ed) or science (B.Sc).

In this study all principals[5] of the sample schools were included in the interview. The back ground information of principal respondents was summarized as shown in table-5 below.

[5] Two of the respondents were deputy principals interviewed for the reason that Principals were not present on the time of my visit.

Table-5. Principal's back ground information

School	Age	Gender	Service Year	Academic Status
Aman	35	Male	15	Diploma (12+2)
Bachuma	30	Male	11	Diploma (12+2)
Debre-Work	28	Male	6	Diploma (12+2)
Edget-Behbret	36	Male	17	B.Ed (12+4)
Genja	39	Male	17	Diploma (12+2)
Maz	31	Male	8	B.Ed (12+3)
Otuwa	28	Male	8	Diploma (12+2)
Shai-Bench	38	Male	15	Diploma (12+2)
Sheko	35	Male	17	Diploma (12+2)
Temenjayax	24	Male	4	Diploma (10+3)

Principal respondents were 24 up to 39 years of old and all of them were males. In addition, they have served for four up to seventeen years; regarding their academic status, two of them are degree holders and the rest eight are diploma holders.

4.3 The contemporary trends of school's mathematics teaching – learning process

4.3.1 Availability of student's text book

One of the information gathered from students was whether they individually have student's mathematics text book. The responses of student respondents were presented in the following table (table-6).

Table-6. Availability of mathematics text book

Item	Yes		No		Z	P
	N	%	N	%		
Do you have student's mathematics text book?	338	92.9	26	7.1	16.4	< 0.05

As shown above (table-6) 92.86% girls and boys replied as they have student's mathematics text book whereas 7.14% of students doesn't have student's mathematics text book. Hence, the result was statistically significant at 0.05 levels.

4.3.2 Students study level

Table-7 below describes test for independence of student's responses toward their mathematics study level.

Table-7. Test for independence of students study level

Item	Response	Gender (N)		Row summary	Chi-square (x^2)	df	P-value
		Female	Male				
How often do you study mathematics?	Daily	88(93.0)	98(93.0)	186			
	Never	7(7.0)	7(7.0)	14			
	Sometimes	87(82.0)	77(82.0)	164	1.15	2	0.56
Column summary		182	182	364			
Table value of $x^2 = 5.99$ The numbers in parenthesis in the table are expected counts.							

The test statistic, chi-square (x^2) is 1.147, there were two degrees of freedom, and with critical value of x^2 be 5.99. If it were true that Gender were independent of mathematics study level and the sampling process were performed repeatedly, the probability of getting a value for chi-square (x^2) this great or greater would be 0.56. Hence, the difference in study level that varies between students is not statistically significant (chi-sq. = 1.15, P=0.56 > 0.05) at 0.05 significance level. Therefore, it was found that gender were independent of students' mathematics study level.

4.3.3 Tutorial delivered by schools

According to table-8 below, the test for independence of tutorial per individual schools was summarized. It was found that test statistic chi-square (x^2) was 40.92. There were nine degrees of freedom with critical chi-square value of 16.92. If it were true that mathematics tutorial program were independent of school and the sampling process were performed repeatedly, the probability of getting a value for chi-square (x^2) this great or greater would be < 0.05.

Table-8. Test for independence of tutorial per school

School	Item		Row summary
	Is there a mathematics tutorial program in your school?		
	No	Yes	
Aman	36 (22.3)	42 (55.7)	78
Bachuma	4 (4.0)	10 (10.0)	14
Debre-Work	3 (8.6)	27 (21.4)	30
Edget-Behbret	13 (14.9)	39 (37.1)	52
Genja	10 (14.3)	40 (35.7)	50
Maz	7 (4.0)	7 (10.0)	14
Otuwa	11 (4.6)	5 (11.4)	16
Shai-Bench	8 (12.0)	34 (30.0)	42
Sheko	8 (11.4)	32 (28.6)	40
Temenjayax	4 (8.0)	24 (20.0)	28
Column Summary	**104**	**260**	**364**
Calculated chi-square (x^2) = 40.92, df = 9, critical x^2 = 16.92, P < 0.05 The numbers in parentheses in the table are expected counts.			

Hence, very significant difference was found in the responses of students to the item "there is a tutorial program in mathematics" (calculated x^2= 40.92, df = 9, critical x^2 = 16.92, P < 0.05) at 0.05 level. Therefore, from the above discussion it may be concluded that the tutorial program delivered was not independent of school.

4.3.4 Responses of students toward home work

(i) Home work given by mathematics teachers

Analysis of data was made on how frequent teachers were delivering home work to their students. The item and student's response to the item were as shown in table-9 below.

Table-9. Goodness of fit in home work given by teachers

Item	Response	N
How often your mathematics teacher does give you home work?	Daily	179
	Once a month	6
	Once a week	14
	Twice/three times a week	165
	Column summary	364
x^2 = 289.8, df = 3, critical x^2 =7.82, P-value < 0.05		

As shown in table-9 above there are four categories. The test statistic, chi-square (x^2), is 289.8. There were three degrees of freedom with critical value of x^2 equal to 7.82. If it were true that the categories of student's response towards the frequency of home work given by their mathematics teacher were equally likely, and the sampling process were performed repeatedly, the probability of getting a value for chi-square (x^2) this great or greater would be < 0.05.

This showed that there is statistically significant difference at 0.05 levels on the frequency of home work delivered by teachers. Meanwhile, 49.17% of students replied that their mathematics teacher gave them home work daily; 1.65% of them said that their mathematics teacher gave them H.W once a month; 3.85% of them respond that their mathematics teacher gave them home work once a week and the rest 45.33% of students replied that their mathematics teacher gave them home work twice/ three times a week.

(ii) Approval of home work by mathematics teachers

As shown in table-10 below the test for independence of response categories to the item 'Does your teacher approve the given home work?' were conducted to see the dependency of categories.

Table-10. Goodness of fit in teachers' approval of home work

Item	Response	N
Does your teacher approve the given home work?	Never	9
	Sometimes	165
	Yes	190
	Column summary	364
x^2 = 158.6, df = 2, critical x^2 =5.99, P-value < 0.05		

Table-10 above showed that there are three categories. The test statistic, chi-square (x^2), is 158.6. There are two degrees of freedom with critical value of x^2 =5.99. If it were true that the categories of student's response towards the frequency of home work approved by their mathematics teacher were equally likely, and the sampling process were performed repeatedly, the probability of getting a value for chi-square (x^2) this great or greater would be < 0.05.

This showed that there is statistically significant difference (P < 0.05) on the frequency of home work approval delivered by mathematics teachers. In other words, 2.47% of student's response was 'never', 45.33% of them responded 'sometimes' and 52.20% of them responded 'yes' to the item whether the mathematics teacher check student's home work. That is, the categories of the item, the teacher approved students home work, were not equally likely.

4.3.5 Teaching materials

The following table (table-11) presented the test for independence of teaching materials based on the responses of students per individual schools.

Table-11. Test for independence on the use of teaching materials

School	**Item**			**Row summary**
	How often do your teacher uses teaching materials?			
	Always	Never	Sometimes	
Aman	23 (31.9)	11 (12.4)	44 (33.6)	78
Bachuma	7 (5.7)	2 (2.2)	5 (6.0)	14
Debre-Work	15 (12.3)	3 (4.8)	12 (12.9)	30
Edget-Behbret	29 (21.3)	10 (8.3)	13 (22.4)	52
Genja	29 (20.5)	1 (8.0)	20 (21.6)	50
Maz	6 (5.7)	0 (2.2)	8 (6.0)	14
Otuwa	4 (6.5)	3 (2.5)	9 (6.9)	16
Shai-Bench	11 (17.2)	14 (6.7)	17 (18.1)	42
Sheko	13 (16.4)	14 (6.4)	13 (17.3)	40
Temenjayax	12 (11.5)	0 (4.5)	16 (12.1)	28
Column Summary	**149**	**58**	**157**	**364**
Chi-square (x^2) = 56.04, df = 18, criticalx^2=28.87, P-value < 0.05 The numbers in parentheses in the table are expected counts.				

According to table-11 the test statistic, chi-square (x^2) test for independence was analyzed considering the responses of individual schools; the resulted chi-square (x^2) is 56.04. There are 18 degrees of freedom with critical value of chi-square 28.87. If it were true that School were independent of school's mathematics teachers uses teaching materials, and the sampling process were performed repeatedly, the probability of getting a value for chi-square (x^2) this great or greater would be < 0.05. Hence, a significant difference was found in the responses of students to the item "the mathematics teacher uses teaching material in the class teaching" (chi-square (x^2) = 56.04, df = 18, critical x^2=2887, P < 0.05).

4.3.6 Responses of teachers towards learning

As it is listed on Appendix-C, the responses of 13 teachers towards their performance on the teaching learning process were analyzed in the following way: Teacher's response on the item "about how often do you have meetings with other teachers in your subject area to discuss and plan gender related teaching approaches?" was not significant (chi-square (x^2) = 6.39, df= 3, critical x^2=7.82, P= 0.09 > 0.05) at 0.05 significant level; the majority of teachers (53.85%) replied as they have meeting once or twice a week to discuss and plan gender related teaching approaches with their colleagues, 23.08% replied they met once/twice a month, a single teacher said that he met once/twice a year, and the remaining 15.38% replied they never met their colleagues to deal on such issue.

Teacher's response on the item "Do you use a textbook in teaching mathematics to your class?" was significant difference (chi-square (x^2) = 9.31, df= 1, critical x^2= 3.84, P= 0.002) at 0.05 level; 92.31% of them use student's textbook in teaching mathematics to their class, 7.69% of respondents said that they do not use textbook. Teacher's response on the item "How often do you usually assign mathematics homework?" was not significant (chi-square (x^2) =4.77, df=2, critical x^2=5.99, P= 0.09); two respondents (15.38%) replied as they always gave home work to students', three of them (23.08%) respond as they gave home work once or twice a week, the remaining eight teachers (61.54%) said as they gave home work three/four times a week. In contrast, teacher's response on the item "how often do you give feedback on homework to whole class?" was not significant (chi-square (x^2) = 3.77, df= 1, P= 0.05) at 0.05 level in which 76.92% of them replied as they always gave feedback on homework to whole class, and the remaining 23.08% said that they sometimes reward such task.

The other point of view was teacher's response on the item "how often do you record whether or not the homework was completed?" which resulted not significant difference (chi-square (x^2) = 4.31, df= 2, critical x^2=5.99, P= 0.12) where the majority 53.85% were respond as they always record whether or not the homework was completed, 38.46% of respondents perform this task sometimes, and only 7.69% respondent said as he never perform such activity.

Teacher's responses on the item "how often do you collect, correct and keep assignments?" was not found a significant difference (chi-square (x^2) = 7.62, df=3, P= 0.06) at 0.05 level where majority (53.85%) of them replied as they always collect, correct and keep assignments, 30.77% of respondents perform this task sometimes, 7.69% of respondents said he rarely perform, and 6.79% of them respond as he never do such task. Teacher's response on the item "how often do you use the given assignments as a basis for class discussion?" was not significant (chi-square (x^2) = 3.92, df= 3, critical x^2=7.82, P= 0.27) where a single respondent said as he always use the given assignments as a basis for class discussion, 46.15% of the respondents response were they sometimes use the given assignments as a basis for class discussion, 23.08% of them rarely uses the given assignments as a basis for class discussion, and the same 23.08% of them said they never use the given assignments as a basis for class discussion.

4.3.7 Classroom observation results towards students learning

Classroom observation was made by the researcher in every school using rating scale in order to gather information about how mathematics teaching learning process was taking place. The result of classroom observation was analyzed in the following way.

Table-12. Planning the lesson

Item	Attributes	x^2	df	P-value
Planning the lesson	Getting ready for classroom interaction (lesson plan)	6.4	1	0.01
	Getting class under control (Management)	3.6	1	0.06
	Presenting the lesson based on the prepared lesson plan	6.2	2	0.04
	Evaluating the lesson plan at the end of the lesson	0.4	1	0.53

As shown in the above table (table-12) it was found a significant difference to the items 'Getting ready for classroom interaction (lesson plan)' and 'Presenting the lesson based on the prepared lesson plan' at 0.05 significance level; it was observed that most teachers (90%) prepared weekly lesson plan and about 30% of teachers were observed lack of time management in Presenting the lesson based on the prepared lesson plan. Whereas the difference to the items 'Getting class under control (Management)' and 'Evaluating the lesson plan at the end of the lesson' were not statistically significant.

Table-13. Instruction

Item	Attributes	x^2	df	Critical x^2	P-value
Instruction (Teaching methods and techniques & presentation of the lesson)	Relating the days' and the previous class (es) course content or provide students with an opportunity to do so.	-	0	-	-
	Presenting the classroom lesson with proper structures(such as introduction, presentation, summary and stabilization)	3.8	2	5.99	0.15
	Presenting the lesson from simple to complex	3.8	2	5.99	0.15
	Presenting the lesson using figures and graphs and make illustration	-	0	-	-
	Presenting the lesson by relating with other subjects	6.4	1	3.84	0.01
	Time management	0.8	2	5.99	0.67
	The number of students is compatible to manage	1.4	2	5.99	0.5
	Enough time is given to class activities	0.2	2	5.99	0.9
	Feed back is given for class activities	2.6	2	5.99	0.27
	Using student-centered approach	1.4	2	5.99	0.5
	Checking/evaluating students exercise book	3.6	1	3.89	0.06

According to table-13 above it was found that all of the observed teachers were trying to relate the days' and the previous class (es) course content or were provide students with an opportunity

to do so at the same time teachers were presenting the lesson using figures and graphs and make illustration. On the other hand a significant difference was found in presenting the lesson by relating with other subjects wherein most of the observed teachers (about 90%) were not made a horizontal relationship between mathematics and any other subject. About 60% of the observed teachers were presenting the classroom lesson with proper structures such as introduction, presentation, summary and stabilization accordingly; again most teachers were present their lesson from simple to complex; about 40% of teachers were low in their time management of the lesson and about 20% of teachers were highly managed their class lesson.

The other point of view was the compatibility of number of students per classroom, at the time of observation there was a minimum of 39 students in Otuwa primary school up to 76 students in Sheko primary school. It was found that some schools were posed face to face seating arrangement of students in order to enhance the implementation of student centered approach. However some schools were still organizing their students seating arrangement in a traditional way. Furthermore, as it was observed from students exercise book about 80% of teachers was Checking/evaluating student's exercise book (class works and home works) and feedback was delivered by most teachers.

Table-14. Instructional materials

Item	Attributes	x^2	df	x^2 critical	P-value
Instructional materials	Using mathematics text book	9.8	2	5.99	0.01
	Using mathematics teacher's guide	6.4	1	3.84	0.01
	The necessary teaching aids and related reference materials	1.6	1	3.84	0.21

As shown in table-14 above, a significance difference was found at 0.05 level in using mathematics text book in classroom teaching learning about 80% of the observed teachers were highly depend on the student's mathematics text book. In contrast, about 90% of teachers were not using mathematics teacher's guide which was a significant difference at 0.05 levels of significance. Finally, it was observed that about 70% of teachers were not use a teaching aid material this was observed in most classrooms as well as the pedagogic-centers of the school's

where there were not enough amounts of teaching materials and the pedagogic-centers were not well organized.

4.3.8 Responses of interview towards learning

Due to certain reasons parental involvement in education matter was poor. While some respondents asserted that; to some extent their parents' are involved in their daughters education matter and give academic support to perform well. Girls were asked about their parent's educational status, majority of female student respondents' stated that their parents' education background was low this level of parental education has a negative influence in their children effective learning. Two of the interviewee explained their father's are diploma holders and a only girl was found in one of the study school's interviewee who respond as her mother was diploma holder and her father was degree holder; the remaining responses of female students showed that their parents are unqualified in any field and this makes them solitary in their learning progress.

Some principal interviewees stated as: "Most of the time girls are dictated to stay at home because their parents were given assignment to help them in domestic works. Their parents did not allow going to school before they finish the daily household activities. Until they complete the assignment they stayed at home and they missed the class and/or become late comers". This in turn affects girls learning and achievement as one of the principals asserted that due to such reasons female students sometimes were exposed of cheating and passing grade levels. Due to lack of time to study and prepare themselves for exam and lack of sufficient prior knowledge on subject matter, students tried to adjust themselves to cheat the exam.

As one of the interviewee student claimed no equal time allocation for boys and girls at home. Boys have enough time for studying but females have not. Parents demanded females for domestic work rather than encouraging them for learning and studying, doing assignment, home work and other educational activities rather. Culturally the ways that were discouraged female in all educational tasks. All of interviewed girls agreed boys spent more time on studying than girls because of the following reasons as they clarified:

- Most of the time girls doesn't focus on their learning because of the influence of domestic work, when we look for boys they are permitted to study more time as well as they played a major role in learning mathematics.

- Boys may study even on the time when they are rearing cattle in the field. However, girl's condition was not appropriate we fetch water and fire wood for the family; we also cook food and so on. Due to such reasons we spent much time as a result we face shortage of time to study mathematics well.
- Studying depends personally; if a girl is an outstanding student in performing mathematics, then she may spend more time in studying mathematics. The amount of time we spent on mathematics depends on the programme we prepare for study. However males spend more of their time in studying mathematics than we do.

As one of the principals said "mathematics club is formulated in his school to achieve female students in their mathematics learning, we have a mathematics question and answer competition program for girls only and after the computation we announce the result on the flag ceremony as well as names of winner girls per every classroom were posted in every 15 days". On the other hand one of the principals from other schools suggested that there is "The tomorrow's teacher" club in his school which activates stressing on mathematics and science subjects in order to initialize and create a strong interest of student's toward these subjects. Furthermore, there is a question and answer competition program in mathematics only aimed to upgrade student's learning outcome vis-à-vis tutorial.

The other principal says, "even if there is no any club look upon mathematics, but we do have a technique to enhance the teaching learning process including mathematics. There is organized activity called 'one to five' which is consisted of one clever student with five weak and medium performer students specially in grades seven and eight levels. This task is guided and controlled by mathematics teachers". As I had observed all schools were trying to perform such kind of activity, but the implementation level differs between schools.

4.4 Attitudes towards mathematics

4.4.1 Student's interest towards learning mathematics

Responses of students were gathered on the item 'are you happy in learning mathematics' as it was presented in table-15 below:

Table- 15. Attitude of girls and boys about their interest in mathematics

		Item		Row summary
		Are you happy in learning mathematics?		
		No	Yes	
Gender	Female	17 (17.5)	165 (164.5)	182
	Male	18 (17.5)	164 (164.5)	182
Column summary		35	329	364
x^2 = 0.03, df = 1, critical x^2= 3.84, P-value = 0.86 The numbers in parentheses in the table are expected counts.				

As described in the table above (table-15)17 out of 35, 0r 48.57%, Gender where who said I am not happy in learning mathematics that are Female and 18 out of 35, or 51.43%, are Male . In contrast of this 165 out of 329, or 50.15%, where who said I am happy in learning mathematics were Females. Whereas 164 out of 329, or 49.85%, where who said I am happy in learning mathematics were Males.

Thus, a significant difference was not found in the responses of girls and boys to the item "I am happy in learning mathematics" (chi-square (x^2) = 0.03, df = 1, critical x^2=3.84, P = 0.86) at 0.05 level. Moreover, 90.38% of students replied as they are happy in learning mathematics and 9.62% of them responded they are not happy in learning mathematics. This issue had concluded on the statement student's happiness in learning mathematics was independent of gender. The finding of qualitative data also assured this issue, all of the interviewee girls said that they like the subject mathematics and are happy in learning it. One of these girls stated that "mathematics is an easy subject if it is studied well; most students are weak in their mathematics performance because of giving less attention to it and not performing mathematical activities". This idea is supported by most mathematicians who believe saying 'learning mathematics is doing mathematics'.

4.4.2 Attitude towards mathematics difficulty level

The following table (table-16) showed that the responses of students whether mathematics is easy or not.

Table-16. Attitude of girls and boys towards mathematics difficulty level

		Item		**Row summary**
		Mathematics is an easy subject		
		No	Yes	
Gender	Female	90 (83.0)	92 (99.0)	182
	Male	76 (83.0)	106 (99.0)	182
Column summary		166	198	364
Chi-square (x^2) = 2.17, df = 1, P-value = 0.14 The numbers in parentheses in the table are expected counts.				

It was found that (Table-16) 90 out of 166, or 54.22% Females, and 76 out of 166, or 45.78%, males said that mathematics is not easy subject. Whereas 92 out of 198, or 46.46%, females and 106 out of 198, or 53.54%, males said mathematics is an easy subject. Hence, there was no significant difference in the attitude of girls and boys to the item "mathematics is an easy subject" (chi-square (x^2) =2.171, df = 1, P = 0.14 > 0.05) at 0.05 level. Therefore, student's attitudinal responses to the item 'mathematics is an easy subject' were independent of gender.

The above idea was supported by all interviewee girls agreed that mathematics is an easy subject, but it need to be studied hard daily. One of the girls asserted that "we females have not to say we can't rather we have to say 'yes we can' because there is nothing impossible".

4.4.3 Attitude towards need/support to understand mathematics

As shown in table-17 below 169 out of 343, or 49.27%, who said I need special help/support to understand mathematics are Females; and 13 out of 21, or 61.90%, females have said they do not need special help/support to understand mathematics. Furthermore, 174 out of 343, or 50.73%, who said I need special help/support to understand mathematics are males; and 8 out of 21, or 38.10%, males have said they do not need special help/support to understand mathematics.

Table- 17. Student's attitude toward the need for support to understand mathematics

		Item		Row summary
		Do you need special help (support) to understand mathematics?		
		No	Yes	
Gender	Female	13 (10.5)	169 (171.5)	182
	Male	8 (10.5)	174 (171.5)	182
Column summary		21	343	364
Chi-square (x^2) = 1.26, df = 1, critical x^2=3.84, P-value = 0.26 The numbers in parentheses in the table are expected counts.				

Thus, it was concluded that the responses of girls and boys to the item "do need special help/support to understand mathematics" is not statistically significant (chi-square (x^2) = 0.032, df = 1, P = 0.26 > 0.05). Besides, the column summary of table-17 illustrated the composite review of student's attitude, 21 (5.77%) of respondents replied that they don't need special help/support to understand mathematics and 343 (94.23%) of them replied as they need help to understand mathematics.

4.4.4 Summary statistics of all students on attitude toward mathematics

Summary of test proportion on the three attitudinal items was made as shown in table-18 below:

Table-18. Details of statistics on attitude of students toward mathematics

No	Item	Test Proportion				x^2	df	P
		Rsp	No	%	Z			
1	Are you happy in learning mathematics?	Yes	329	90.38%	15.41	237.5	1	<0.05
		No	35	9.62%	-15.41			
2	Mathematics is an easy subject	Yes	198	54.4%	1.68	2.81	1	0.09
		No	166	45.6%	-1.68			
3	Do you need a special help (support) to understand mathematics?	Yes	343	94.23%	16.88	284.8	1	<0.05
		No	21	5.77%	-16.88			

As it is shown in table-18 above, there was statistically significant difference (P < 0.05) at 0.05 level of significance on the students happiness in learning mathematics, the majority of students agreed that they are happy in learning mathematics; In addition, more students rewarded as mathematics is easy subject in which there was no significant difference (P= 0.09 > 0.05) at 0.05 level on the categories of item number two. However 94.23% of them responded that they need a special help (support) to understand mathematics which was a significant difference at 0.05 levels.

4.5 Mathematics achievements

4.5.1 Achievement outcome of past students

a) PSLE outcome of 2001E.C

Statistical analyses were made on the achievement score of past and present students. Below is presented the basic statistic of students in 2001E.C. academic year primary school leaving examination (PSLE) outcome.

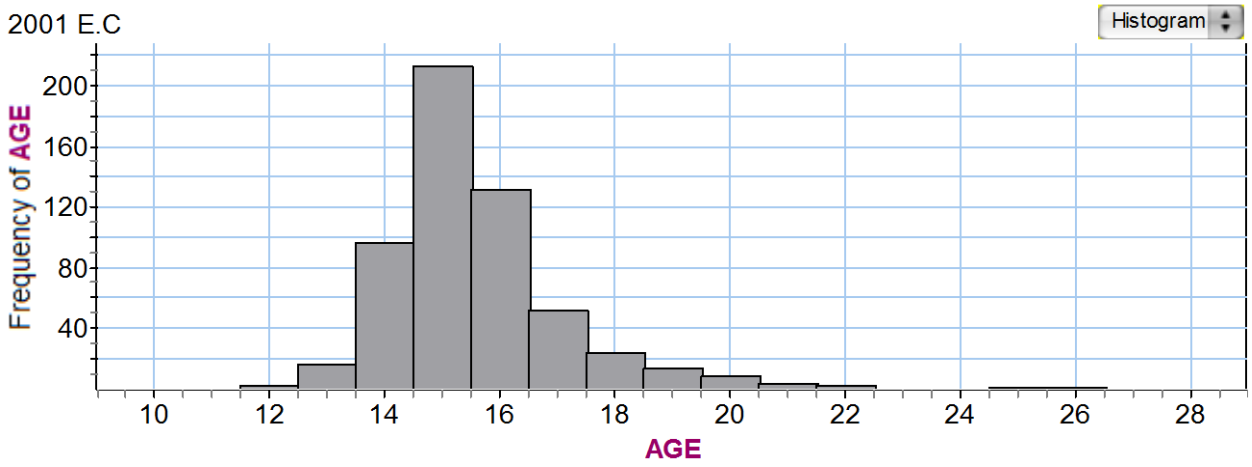


Figure-2.Histogram of students' age (2001E.C)

The above figure (figure-2) explained the age of students in 2001E.C academic year. The composite average age was 15.56 years old with standard deviation of 1.57. The smallest mean age was found in Shai-Bench primary school (14.85 years old), and Maz primary school was the highest mean age (17.25 years old).

Table-19. Summary descriptive statistics (achievement score) of 2001E.C Students

School	N	Mean Score	SD	Min	Median	Max	Q1	Q3
Aman	214	19.81	6.42	9	18	45	15	23
Bachuma	46	17.59	5.37	4	18	30	14	23
Debre-Work	30	19.33	4.44	11	18	29	17	23
Edget-Behibret	60	17.28	2.96	11	17	26	15	20
Genja	26	19.77	3.56	12	20	29	17	21
Maz	4	16.75	3.40	12	17.5	20	14.5	19
Otuwa	10	22.40	5.06	14	23	32	18	24
Shai-Bench	84	19.08	4.54	8	18	29	15	23
Sheko	38	19.68	3.95	11	19	26	17	23
Temenjayax	48	19.58	5.41	8	19	36	16	22
Composite	**560**	**19.22**	**5.35**	**4**	**18**	**45**	**15**	**21**

According to table-19, the composite mean score was 19.22. The lowest average score was 16.75 in Maz primary school and highest average score was 22.40 in Otuwa primary school. Minimum achievement score was observed in Bachuma primary school and maximum achievement score was scored in Aman primary school. The composite median score (18) was less than the composite mean score (19.22).

Table-20.Comparison of 2001E.C PSLE mean score per gender

Gender	N	Mean	SD	SI	Student's t	df	Critical t	P-value
Female	280	19.43	5.55	0.33				
Male	280	19	5.14	0.31	0.96	555	1.98	0.34

As shown in the above table (table-20), the test statistics student's t is 0.96. There are 555 degrees of freedom. If it were true that the population mean score of females were equal to mean score of males, and the sampling process were performed repeatedly, the probability of getting a value for student's t with an absolute value this greater would be 0.34. Therefore, there is no significant difference between mean scores of girls and boys ($t_{calc.}$= 0.96, df= 555, $t_{crit.}$=1.98, P = 0.34 > 0.05) at 0.05 level. It may be concluded that the achievement mean score of females were almost equal to mean score of males. However, females achieve in mathematics 0.43 points better than males in the composite score.

b) PSLE outcome of 2002E.C

The following figure (figure-3) represents the description of student's age using histogram.

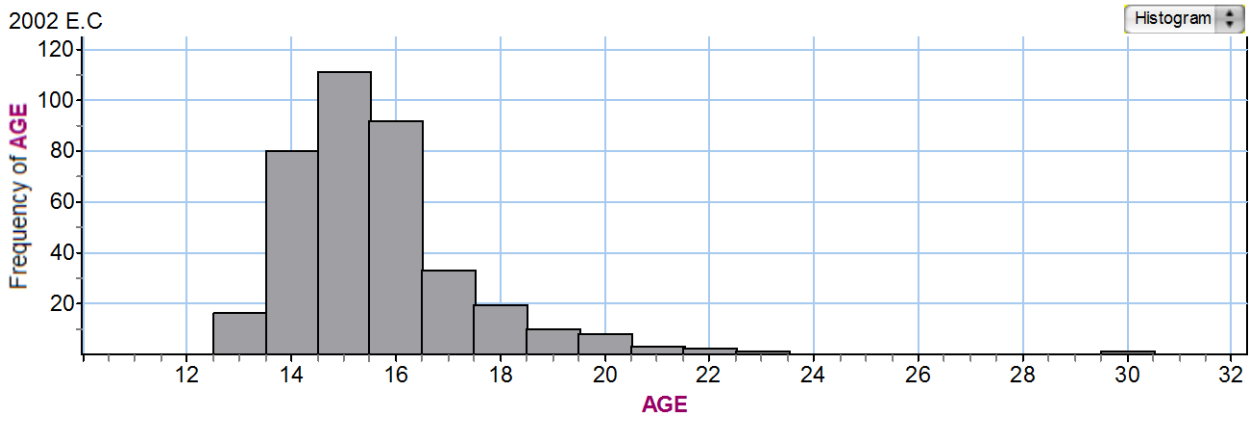


Figure-3. Histogram of students' age (2002 E.C)

The above figure (figure-3) explained student's age in 2002E.C academic year. The composite average age was 15.63 years old with standard deviation of 1.82. Shai-Bench primary school has the smallest average age (14.75) and the highest mean age was observed in Bachuma primary school.

Table-21. Summary descriptive statistics (achievement score) of 2002E.C Students

School	N	Mean Score	SD	Min	Median	Max	Q1	Q3
Aman	106	20.76	6.28	6	20	45	17	24
Bachuma	42	20.55	5.07	11	21	30	17	24
Debre-Work	30	19.67	6.27	14	18	38	15	21
Edget-Behibret	20	17.40	3.55	12	17	27	15	19
Genja	12	20.25	3.41	14	20	26	17.5	23
Maz	4	23.50	2.08	21	23.5	26	22	25
Otuwa	90	22.09	9.18	9	20	48	15	27
Shai-Bench	16	20.63	6.74	11	21	36	16	23
Sheko	24	19.50	4.90	14	17.5	32	16	22.5
Temenjayax	32	21.69	4.61	14	21	30	18	24
Composite	**376**	**20.80**	**6.66**	**6**	**20**	**48**	**17**	**24**

According to table-21 above, the composite mean score was 20.80. The lowest average score was 17.40 found in Edget-Behibret primary school and the highest average score was 23.50 in Maz primary school. Minimum achievement score (6) was observed in Aman primary school and maximum achievement score (48) was found in Otuwa primary school. The composite median score (20) was less than the composite mean score (20.80).

Table-22. Comparison of 2002E.C PSLE mean score per gender

Gender	N	Mean	SD	SI	Student's t	df	P-value
Female	188	20.72	6.49	0.47			
Male	188	20.87	6.84	0.50	-0.21	373	0.83

As shown in the above table (table-22), the test statistics is, $t_{calc.}$= -0.21, $t_{crit.}$=1.98. There are 373 degrees of freedom. If it were true that the population mean score of females were equal to mean score of males, and the sampling process were performed repeatedly, the probability of getting a value for student's t with an absolute value this greater would be 0.83. Therefore, there is no significant difference between mean scores of girls and boys (P = 0.83 > 0.05) at 0.05 level. Hence, it may be concluded that: the population mean score of females is almost equal to mean score of males. However, mathematically males achieve 0.14 points better than females in the composite mean score.

Generally, comparing the PSLE data of both years the composite achievement score of students in both academic years was below the average outcome that was expected in the PSLE outcome. Since the achievement score was scored out of 60 points, all schools were observed that they are low achievers in mathematics. The mean achievement score in Maz primary school at 2001E.C was the lowest (16.75) of all schools, in contrast this school was scored the maximum achievement mean score (23.50) at 2002E.C. on the other hand Aman primary school scored the minimum score (6) at 2002E.C and maximum (45) at 2001E.C. Otuwa primary school was high achiever in 2001E.C whose students' were scored the highest mean score from all, at the same time someone in this school found to score the maximum point (48) in 2002E.C PSLE achievement score.

4.5.2 Achievement outcome of present students

a) Summary statistics of student's achievement score

According to table-23 below girls in Temenjayax primary school achieved well in the achievement test than the other schools female students, on the other hand less achieved girls were found in Edget-Behibret primary school. The composite achievement mean score of girls was 13.68 out of 30 points; and the composite achievement mean score of boys is 16.27 out of 30 points. It was found that males achieve better in mathematics than females. The achievement score of students in individual schools showed that boys achieve better than girls except Temenjayax Primary School where females achieved better than males.

Table-23. Comparisons of student's achievement mean score per gender

School	N		Mean score		SD		SI		Using unpooled variances		
	F	M	F	M	F	M	F	M	Student's t	df	P-value
Aman	39	39	15.23	16.41	4.5	4.9	0.7	0.8	-1.1	76	0.27
Bachuma	7	7	12.29	16	2.3	4.9	0.9	1.9	-1.8	9	0.10
Debre-Work	15	15	12.93	17.60	3.2	3.2	0.8	0.8	-4	28	0.00
Edget-Behibret	26	26	11.19	14.38	1.9	4.8	0.4	1.0	-3.1	32	0.00
Genja	25	25	13.32	15.76	3.4	4.3	0.7	0.9	-2.2	46	0.03
Maz	7	7	11.86	19.14	2.8	4.3	1.1	1.6	-3.8	10	0.00
Otuwa	8	8	15.13	19.50	2.4	5.1	0.9	1.8	-2.2	10	0.05
Shai-Bench	21	21	13.10	15.62	2.6	4.9	0.6	1.1	-2.1	31	0.04
Sheko	20	20	13.60	16.40	3.4	4.2	0.8	0.9	-2.3	37	0.03
Temenjayax	14	14	17.14	16.57	3.8	2.3	1.0	0.6	0.5	21	0.63
Composite	**182**	**182**	**13.68**	**16.27**	**3.7**	**4.5**	**0.3**	**0.3**	**-6.1**	**348**	**< 0.05**

In the composite achievement score of Debre-Work, Edget-Behibret and Maz primary schools there were very significant difference between girls and boys at 0.05 levels of significance. In Genja, Shai-Bench, and Sheko Primary schools their achievement score showed a significance difference at 0.05 levels. Furthermore, the achievement score was not statistically significant at

0.05 levels of significance in Aman, Bachuma, Otuwa, and Temenjayax primary schools. At the same time the composite achievement score of all schools showed that there was a very significant difference at 0.05 levels of significance.

The following table (table-24) showed that the ANOVA described for the achievement score of students with respect to student's gender. If it were true that the population mean of score where gender is female were equal to that of score where gender is male and the sampling process performed repeatedly the probability of getting a value for F-statistics greater than or equal to the observed value would be the one showed in the table.

Table-24. Analysis of variance (Achievement score versus Gender)

School	**Degrees of Freedom**			**Sum of squares**			**Mean square**		**F statistic**	**P-value**
	Source groups	Error	Total	Groups	Error	Total	Groups	Error		
Aman	1	76	77	27	1668	1695	27	22	1.24	0.27
Bachuma	1	12	13	48	175	224	48	15	3.30	0.09
Debre-Work	1	28	29	163	285	448	166	10	16.07	0.00
Edget-Behibret	1	50	51	132	668	801	132	13	9.91	0.00
Genja	1	48	49	74	716	790	74	15	4.99	0.03
Maz	1	12	13	186	158	344	1856	13	14.14	0.00
Otuwa	1	14	15	77	225	301	77	16	4.77	0.06
Shai-Bench	1	40	41	67	605	672	67	15	4.42	0.04
Sheko	1	38	39	78	550	628	78	14	5.42	0.03
Temenjayax	1	26	27	2	251	253	2	10	0.24	0.63
Composite	**1**	**362**	**363**	**615**	**6074**	**6689**	**615**	**17**	**36.63**	**0.00**

It was found that there was no significant difference ($P > 0.05$) at 0.05 levels of significance between achievement scores of students' and their gender in Aman, Bachuma, Otuwa and Temenjayax primary schools. In contrast, there was a significant difference at 0.05 levels of significance between achievement scores of students' and their gender in Genja, Shai-Bench and Sheko primary schools. Furthermore, there was a very significant difference ($P = 0.00 < 0.05$) at

0.05 levels in Debre-Work, Edget-Behibret and Maz primary schools as well as in the composite achievement scores of students with respect to their gender.

On the other hand the analysis of variance were performed on the basis of achievement score and every item of the questionnaire. In each case analysis of variance was carried out to detect the presence of statistically significant mean differences between achievement score and responses of students for each item (table-25). This analysis considers student's score as a response attribute and response of items as grouping attribute.

Table-25. Analysis of variance of questionnaire items

Item	F statistic	P-value
Do have student's text book	0.03	0.86
Happy in learning mathematics	3.36	0.07
Mathematics is an easy subject	16.21	< 0.05
Need special help/support to understand mathematics	0.84	0.36
Do study mathematics	3.66	0.03
There is a mathematics tutorial program	3.67	0.06
There is mathematics tutorial program for girls only	2.94	0.09
Mathematics teacher gave H.W	1.63	0.18
Mathematics teacher approved the given H.W	1.59	0.21
Mathematics teacher uses teaching material	3.09	0.05
Df =363, sum of squares = 6688.78		

The analysis of variance showed a very significant difference ($P < 0.05$) at 0.05 level on the attitude of students toward mathematics, thus, 'population means of Score grouped by mathematics is an easy subject are equal' was significant. Meanwhile, those students who respond as mathematics is easy subject perform better. A significant difference was found at 0.05 level on the item 'how often do study mathematics'. The analysis of variance doesn't show significant differences to the remaining items.

b) Correlation between student's achievement score and their age

The other point of view was looking for the correlation between student's achievement score and their age. It was summarized in the following table respecting individual school.

Table-26. Test correlation between student's achievement score and age

School	N	Correlation	Student's t	df	P-value
Aman	78	-0.21	-1.92	76	0.06
Bachuma	14	-0.39	-1.45	12	0.17
Debre-Work	30	0.46	2.72	28	0.01
Edget-Behibret	52	0.16	1.13	50	0.26
Genja	50	0.21	1.49	48	0.14
Maz	14	0.03	0.10	12	0.93
Otuwa	16	0.77	4.46	14	0.00
Shai-Bench	42	-0.02	-0.15	40	0.88
Sheko	40	0.05	0.33	38	0.74
Temenjayax	28	-0.16	-0.84	26	0.41
Composite	**364**	**0.04**	**0.77**	**362**	**0.44**

In order to look correlation between student's achievement score and age, correlation test was conducted as shown in table-26 above. Thus, a strong correlation was found in Otuwa primary school (0.77) between achievement score and age of students. In Aman, Bachuma, Shai-Bench and Temenjayax primary schools achievement score and age of students were negatively correlated and positively correlated in the remaining six schools. The composite score showed that there is weak relation sheep between the achievement scores of students and their age. Hence, there was a significant difference ($P < 0.05$) between the achievement scores of students and their age in Debre-Work primary school at 0.05 significant levels; and in Otuwa primary school there was a very significant difference between the achievement scores of students and their age at 0.05 levels. There was no significant difference ($P > 0.05$) at 0.05 significant levels in the remaining eight schools.

c) Simple regression test for student's achievement score and their age

The model simple regression was analyzed considering student's achievement score as a response variable (attribute) and student's age as predictor variable (attribute) as described in the following table (table-27).

Table-27. Simple regression between schools

School	N	Equation of least-squares regression line	Correlation coefficient (r)	r-squared	Best estimate for the Slope	SE Slope
Aman	78	Y = 29.88 -0.96 X	-0.21	0.05	-0.96 ± 0.99	0.50
Bachuma	14	Y = 26.51 -0.78X	-0.39	0.15	-0.78 ± 1.17	0.54
Debre-Work	30	Y = -2.26 + 1.11X	0.46	0.21	1.11 ± 0.84	0.41
Edget-Behibret	52	Y = 5.62 + 0.48X	0.16	0.02	0.48 ± 0.84	0.42
Genja	50	Y = 4.96 + 0.63X	0.21	0.04	0.63 ± 0.85	0.42
Maz	14	Y = 14.38 + 0.07X	0.03	0.00	0.07 ± 1070	0.78
Otuwa	16	Y = -27.74 +2.87X	0.77	0.59	2.87 ± 1.38	0.64
Shai-Bench	42	Y = 15.42 - 0.07X	-0.02	0.00	-0.07 ± 0.94	0.46
Sheko	40	Y = 12.08 + 0.20X	0.05	0.00	0.20 ± 1.22	0.60
Temenjayax	28	Y = 22.40 - 0.37X	-0.16	0.03	-0.37 ± 0.90	0.44
Composite	**364**	**Y = 13.05 + 0.13**X	**0.04**	**0.002**	**0.13± 0.32**	**0.16**

Where, Y- represents score and X- stands for student's age.

All of the models in the table above were performed with confidence level of 95%

A simple regression analysis of score (Y) on age (X) was carried out. This resulted in the composite regression equation: Y = 0.13X + 13.05. The regression coefficient was not statistically significant (b = 0.13) and the value of the standardized coefficient (beta = .95) indicated that a change in the predictor variable (age) doesn't corresponds to a substantial change in the outcome variable (score). The value of r^2 was 0.002, indicating that the variability of the predictor variable (age) can predict 0.2% of the variability of the response variable (score), which is not highly accurate level of estimation. Relatively significant result was found in Otuwa primary school where 59% of the variation in score was accounted for by age.

4.6 Factors influencing female students' mathematics achievement

4.6.1 Responses of Principal's and girls

As some of the principals stated, "There is a high need for girls to work the household/domestic work from an earlier age on than boys. A daughter is usually unrecognized domestic worker and it affects all school age girls. Girls have heavy burden and a subsequent unclear mind, and increased absenteeism from school, lack of time for school assignments after school attending, lack of understanding the subject matter and commitment to school activities". The effect is academic underperformance for the girl. This may indicate that females spend more time helping their parents at home than doing their homework and assignments which negatively affects their academic achievement.

The other principal highlighted that it is agreed large numbers of eligible females are not achieving well. Even if a girl was in school, she has no time to study, to read, and to prepare for the lesson rather waiting the daily routine works at home because the school girls expected to fetch water and firewood for the family. In addition, most of female students' approved that their daily task includes making coffee and preparing food for whole family and rearing cattle in the field, making homemade ethanol and purchasing important items from the market for the family. Girls' labor is used to substitute for mothers' work in the households. In one or other way girls have such heavy, long and tiresome, and difficult activities in the household that take a lot of time and energy. Another impediment to the achievement of girls was gender biases on burden of domestic workload and lack of assistance in their study are negatively affecting the mathematics learning and academic achievement of female students at large. The argument here is that the school girl has no time to refer books, study and to do an assignment.

All principals agreed up on one issue that is majority of the society of the zone is illiterate and have no sufficient ideas about the benefit of education. The family as well as community have negative attitude towards education. Due to this reason girls fill hopelessness, unable to see bright future and poorly perform in exam which is the outcome of their learning. The problem implies that female students' are unable to follow schooling attentively and to study properly; finally, they lose their confidence for success because of their exposure to different problems.

One of the interviewee girls suggested that, “there should be meeting between different stake holders and our parents, and deal about our better future life; we girls need help in getting available guides and parents should have to sent us early to school.” In addition to this idea, one of the principals asserted that based on the last year’s PSLE result of the school girls achievement level were studied and interpreted; the result of the study were presented to parents in the meeting prepared for the purpose of discussion about low achievement of girls in their learning. The meeting was continuous and as a solution the school decided and starts implementing specially at eighth grade to thought without shift including the availability of library service. The principal added his idea saying if there is any topic which students doesn’t understood they are permitted to give for their teachers, and teachers are commanded to prepare a tutorial classes and bear their students learning and achievement.

4.6.2 Test statistics of tutorial delivered for girls only

As shown in table-28 the test statistic, chi-square (x^2) is 46.36. There are nine degrees of freedom. If it were true that mathematics tutorial program delivered for girls only were independent of school, and the sampling process were performed repeatedly, the probability of getting a value for chi-square (x^2) this great or greater would be < 0.05.

Table-28. Test for independence on the tutorial delivered for girls only

School	Item		Row summary
	There is a mathematics tutorial program delivered for girls only		
	No	Yes	
Aman	18 (36.4)	60 (41.6)	78
Bachuma	9 (6.5)	5 (7.5)	14
Debre-Work	16 (14.0)	14 (16.0)	30
Edget-Behbret	28 (24.3)	24 (27.7)	52
Genja	23 (23.4)	27 (26.6)	50
Maz	11 (6.5)	3 (7.5)	14
Otuwa	15 (7.5)	1 (8.5)	16
Shai-Bench	24 (19.6)	18 (22.4)	42
Sheko	18 (18.7)	22 (21.3)	40
Temenjayax	8 (13.1)	20 (14.9)	28
Column Summary	**170**	**194**	**364**

Chi-square (x^2) = 46.36, df = 9, critical x^2 = 16.92, P-value < 0.05

The numbers in parentheses in the table are expected counts.

Therefore, a very significant difference was found at 0.05 level in the responses of students to the item "there is a mathematics tutorial program for girls only" (chi-square (x^2) = 46.36, df = 9, P < 0.05) with critical value of chi-square 16.92. Hence, the mathematics tutorial program delivered for girls only were not independent of School.

Moreover, 60% of Interviewee girls have agreed that there is a tutorial program in mathematics which is delivered to girls only, rather 40% of them said that there is no any kind of tutorial program in mathematics or in any subject delivered only for girls only. In addition they stated the following suggestions regarding tutorial programs:

- We need special help and support in tutorial to perform well our mathematics, and there should prepare an affirmative action.
- The mathematics teachers should thought us well and change us in helping to focus on our learning.
- Girl's mathematics result is relatively very low compared to other subjects, so that there should be special help for low achiever girls if change is needed to come.

Interview of principals in girl's tutorial was summarized as follows: some of the principals suggested that to better upgrade girl's learning they deliver tutorial program for female students. Tests were prepared and given to the selected female students from every classroom and for those girls who have got lowest points in the test will be delivered support in tutorial program. The other principal said there are permanent days fixed to girl's tutorials in opposite shifts labeling them in to three phases who are low, medium and high achievers.

All principals agreed on the need of special help/support to female students for the following summarized reasons of their interview:

→ Due to domestic work of the family, negative attitudes of the society, teachers, administrators and family.

→ Girls have no time for study as compared to boys; they are more influenced by domestic works after returning home from school. It seems said "let only girls' work". After all they come to school and observed being cheating and stealing. Without knowing anything they may promote to the next class or not. Thus, considering their domestic work load they need support/help to come and learn in the opposite shift.

→ The domestic work makes girls late comers to school this in turn affect their learning loosing lessons thought by teachers and make them to fear teachers to compete their male counterparts.

→ There are some grade eight students who are married, family administrators and who learn helping themselves.

→ Due to certain biological problems.

→ Lack of family attention given to girls and their fear to express their opinions.

5. Summary, Conclusion and Recommendation

This study examined gender difference in mathematics learning and achievement in primary schools of BMZ. It also investigated associations between attitudes of girls and boys as well as expressed those factors influencing female students' mathematics achievement. The final findings of the study, summary, conclusion and recommendation, was presented below.

5.1 Summary

Based on the analysis and discussion of the results the following issues were summarized.

- The mean age of students has a composite value of 15.11 years old. And the least age were found to be 12 year in Genja primary school and maximum age were found in Debre-Work school which was 23 years old. The average age of female students was 14.77 and males were 15.45 years old. The minimum age for females is 12 years and the maximum age is 18 years, boys were a minimum of 13 years and a maximum of 23 years old.
- There were 13 teachers who thought in grade eight of sample schools; all of them were males, whereas seven of them were less than 25 years old, two of them were aged between 25 and 29, and the rest four teachers were aged between 30 and 39 years.
- There were ten principals of the sample schools, they were 24 up to 39 years of old and all of them were males. In addition, they have served for four up to seventeen years; regarding their academic status, two of them were degree holders and the rest eight were diploma holders.
- It was observed that most teachers (90%) prepared weekly lesson plan and about 30% of teachers were observed lack of time management in presenting the lesson based on the prepared lesson plan. Whereas the difference to the items 'getting class under control (management)' and 'Evaluating the lesson plan at the end of the lesson' were not statistically significant.
- Significant difference was found in presenting the lesson by relating with other subjects wherein most of the observed teachers (about 90%) were not made a horizontal relationship between mathematics and any other subject. About 60% of the observed teachers were presenting the classroom lesson with proper structures such as introduction, presentation, summary and stabilization accordingly; again most teachers were present their lesson from simple to complex; about 40% of teachers were low in their time management of the lesson and about 20% of teachers were highly managed their class lesson.

- There was a minimum of 39 students in the observed classroom in Otuwa primary school up to 76 students in Sheko primary school. It was found that some schools were posed face to face seating arrangement of students in order to enhance the implementation of student centered approach. However some schools were still organizing their students seating arrangement in a traditional way. Furthermore, as it was observed from students exercise book about 80% of teachers was Checking/evaluating student's exercise book (class works and home works) and feedback was delivered by most teachers.
- In using mathematics text book in classroom teaching learning about 80% of the observed teachers were highly depend on the student's mathematics text book. In contrast, about 90% of teachers were not using mathematics teacher's guide which was a significant difference at 0.05 levels of significance. Finally, it was observed that about 70% of teachers were not use a teaching aid material this was observed in most of the pedagogic-centers of the school's where there were not enough amounts of teaching materials and the pedagogic-centers were not well organized.
- Most of the time girls are dictated to stay at home because their parents were given assignment to help them in domestic works. Their parents did not allow going to school before they finish the daily household activities. Until they complete the assignment they stayed at home and they missed the class and/or become late comers. This in turn affects girls learning and achievement as one of the principals asserted that due to such reasons female students sometimes were exposed of cheating and passing grade levels. Due to lack of time to study and prepare themselves for exam and lack of sufficient prior knowledge on subject matter, students tried to adjust themselves to cheat the exam.
- The responses of girls and boys to the item "do need/support to understand mathematics" is not statistically significant ($x^2 = 0.032$, df = 1, critical $x^2 = 3.84$, P = 0.26 > 0.05).Besides, the composite review of student's attitude, 21 (5.77%) of respondents replied that they don't need special help/support to understand mathematics and 343 (94.23%) of them replied as they need help to understand mathematics.
- Student's 'gender' was independent of their attitudes: 'happiness in learning mathematics', 'student's belief on whether mathematics is an easy subject', and 'their need of special help (support) to understand mathematics'.

- The composite achievement score of students in 2001E.C and 2002E.C PSLE was below the average outcome that was expected in the PSLE outcome. Meanwhile girls achieved better in 2001E.C PSLE than boys, and in 2002E.C boys were better achievers than girls. However in both of these years the difference on the achievement score of boys and girls were not statistically significant.
- In the composite achievement score of Debre-Work, Edget-Behibret and Maz primary schools there were very significant difference between girls and boys at 0.05 levels of significance favoring males. In Genja, Shai-Bench, and Sheko Primary schools there were significance difference between the scores of boys and girls at 0.05 levels. Furthermore, the achievement score was not statistically significant at 0.05 levels of significance in Aman, Bachuma, Otuwa, and Temenjayax primary schools. At the same time the composite achievement score of all schools showed that there was a very significant difference at 0.05 levels of significance.
- Mathematics results vary among schools in the Zone: The sample students from Otuwa and Temenjayax achieved relatively higher mean score than the students in the rest of the Zone. On the other hand, sample students in Edget-Behibret and Bachuma scored the lowest two mean scores. Students in the other schools obtained mean scores that lie between these two extremes.
- On the given achievement test female students from Temenjayax achieved well in the achievement test than the other schools female students, on the other hand less achieved girls were found in Edget-Behibret. The composite achievement mean score of girls was below the composite achievement mean score of boys.
- Girls' labor is used to substitute for mothers' work in the households. In one or other way girls have such heavy, long and tiresome, and difficult activities in the household that take a lot of time and energy. Another impediment to the achievement of girls was gender biases on burden of domestic workload and lack of assistance in their study are negatively affecting the mathematics learning and academic achievement of female students at large. The argument here is that the school girl has no time to refer books, study and to do an assignment.
- The mathematics tutorial program delivered for girls only were not independent of School. Meanwhile, 60% of interviewee girls have agreed that there is a tutorial program in

mathematics which is delivered to girls only, rather 40% of them claimed that there is no any kind of mathematics tutorial program in their school delivered for girls only.

5.2 Conclusions

The comparison made on the basis of student's gender indicated that male students have significantly higher mean achievement score than female students. There are multiple factors that can influence a student's mathematics learning and academic achievement. To mention some, but a few, family educational background, socio-economic status, student's attitude towards the subject matter and school facilities are some of them. In addition the quality and quantity of instruction, climate in the classroom, and educational stimulation in the home are some of the other factors that need to be considered. On the given achievement test female students from Temenjayax achieved well than the other schools female students, in contrast less achieved girls were found in Edget-Behibret. Male students scored better than female students in the composite outcome of achievement test. However, female students of Temanjayax School outperformed their male counterparts. Male students obtained relatively greater mean score in all the other schools.

Result of the study show that direct teacher talk dominated in the classroom. Lecture method followed by class work activities was the salient pattern of behavior. Girls also did not get an equal share of the teacher's time as classroom interaction was dominated by boys. There are tendencies for boys to be more active and assertive in the classroom than girls. This may be one of the reasons why girls do not perform well in mathematics in Bench-Maji zone. Furthermore, the overpopulated number of students in some schools created difficulty on the identification of individual learners on the side of teachers. This signifies the non existence of closer relationship between the students and their respective teachers. As a result, students' participation in the learning process was affected severely. There was a mathematics tutorial program which was dependent of school. In some schools there is a tutorial program in mathematics which is delivered to girls only, rather in some other schools there is no any kind of mathematics tutorial program in their school delivered for girls only. This may discourage girls in their progress of learning and achievement in mathematics.

There is a high need for girls to work the household/domestic work from an earlier age on than boys. A daughter is usually unrecognized domestic worker and it affects all school age girls.

Girls have heavy burden and lack of time for school assignments after school attending. Girls' labor is used to substitute for mothers' work in the households. The effect is academic underperformance of girls. This may indicate that females spend more time helping their parents at home than doing their homework and assignments which negatively affects their academic achievement. It is argued that parents who have more educated appear better able to provide their children with the academic and social support important for educational success when compared to parents with less educated.

5.3 Recommendation

Based on the findings of the study, the following issues were recommended.

1. In Temenjayax females outperformed their male counterparts; and there was no significant difference in mathematics achievement of boys and girls in Aman, Bachuma, and Otuwa schools. These results suggest these schools may be closer to attaining gender equity. In contrast a very significant difference in the achievement score between boys and girls were found in Debre-Work, Edget-Behbret, and Maz schools favoring males which suggested that school principals, their mathematics teachers and other stakeholders need to work towards the attainment of gender equity in the provision of mathematics education in their respected schools.
2. Schools and their mathematics teachers should avail sustainable tutorial programs to all students in general and female students in particular. Development and expansion of school programs in gender education are undoubtedly necessary to meet the immediate need of female students.
3. Mathematics teachers should give due attention to girls within the teaching learning process, they have to scrutinize the beliefs of their students. In so doing, they should devote much of their time and energy to promote high mathematics self-efficacy of their students in general and female students in particular so as to make them successful in their learning and achievement of mathematics. If learners are not assisted or encouraged to perceive positively most of the things they learning in mathematics classes, their performance will be affected. It depends entirely on the teacher to help learners develop positive attitudes towards the learning of mathematics.

4. There were underlie schoolal, parental and societal factors which negatively influencing girl's mathematics learning and achievement. There has a great need to address problems on teaching practices, attitudes, learning behaviors and other factors associated with the under-performance of girls.
5. It is strongly recommended that more comprehensive research regarding gender differences be carried out to other segments of primary schools in BMZ. Future research should also include a large sample including elementary, junior and secondary school students to examine the root causes of gender differences in mathematics learning and achievement.

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APPENDIX-A

Surveys Used

A1. Questionnaires

Addis Ababa University
School Of Graduate Studies
Faculty of Education
Department Of Mathematics Education

A1.1 Teachers Questionnaires

Questionnaire to be filled by primary school mathematics teachers

Dear respondents!

The purpose of this questionnaire is to identify major factors that impede mathematics learning and academic achievement of students in about ten primary schools around the Bench-Maji Zone. It is designed to measure and interpret differences in mathematics achievement between boys and girls in order to help improve the teaching and learning of mathematics throughout Bench-Maji Zone.

It is important that you answer each question carefully so that the information provided reflects your situation as accurately as possible. Since your sincere response has a great influence on the study, your cooperation in answering the questions will be highly appreciated. On my part, I assure you that the information you give remain a secret and I will use it lonely for the purpose of the study.

GENERAL DIRECTIONS:

1. Identify a place and a time when you will be able to complete this questionnaire without being interrupted. This questionnaire has been designed to be completed within 40 minutes by most teachers. However, the amount of time you will need may vary. To make it as easy as possible for you to respond, most items may be completed simply by circling the appropriate choice and/or checking the appropriate box.

2. There are no “right” or “wrong” answers to any of these items. The questionnaire is designed to provide information about teachers’ professional experiences, opinions, and classroom activities.

Again, thank you for your time, effort, and thought in completing this questionnaire!

Masresha Kassa!

Name of the school_____

1. How old are you?

   A. under 25 B. 25-29 C. 30-39 D. 40-49 E. 50 or more

2. Are you male or female?
   A. Female B. Male

3. Academic qualification

   A. TTI B. Diploma C. B.Ed/B.Sc D. other

4. By the end of this school year, how many years will you have been teaching altogether? Please round to the nearest whole number

   A. 1-5 years B. 6-10 years C. 11-15 years D. Above 15 years

5. In one typical calendar week from Monday to Friday, for how many single <hours/periods> are you formally <scheduled/time-tabled> in one school week altogether?
   A. below 10 B. 10-20 C. 21-30 D. above 30

6. In one typical calendar week from Monday to Friday, for how many single <hours/periods> are you formally <scheduled/time-tabled> to teach each of the following subjects?

   Write zero if none.
   Number of
   <hours/periods>

   A. Mathematics..... _____
   B. Biology..... _____
   C. Chemistry..... _____
   D. Physics..... _____
   E. Other Subjects ..... _____

7. About how often do you have meetings with other teachers in your subject area to discuss and plan gender related teaching approaches?
   A. Never B. Once or twice a year C. Once or twice a month
   D. Once or twice a week E. Almost every day

8. Do you think that society appreciates your work?
   A. Yes B. No
9. Do you think your students appreciate your work?
   A. Yes B. No

10. Do you use a textbook in teaching mathematics to your class?

A. Yes B. No

11. How often do you usually assign mathematics homework?

A. Never B. Less than once a week C. Once or twice a week

D. 3 or 4 times a week E. Every day

12. If students are assigned written mathematics homework, how often do you do the following?

I do not assign written homework. ..... ☐

*Check **one** box in each row.*

	Never	Rarely	Sometimes	Always
a) Record whether or not the homework was completed …	☐	☐	☐	☐
b) Collect, correct and keep assignments	☐	☐	☐	☐
c) Collect, correct assignments, and then return to students.	☐	☐	☐	☐
d) Give feedback on homework to whole class.....	☐	☐	☐	☐
e) Have students correct their own assignments in class.....	☐	☐	☐	☐
f) Have students exchange assignments and correct them in class……	☐	☐	☐	☐
g) Use it as a basis for class discussion.....	☐	☐	☐	☐
h) Use it to contribute towards students' grades or marks...	☐	☐	☐	☐

THANK YOU for the thought, time, and effort you have put into completing this questionnaire.

A1.2 Student's questionnaires and achievement test

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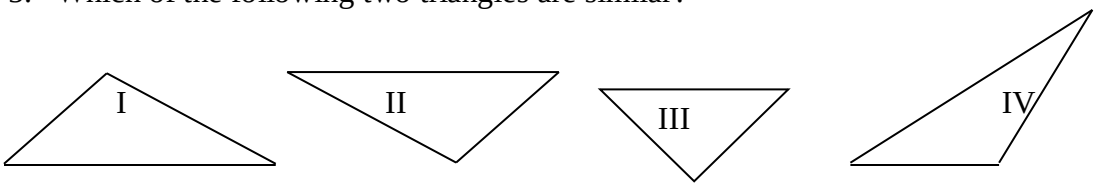
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Direction: The following part contains 30 multiple-choice items. Read each question carefully and respond as accurately and carefully as possible. You may ask for help if you do not understand something or are not sure how to respond. All questions will be followed by a few possible choices indicated with a letter next to or below it. For all questions, circle the letter next to or below your choice; if you decide to change your response to a question, put an "X" over your first choice and then put a circle around your new choice.

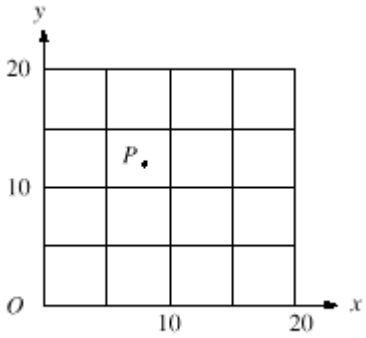
1. In a discus-throwing competition, the winning throw was 61.60m. The second-place throw was 59.72m. How much longer was the winning throw than the second-place throw?
   A. 1.18m B. 1.88m C. 1.98m D. 2.18m
2. A quadrilateral MUST be a parallelogram if it has
   A. One pair of adjacent sides equal
   B. One pair of parallel sides
   C. A diagonal as axis of symmetry
   D. Two adjacent sides equal
   E. Two pairs of parallel sides
3. Divide: 8/35 ÷ 4/15 =
   A. 1/2 B. 6/7 C. 32/525 D. 7/6
4. Divide: $0.004\overline{)24.56}$
   A. 0.614 B. 6.14 C. 61.4 D. 614 E. 6140

5. Which of the following two triangles are similar?



A. I and II B. I and IV C. II and III
D. II and IV E. III and IV

6. Which of the following are most likely to be the coordinates of point P?



A. (8, 12) B. (8, 8) C. (12, 8) D. (12, 12)

7. The table represents a relation between x and y. What is the missing number in the table?

x	y
1	1
2	?
4	7
7	13

A. 2 B. 3 C. 4 D. 5 E. 6

8. $\frac{X}{2} < 7$ is equivalent to

A. X < 7/2 B. X < 5 C. X < 14 D. X > 5 E. X > 14

9. The length of a rectangle is 6 cm, and its perimeter is 16 cm. what is the area of a rectangle in square centimeters?

A. 10 B. 12 C. 14 D. 16

10. These triangles are congruent. The measures of some of the sides and angles of the triangles are shown.

What is the value of X?

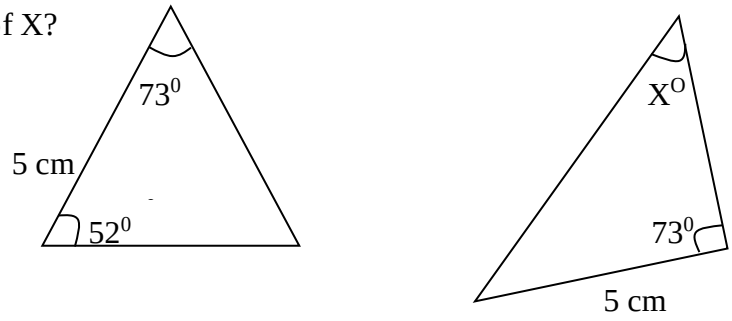
A. 52

B. 55

C. 65

D. 73

E.75



11. 3/4 + 8/3 + 11/8 =

A. 22/15 B. 43/24 C. 91/24 D. 115/24

12. Which number is five hundred four and seven-tenths?

A. 54.7 B. 504.7 C. 547 D. 5004.7

13. The table shows the values of x and y, where x is proportional to y.

X	3	6	P
y	7	Q	35

What are the values of P and Q?

A. P= 14 and Q=31
B. P= 10 and Q= 14
C. P= 10 and Q= 31
D. P= 14 and Q= 15
E. P= 15 and Q= 14

14. In a quadrilateral, two of the angles each have a measure of 110^0, and the measure of a third angle is 90^0. What is the measure of the remaining angle?

A. 50^0 B. 90^0 C. 130^0 D. 140^0 E. none of the above

15. Find x if 10x - 15= 5x + 20

A. 3 B. 5 C. 7 D. 9

16. What is the value of $\frac{2}{3} - \frac{1}{4} - \frac{1}{12}$?

A. 1/6 B. 1/3 C. 3/8 D. 5/12 E. 1/2

17. Which number is largest?

A. 4/5 B. 3/4 C. 5/8 D. 7/10

18. A class has 28 students. The ratio of girls to boys is 4:3. How many girls are in the class?

A. 7 B. 12 C. 16 D. 21

19. If x=2, what is the value of $\frac{7x + 4}{5x - 4}$?

A. 3 B. 5 C. 6 D. 8

20. Which of these is 89.0638 rounded to the nearest hundredth?

A. 100 B. 90 C. 89.1 D. 89.06 E. 89.064

21. If 3(x + 5) =30, then x =

A. 2 B. 5 C. 10 D. 95

22. What is the ratio of the length of a side of a square to its perimeter?

A. 1:1 B. 1:2 C. 1:3 D. 1:4

23. If m represents a positive number, which of these is equivalent to m+ m + m + m?

A. m +4 B. 4m C. m^4 D. 4(m +1)

24. Which of these is equal to y^3?

A. $y + y + y$ B. $y \times y \times y$ C. $3y$ D. $y^2 + y$

25. Juan has 5 fewer hats than Maria, and Clarissa has 3 times as many hats as Juan. If Maria has n hats, which of these represents the number of hats that Clarissa has?

A. 5 -3n B. 3n C. n-5 D. 3n-5 E. 3(n-5)

26. A cake is put in the oven at 7:20. If the cake takes three quarters of an hour to bake, at what time should it be taken out of the oven?

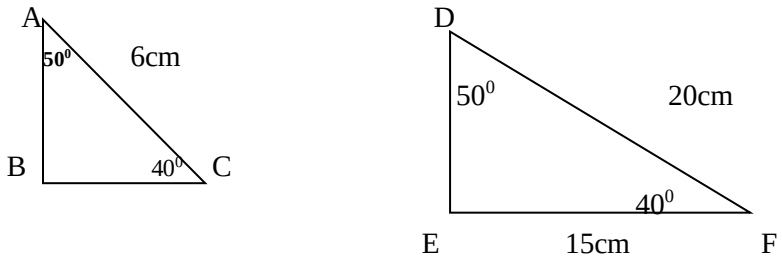
A. 7:50 B. 8:00 C. 8:05 D. 8:10 E. 8:15

27. One of the following is FALSE when a, b, and c are different real numbers?

A. (a + b) +c = a + (b + c) B. ab = ba C. a + b = b + a

D. (ab) c = a (bc) E. a-b = b-a

28. The figure represents two similar triangles. The triangles are not drawn to scale.



In the actual triangle ABC, what is the length of BC?

A. 3.5cm B. 4.5cm C. 5cm D. 5.5cm E. 8cm

29. There are 68 rows of cars in a parking lot. Each row has 92 cars. Which of these would give the closest estimate of the total number of cars in the parking lot?

A. 60x90 = 5400 B. 60x100= 6000 C. 70x90= 6300 D. 70x100=7000

30. n is a number. When n is multiplied by 7, and 6 is then added, the result is 41. Which of these equations represents this relation?

A. 7n + 6 = 41 B. 7n – 6 = 41 C. 7n x 6 = 41 D. 7(n + 6) = 41

A2. Interviews

A2.1 Interview for school Principals

My name is Masresha Kassa. This interview is prepared for the purpose of thesis work that I conduct for the partial fulfillment of master of education in Addis Ababa University School of graduate studies, Mathematics Department. I assure you that the information you give remain a secret and I will use it lonely for the purpose of the study.

General information:

Name of the school…….

Interviewer's name …….. Age:..… Sex:……

Year of work experience……. Highest educational qualification……..

Date of interview ……

Started time …….. End time…….

1. What kind of activities regarding gender related issues attempted in your school?
2. Does your school have facilities to respond to girls need (for example, separate Toilet, water, providing instructional materials, etc)?
3. How is mathematics department organized in your school?
4. What kinds of clubs are structured in order to facilitate learning in general and mathematics learning in particular? How is its activity (if any)?
5. How does mathematics department (its teachers) organized so as to provide affirmative action enhancing female students learning and achievement of mathematics education?
6. What do you comment about community attitude towards girls schooling?
7. Do you believe that female students need more help/support than male students at this level (grade 8^{th} level)? Why?

A2.2 Students interview

My name is Masresha Kassa. This interview is prepared for the purpose of thesis work that I conduct for the partial fulfillment of master of education in Addis Ababa University School of graduate studies, Mathematics Department. I assure you that the information you give remain a secret and I will use it lonely for the purpose of the study.

General information:

Name of the school: ……

Name of the student: ..... Age..... Grade……..
Marital status.....

1. What is your opinion about the subject mathematics and learning mathematics?
2. Who spend more time in studying mathematics males or females? How?
3. Do you attend mathematics class regularly?
4. Does your mathematics teacher, while teaching in the classroom, reinforce female students in particular?
5. What activities do you perform more at home besides after schooling?
6. Tell me about your parents' educational status.
7. Do your parents (any other) help you while studying mathematics (doing your mathematics homework)? How? Why?
8. Is there a tutorial program delivered by your school? What about in mathematics?
9. Is there a tutorial program for girls only delivered by your school? What about in mathematics?
10. Whom do you think perform better in mathematics boys or girls? Why?
11. What should be done to improve female students' mathematics academic achievement?

A3. Class room observation rating scale

This rating scale guides the researcher to examine Teaching mathematics in Grade eight classrooms around Bench-Maji Zone primary Schools: Practice, Problem, and Improvement Strategies. Ranking value is used accordingly as 1= low, 2= fair, 3= high.

1. School name_____

2. Woreda_____ 3. Sex_____ 4.Age_____

5. Years of service_____

Code No	**Various categories of classroom observation**	Rank/Value		
		1	2	3
1	**Category-Planning**			
1.1	Getting ready for classroom interaction (lesson plan)			
1.2	Getting class under control (Management)			
1.3	Presenting the lesson based on the prepared lesson plan			
1.4	Evaluating the lesson plan at the end of the lesson			
2	**Category-Instruction(Teaching methods and techniques & presentation of the lesson**)			
2.1	Relating the days' and the previous class (es) course content or provide students with an opportunity to do so.			
2.2	Presenting the classroom lesson with proper structures(such as introduction ,presentation, summary and stabilization)			
2.3	Presenting the lesson from simple to complex			
2.4	Presenting the lesson using figures and graphs and make illustration			

2.5	Presenting the lesson by relating with other subjects			
2.6	Time management			
2.7	The number of students is compatible to manage			
2.8	Enough time is given to class activities			
2.9	Feed back is given for class activities			
2.10	Using student-centered approach			
2.11	Checking/evaluating students exercise book			
3	**Category-Instructional materials**			
3.1	Using mathematics text book			
3.2	Using mathematics teacher's guide			
3.3	The necessary teaching aids and related reference materials			

APPENDIX-B

Description of achievement test

Item No	Content category	Performance expectation
1.	Fractions and number sense: real life application	Solving problems
2.	Geometry: property of quadrilateral and parallelogram	Knowing
3.	Fractions and number sense: properties of operations	Performing routine procedures
4.	Fractions and number sense	Performing routine procedures
5.	Geometry: similarity of triangles	Knowing
6.	Geometry: relation	Performing routine procedures
7.	Algebra: relation and function	Performing routine procedures
8.	Algebra: equivalent inequality	Performing routine procedures
9.	Measurement: perimeter and area	Solving problems
10.	Geometry: congruency of triangles	Performing routine procedures
11.	Fractions and number sense	Performing routine procedures in using property of addition
12.	Fractions and number sense: decimals	Knowing
13.	Proportionality: relation and function	Performing routine procedures
14.	Geometry: quadrilateral	Solving problems
15.	Algebra: linear equation	Performing routine procedures
16.	Fractions and number sense	Performing routine procedures in using properties of subtraction
17.	Fractions and number sense	Using complex procedures in comparing fractions
18.	Proportionality: word problem	Solving problems
19.	Algebra: working with variables	Performing routine procedures

20.	Fractions and number sense	Performing routine procedures in rounding decimals
21.	Algebra: solutions of linear equation	Performing routine procedures
22.	Geometry: properties of a square	Solving problems
23.	Algebra: fundamental operations with variables	Knowing
24.	Algebra: properties of variables	Knowing
25.	Algebra: word problem	Using complex procedures
26.	Measurement: measuring time	Performing routine procedures
27.	Algebra: fundamental properties of real numbers	Knowing
28.	Geometry: similarity of triangles	Uses properties of similar triangles to find the length of a corresponding side
29.	Fractions and number sense: real life application on estimation	In a word problem, uses rounding to identify the number sentence that gives the best estimate for the product
30.	Algebra: word problem	Identifies the linear equation corresponding to a given verbal statement involving a variable

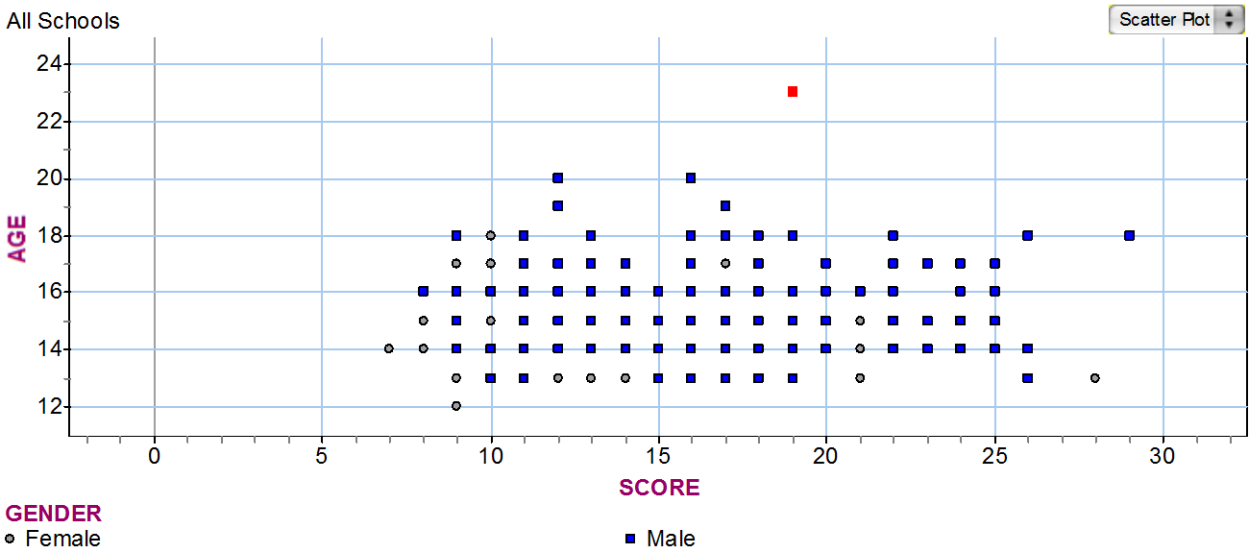
APPENDIX-C

Summary of statistics on responses of teachers

Item	Chi-square (x^2)	df	P
About how often do you have meetings with other teachers in your subject area to discuss and plan gender related teaching approaches?	6.39	3	0.09
Do you think that society appreciates your work?	6.23	1	0.013
Do you think your students appreciate your work?	9.31	1	0.0023
Do you use a textbook in teaching mathematics to your class?	9.31	1	0.0023
How often do you usually assign mathematics homework?	4.77	2	0.09
Record whether or not the homework was completed	4.31	2	0.12
Collect, correct and keep assignments	7.62	3	0.06
Collect, correct assignments, and then return to students	15.38	2	0.0005
Give feedback on homework to whole class	3.77	1	0.052
Have students correct their own assignments in class	10.08	3	0.018
Have students exchange assignments and correct them in class	4.77	2	0.09
Use it as a basis for class discussion	3.92	3	0.27
Use it to contribute towards students' grades or marks	4.31	2	0.12

APPENDIX-D

Scatter plot of students (score versus age)



APPENDIX-E

PSLE statistics of students

School	2001E.C									2002E.C								
	Examined			Promoted			Sample			Examined			Promoted			Sample		
	M	F	**T**	M	F	**T**	M	F	**T**	M	F	**T**	M	F	**T**	M	F	**T**
Aman	291	203	494	150	107	257	107	107	**214**	335	231	566	85	53	138	53	53	**106**
Bachuma	66	51	117	25	23	48	23	23	**46**	88	67	155	25	21	46	21	21	**42**
Debre - Work	132	38	170	61	15	76	15	15	**30**	152	64	216	35	15	50	15	15	**30**
Edget-Behbret	150	113	263	58	30	88	30	30	**60**	151	112	263	24	10	34	10	10	**20**
Genja	199	68	267	64	13	77	13	13	**26**	191	71	261	38	6	44	6	6	**12**
Maz	73	11	84	9	2	11	2	2	**4**	93	28	121	2	2	4	2	2	**4**
Otuwa	72	49	121	20	5	25	5	5	**10**	75	66	141	45	49	94	45	45	**90**
Shai - Bench	74	91	165	42	54	96	42	42	**84**	158	159	317	18	8	26	8	8	**16**
Sheko	104	90	194	26	19	45	19	19	**38**	139	121	260	18	12	30	12	12	**24**
Temenjayax	149	44	193	74	24	98	24	24	**48**	125	57	182	44	16	60	16	16	**32**
Total	**1310**	**758**	**2068**	**529**	**292**	**821**	**280**	**280**	**560**	**1507**	**976**	**2482**	**334**	**192**	**526**	**188**	**188**	**376**

Source: BMZED Teaching and Learning Assessment Core process: (2003)

APPENDIX-F

Fathom: the software used

Fathom is newly developed dynamic data software which exists in a package that fits together and could easily be used in the study for data analysis as compared to other statistical software. As explained by Binker et al (2005) a Fathom document lives in a window and contains objects. There are several different kinds of objects, led by the *collection* (which holds the data). The collection looks like a rectangle with gold balls in it or, if you make it small, a box of gold balls. Graphs, tables, and statistical tests are objects, too. But they do not contain data. They simply provide ways of looking at or altering data. (Deleting a graph or table leaves your data intact; deleting the collection *deletes your data.*) Sliders are objects that control variable parameters, such as the coefficient of a function or a probability in a simulation. Text resides in objects, too. Text objects allow you to add explanatory notes (Binker et al., 2005:9-10).

The application of Fathom in research analysis will help the researcher get better at figuring things out. Fathom presents a simple interface to the beginning user: it consists of ten *objects* on a *shelf* and seven menus. You can get started quickly and go far just by dragging *attributes* from a case table to a graph. But beneath this simple surface lies enormous possibility for embellishing graphs with lines and *functions*, building probability *simulations*, doing statistical *inference* via re-sampling techniques, constructing parameterized mathematical *models*, and much more. As your interests in and capabilities with data analysis and mathematics grow, Fathom will keep pace with you, allowing you to tap into undiscovered features and ways of accomplishing things. In Fathom***,*** *Data* are stored in a ***collection***. A collection contains ***cases***. Cases have ***attributes***. Attributes have ***values***, usually different values for each case. Attributes can also have ***units*** or ***category sets***. By way of example, suppose you have conducted a survey. The results of your survey are stored in a collection. Each case in the collection represents one person who filled out the survey. The cases have attributes corresponding to the questions on the survey: sex, height, age, favorite color, and so forth. Attributes describe the cases in a collection. Database mavens often call attributes fields; many statisticians call them variables. (Fathom chooses “attribute” over “variable” to avoid confusion with the mathematical meaning of variable.) (KCP, 2005: 328-330).

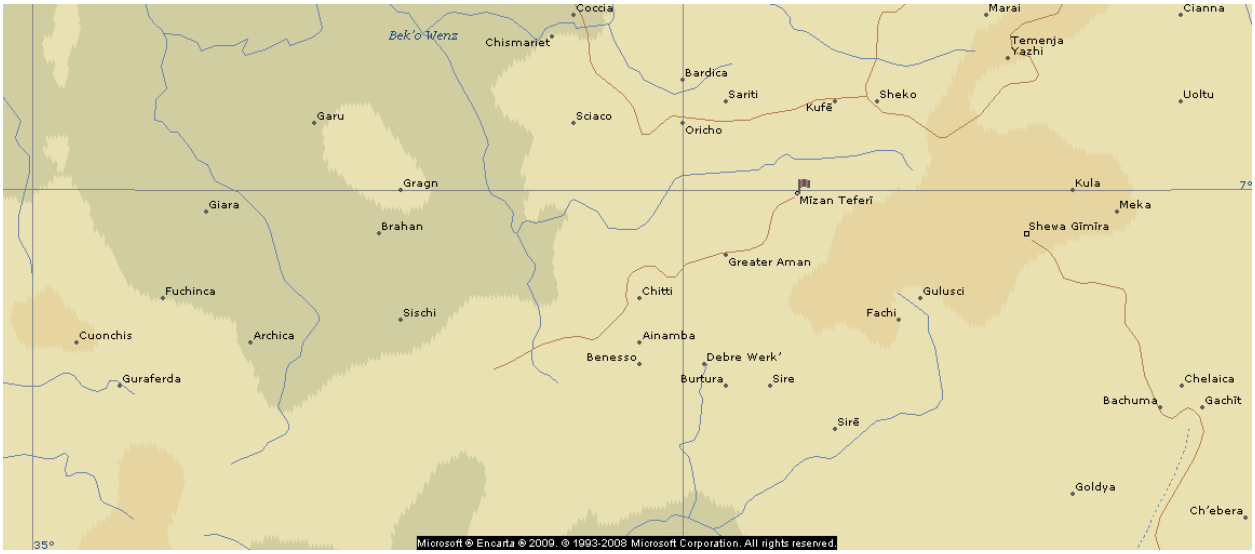
APPENDIX-G

TIMSS

The Trends in International Mathematics and Science Study (TIMSS) is an international comparative assessment about mathematics and science education that is organized by the International Association for the Evaluation of Educational Achievement (IEA). The survey has been administered periodically in cycles of 4 years since 1995. Initially TIMSS was an acronym for the Third International Mathematics and Science Study, which identified its position as the third study following the First and Second International Mathematics and Science Studies (FIMS & SIMS) in 1964 and 1982 respectively. A similar study to the 1995 TIMSS (using the same technical framework) was carried out in 1999, and was referred to as the Third International Mathematics and Science Study Repeat (TIMSS-R). The 2003 study was the third cycle of studies based on the 1995 assessment framework, and the acronym TIMSS was redefined to mean Trends in International Mathematics and Science Study. With funding from the U.S. National Science Foundation, the TIMSS assessment was to be offered more timely in intervals of four years (Chepete, 2008:5).

In addition to the above idea as Martin and her colleagues said, TIMSS has assessed mathematics and science in 1995, 1999, 2003, and 2007 with planning underway for 2011. In addition to monitoring trends in achievement at the fourth and eighth grades, TIMSS provides information about relative progress across grades as the cohort of students assessed at the fourth grade in one cycle moves to the eighth grade four years later (i.e., the fourth grade students of 2003 became the eighth grade students of 2007). Also, to provide comparative perspectives on trends in achievement in the context of different educational systems, school organizational approaches, and instructional practices, TIMSS collects a rich array of background information (Martin M. et al, 2008: 14).

Map of study area



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