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Full Length Research Paper

Grade Eleven Students' Beliefs in Mathematics Education Related to Achiever Level in West Arsi Zone, Ethiopia

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Abstract

In school mathematics, students' mathematics achievement is influenced by students' beliefs in mathematics education. Thus, studying students' beliefs in mathematics education related to achiever level is essential in educational research. So, the objective of this research was to investigate students' beliefs in mathematics education related to achiever level. To achieve this objective, quantitative research using a survey design was eployed. The data were collected from four schools in West Arsi Zone using multistage sampling. The quantitative data obtained were analyzed using mean, correlation, regression, one-way ANOVA, and Post Hoc tests using Games-Howell. Consequently, this study displayed that overall there was statistically significant students' beliefs in mathematics education difference according to achiever level ($F(2, 542) = 206.99$, $p < .05$). Also, there was statistically significant belief difference in mathematics education between high achiever and middle achiever, high achiever and low achiever, and middle achiever and low achiever students' ($p < .05$). To reduce this difference it is important middle and low achiever students to believe that hard working makes a difference in once success and to work accordingly using their time properly.

Key words: Achiever level, Belief, Mathematics Education

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Introduction

Students' beliefs in mathematics education are behind every students' mathematics activities, and important in understanding the reasons why students select some mathematical activities and avoid others, why they succeed in some academic pursuits and fail at mathematics, or why they are filled with either eagerness or fear at the thought of doing this or that task (Goldin, *et al*., 2009). In line with this Wigfield and Cambria (2010) also indicated thatstudents' beliefs in mathematics education predict their achievement outcomes, including their intentions, performance, persistence, and choices of which activities to do. As a result, many studies conducted on the the relationships between mathematics beliefs and achievement at elementary, secondary and tertiary educational level (Randel, *et al*., 2000; House, 2006; Suthar and Tarmizi, 2010; Belachew, 2015). For instance, House (2006) conducted a comparative study on mathematics beliefs and achievement of elementary school students in Japan and United States to examine the relationships between mathematics beliefs and achievement of elementary school-aged students. From this study, he found that several mathematics belief variables were significantly related to mathematics achievement test scores for students in both Japan and United States. For example, students who attributed success in mathematics at school to hard work studying at home were more likely to have earned higher mathematics test scores than those students who did not indicate that belief.

Research was also conducted on attitudes, beliefs, and mathematics achievement of German and Japanese high school students (Randel, *et al*., 2000). The drive that provoked the researchers for this study was the unexpected low scores of German students obtained from the Third International Mathematics and Science Study (TIMSS). As a consequence, the researchers motivated and conducted the comparative study on attitudes, beliefs, and mathematics achievement of German and Japanese high school students. Accordingly, the researchers found that compared to the Japanese students, the German students were more likely to agree with the statement that natural ability is more important than effort, and test scores depend on one's natural ability. Also, the most frequent choice of the German students was having a good teacher; whereas for the Japanese students it was studying. One factor suggested by the researchers for this belief difference between German and Japan students was due to the difference in cultural context. Within the Japanese cultural context, students benefited from high standards, hard work, and cultural values of education. Japanese students, from the time they enter school, are made aware of the emphasis placed by society, and by their parents and teachers, on the importance of academic success. As a result, they seemingly face little conflict in devoting their time and effort to academic activities. In contrast, German students like their American counterparts are conflicted about the role of school in their lifes.

Moreover, Oundo (2013), which conducted a study in Kenya in response to persistent low mathematics achievement at Kenya, found that secondary school students held tenaciously the belief that mathematics was difficult and that they had low ability in the subject. Furthermore, Kislenko (2009) studied students' beliefs about mathematics in Estonian. The findings revealed that the students believe mathematics is important, but studying it tends to be difficult and boring. Likewise, Ignacio, *et al*. (2006) investigated the affective domain in mathematics of high schools students in Badajoz using a questionnaire on beliefs and attitudes about mathematics. Results indicate that many of them, even some of the most able, find mathematics to be just a tiresome chore. They considered mathematics as a sort of "millstone" that they have to get rid of soon as they can by choosing the options offered them in higher institution that involve little or no mathematics.

In Ethiopia, mathematics is a prerequisite for admission into university and college areas of study. It is also used as a language for science and technology (MoE, 1994). However, despite its utility and importance many students considered mathematics as a difficult subject. For instance, Jale (2009), from his practical experience as a mathematics educator in Ethiopia, indicated that most secondary school students consider mathematics as one of the most difficult subjects. Moreover, in many areas of Ethiopia students believe that science and mathematics education requires special natural talents that are not normally acquired through learning (Asfaw, *et al*., 2009). Such beliefs hinder students' perseverance, hardworking, and effort. Because, if students believe that they were not born with the intellectual capacity to learn, there is little reason for them to try (Nicholls, 1984). They are also more likely to avoid putting much effort into a task so that they can offer a plausible alternative to low ability or lack of knowledge (Covington, *et al*., 1980). Then through time students gradually generate negative beliefs about mathematics in the course of their academic life, and on occasions present a real dislike to mathematics. Also, they have to get rid of soon as they can by choosing the options offered to them in preparatory education and in the subsequent university courses that involve little or no mathematics. This makes difficult to fulfill the objectives of the Ethiopian Education and Training Policy that:

> The development of the physical and mental potential and the problem-solving capacity of learners; bringing up citizens who…. appreciate aesthetics and show a positive attitude towards the development and dissemination of science and technology in society; … (MoE, 1994).

Thus, to change such conditions so that students to choose, to study mathematics and to improve their mathematics achievement in preparatory education and in the subsequent university course it is important to work on their beliefs.

Statement of the Problem

The government of Ethiopia has designed a strategy through which 70% of the university enrollment would be in science and technology (MoE, 2008). This in turn needs students who have strong mathematics knowledge and a good mathematics achievement in secondary schools. However, Ethiopian secondary students' performance in mathematics is very low (Asfaw, *et al*., 2009; Atnafu, 2010; NAE, 2010). For instance, the first national learning assessments have been conducted in Ethiopia in 2010 on grades ten and twelve to provide information about learning attainments by students and the factors that determine those attainments in the nation in English, mathematics, biology, chemistry and physics results across subgroups: gender, region and selected home background variables (NAE, 2010). Accordingly, in grade ten the mean score for each subject and the average score of the five subjects were all below the minimum expected score (50%). In particular, the mean score for mathematics was 34.7%. Regarding grade twelve, the findings showed that the average score of the five subjects were below the minimum expected score. The mean score for mathematics was 54.3%. One of the reasons indicated on the research for this low mathematics performance of students in both grade ten and grade twelve is associated with the beliefs of students' that they have in mathematics (NAE, 2010). Hence, from experiences of America, German (Randel, *et al*., 2000; House, 2006), which conducted research on beliefs of students in response to students' low mathematics achievement, the low Ethiopian students' mathematics achievement demanded studying students' beliefs in mathematics education. Therefore, this study was conducted to investigate students' beliefs in mathematics education related to achiever level.

Research Questions

From aforementioned general objective, the following four major research questions were posed to be addressed:

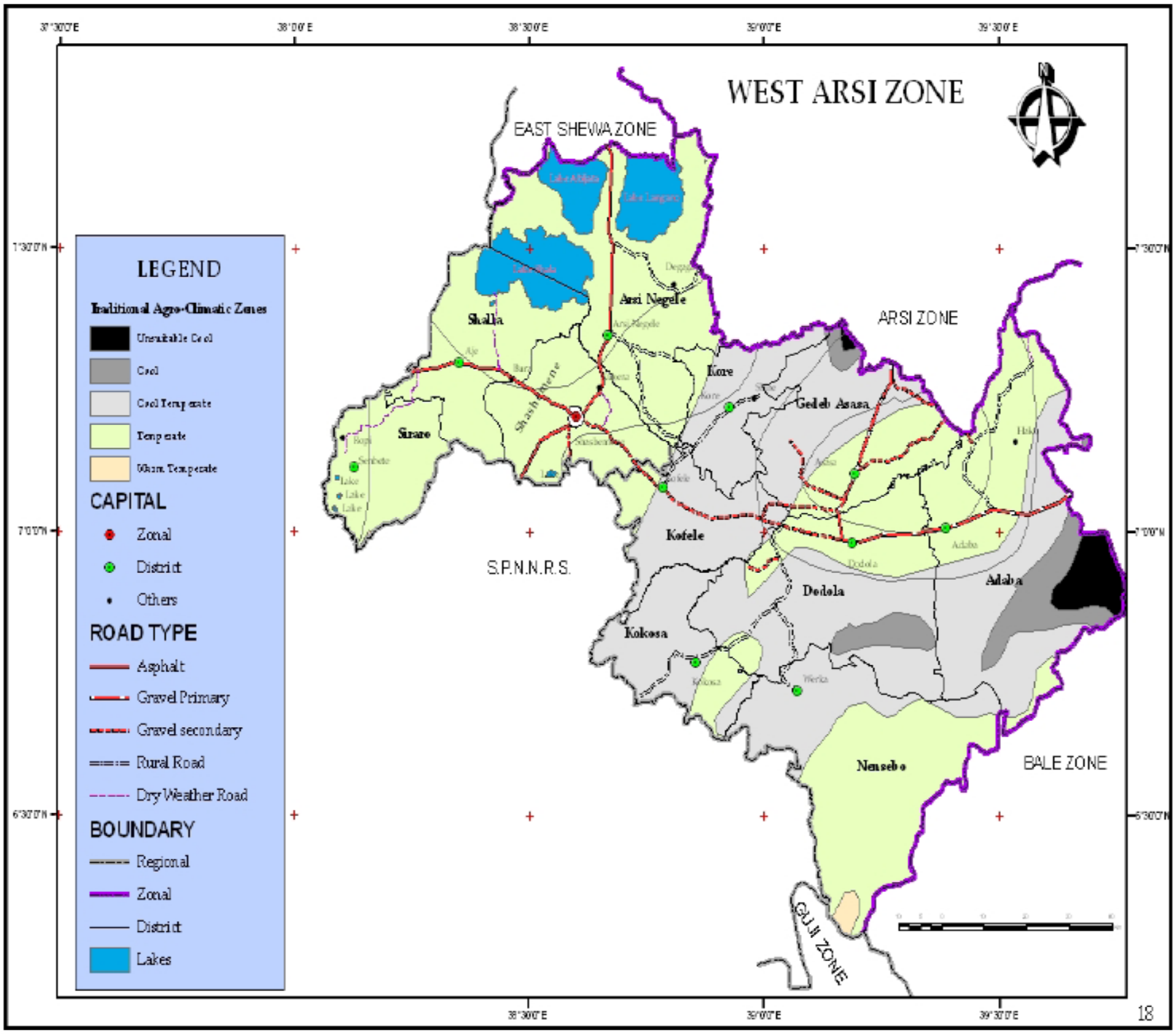
1. Is there a significant difference among students' beliefs in mathematics education according to achiever level?
2. Is there statistically significant difference between high achiever and middle achiever, high achiever and low achiever, and middle achiever and low achiever students' beliefs in mathematics education?
3. Is there a significant difference among high achiever, middle achiever and low achiever students' beliefs related to mathematics learning and problem solving, self in mathematics education, and context's support in mathematics education?
4. Is there statistically significant difference between high achiever and middle achiever, high achiever and low achiever, and middle achiever and low achiever students' beliefs related mathematics learning and problem solving, self in mathematics education, and context's support in mathematics education?

Research Design

In this research quantitative approach using a survey design for obtaining descriptive statistics was employed (Creswell, 2014).

Description of the Study

This study was conducted in West-Arsi zone in Oromia Region. The capital town of West Arsi Zone is Shashamane, which is approximately at a distance of 250km from Finfine. The zone was established in 2006 from previously existing districts administered under Estern-Shewa, Arsi, and Bale zone. According to Feyissa (2009), it was established in order to solve long-existed socio-economic and political problems in the society in the past. The long distance of the edges of the previous districts from the previous districts capital has increased vulnerability of the societies to challenges of injustice, extra-costs, information delays, highway robbery, conflicts among ethnic groups, and problem of unemployment (Feyissa, 2009). The zone is located in the Rift Valley Region, and has land area of about 12556km^2. It shares boundary line with East Shewa zone to the north, SPNNRS to the west and south, Arsi to the northeast, Guji to the south east and Bale zone to the east. According to 2013/14 data obtained from the Zone Education Office, West-Arsi Zone has ten preparatory schools. These are Adaba, Dodola, Kokosa, Nensabo, Gedeb Hasasa, Kofele, Shashemene, Kuyera, ArsiNegele, and Ajje preparatory school.



Source: O/F/&E/D/O statistical abstracts

Population and Sampling

All grade eleven students from government schools of West Arsi Zone were constitute the population of the study. Regarding sampling for data collection using mathematics belief scale, first cluster sampling was applied to address the preparatory schools in the three geographic sites. The cluster sampling was followed by simple random sampling to decide the preparatory schools from each cluster. Accordingly, Dodola preparatory school was selected from Adaba, Dodola, Kokosa and Nensebo preparataory schools of southern cluster; Gedeb Hasasa preparatory school was selected from Kofele and Gedeb Hasasa preparataory schools of central cluster; and two preparatory schools: Shashemene and Arsi Negele were selected from Shasheme, Kuyera, Arsi Negela and Ajje preparataory schools of northern cluster by lottery method. There were 2046 (1247males and 799 females; 1233 natural science and 813 social science) students in the four sampled preparatory schools when the sample was taken. Following the selection of the four sampled preparatory schools, it was made clear that the students were assigned randomly without any discrimination in each section through discussion with school directors, home room teachers and mathematics teachers. Hence, sections were selected using lottery method to collect data using mathematics belief scale. The researcher then considered all students in the selected sections for data collection.The respondents of the study were 600 students in which all are the members of the above selected schools and selected sections. However, from 600 respondents the participants who have completed the data for all items in the mathematics belief scale were 545 (325 males and 220 females). Thus, the responses of 545 respondents were used for the main data analysis. The responses of 55 respondents (41 males and 14 females) were dropped due to inconsistency and incomplete responses.

Instruments of Data Collection

In order to address the research questions of this study mathematics s belief scale was used. The mathematics belief scale used in the pilot study has nineteen belief components. The nineteen belief components in mathematics belief scale were from the five belief categories: students' beliefs about mathematics, students' beliefs about mathematics learning and problem solving, students' beliefs about mathematics teaching, students' beliefs about self in mathematics education, and students' beliefs about context support in mathematics education. The first belief category students' beliefs about mathematics represented by one belief component, that is, students' beliefs about nature of mathematics, which contain ten items. The second belief category students' beliefs about mathematics learning and problem solving represented by two belief components: students' beliefs about mathematics learning and students' beliefs about mathematics problem solving, each contain eight belief items. The third belief category students' beliefs about mathematics teaching represented by one belief component, that is, students' beliefs about mathematics teaching, which contain eightitems.The fourth belief category students' beliefs about self in mathematics education represented by four belief components: students' self-efficacy beliefs about mathematics education, students' control beliefs about mathematics education, students' goal orientation beliefs about mathematics education,and students' task value beliefs about mathematics education, each contain eight items.

Likewise, the fifth belief category students' beliefs about context's support in mathematics education represented by eleven belief components: students' beliefs about mathematics as a male domain, students' beliefs about mothers' support in mathematics education, students' beliefs about fathers' support in mathematics education, students' beliefs about siblings' support in mathematics education, students' beliefs about relatives' support in mathematics education, students' beliefs about mathematics teachers' support in mathematics education, students' beliefs about peers support in mathematics education, students' beliefs about non mathematics teachers support in mathematics education, students' beliefs about education system's support in mathematics education, students' beliefs about mathematics text's support in mathematics education, and students' beliefs about school's support in mathematics education. Each of the above belief components except students' beliefs about mathematics text's support in mathematics education, and students' beliefs about school's support in mathematics education contain eight items; whereas, the belief components: students' beliefs about mathematics text's support in mathematics education, and students' beliefs about school's support in mathematics education each contain six belief items.

Consequently, the mathematics belief scale used in the pilot study has 150 items covering the nineteen belief components, in which 75 of the items are positive and 75 of the items are negative. In the scale the respondents were asked to complete on a five point Likert Scale: "Strongly agree", "Agree", "Undecided", "Disagree", and "Strongly Disagree". The response for each item was rated 1-5 so that for positive item strongly agree, agree undecided, disagreeand strongly disagree worth 5, 4, 3, 2, and 1 respectively; while for negative item the rating was reversed.

Validity and Reliability of Mathematics Belief Scale of the Pilot Study

In this research, the mathematics belief scale was repeatedly checked by colleagues and then by experts to maintain both the content and the face validity. Also, pilot-test was conducted on 40 (19 males, 21 females; 21 natural science, 19 social science) grade 11 students of Didea Preparatory

School in East Arsi Zone, Oromia, which was selected by simple random sampling. From 40 respondents the participants who have completed the data for all items in the mathematics belief scale were 34 (15 males and 19 females). The remaining 6 respondents' responses (4 males and 2 females) were dropped due to incomplete responses. Thus, the responses of 34 respondents of the pilol study were used for discussing the reliability statistics and the normality of the mathematics belief scale, and also the contribution of each belief components on students' beliefs in mathematics education. Accordingly, the reliability statistics (Cronbach's Alpha) for both belief components and students' beliefs in mathematics education are greater than 0.7, w hich indicated that the mathematics belief scale was internally reliable.

For this research the skewness statistics for mathematics belief scaleand students' beliefs in mathematics education are between -1 and 1. Accordingly, the data distribution is normal (Leech, *et al*., 2005). In addition, for this pilot study there were 34 correctly responded observations, so greater than the numbers of the predicators (belief components). Indeed, the dependent variable, that is, students' beliefs in mathematics education is a scale level variable, which is normally distributed in the data. Moreover, the remaining assumptions of multiple regressions were satisfied testing them with the help of SPSS 20. Furthermore, in the pilot study the correlations between students' beliefs about mathematics teaching and students' beliefs about relatives' support in mathematics education was r(34)= .88. Thus, based on the rule of thumb one of these belief components should be dropped; in this case, students' beliefs about mathematics teaching discarded from the regression analysis due to multicollinearity (Garson, 2012). Hence, regression analysis was applied with eighteen belief components of the pilot data to determine the contribution of each of the belief components to students' beliefs in mathematics education. This was summarized in Table 1.

Table 1: Contribution of Each Belief Components to Students' Beliefs in MathematicsEducation for the Pilot Study

Belief Components	**Contribution (%)**
Students' beliefs about nature of mathematics	2.41
Students' beliefs about mathematics learning	4.01
Students' beliefs about mathematics problem solving	7.80
Students' self-efficacy beliefs	9.47
Students' control beliefs	7.79
Students' goal orientation beliefs	4.45
Students' task value beliefs	5.47
Students' beliefs about mathematics as a male domain	2.48
Students' beliefs about mothers' support	6.87
Students' beliefs about fathers' support	8.73
Students' beliefs about siblings' support	7.44
Students' beliefs about relatives' support	2.27
Students' beliefs about mathematics teachers' support	8.38
Students' beliefs about peers' support	7.07
Students' beliefs about non mathematics teachers' support	2.92
Students' beliefs about education system's support	2.75
Students' beliefs about mathematics text's support	3.98
Students' beliefs about school's support	5.55
Total	99.84

According to Table 1, the belief components with less than 3% contribution to students' beliefs in mathematics education include:students' beliefs about relatives' support in mathematics education (2.27%), students' beliefs about nature of mathematics(2.41%), students' beliefs about mathematics as a male domain (2.48%), students' beliefs about education system's support (2.75%), and students' beliefs about non mathematics teachers' support (2.92%). Furthermore, as indicated in the informal discussion on the pilot items with respondents of the pilot study, the participants indicated that they were not familiar with items of students' beliefs about the nature of mathematics which addresses students' beliefs about: source of mathematics knowledge, composition mathematics, structure of mathematics, and status of mathematics. Also, related to students' beliefs about relatives support in mathematics education,respondents underlined that relatives'contribution for students' to learn mathematics and on theirresultsare not influencial.Therefore, students' beliefs about relatives' support in mathematics education and students' beliefs about the nature of mathematics also discarded from the mathematic belief scale. Accordingly, sixteen belief components, which have 124 items, were used in the mathematics belief scale for the main data collection.Indeed, these sixteen belief components are from the three belief categories: students' beliefs about mathematics learning and problem solving, students' beliefs about self in mathematics education, and students' beliefs about context support in mathematics education. Table 2 displayed that the reliability statistics (Cronbach's Alpha) for both belief components and students' beliefs in mathematics education were closer to one, which indicated that the mathematics belief scale used for the main data collection was more internally reliable.Also, the skewness values (statistics) of all the belief scale items of the main study are between -1 and 1. Accordingly, the data distribution is normal (Leech, *et al.*, 2005).

Table2: Reliability of the Mathematics Belief Scale used in the MainStudy

Variables	No of Items	Reliability Statistics (Cronbach's Alpha)	No of Resp-ondents
Students' beliefs about mathematics learning	8	.951	545
Students' beliefs about mathematics problem solving	8	.955	545
Students' self-efficacy beliefs	8	.970	545
Students' control beliefs	8	.987	545
Students' goal orientation beliefs	8	.954	545
Students' task value beliefs	8	.968	545
Students' beliefs about mathematics as male domain	8	.963	545
Students' beliefs about mothers' support	8	.935	545
Students' beliefs about fathers' support	8	.961	545
Students' beliefs about siblings support	8	.969	545
Students' beliefs about mathematics teachers' support	8	.959	545
Students' beliefs about peers' support	8	.946	545
Students' beliefs about non mathematics teachers' support	8	.986	545
Students' beliefs about education system's support	8	.988	545
Students' beliefs about mathematics text's support	6	.989	545
Students' beliefs about school's support	6	.970	545
Students' beliefs in mathematics education (Mathematics Belief Scale)	124	.984	545

Method of Data Analysis

In accordance with the objective of the study and the research questions, mean, correlation, regression, one-way ANOVA, and Post Hoc tests for multiple comparisons of achiever level'sbeliefs in mathematics education using Games-Howell were employed in the study using statistical package for social science (SPSS) version 20.

Results and Discussions

Students' Beliefs in related to Achiever Level

First semester 2013/14 mathematics achievement of grade eleven students was collected from the four sampled schools' of mathematics teachers. In each school the teacher used tests, mid-exam, and final exam with assessment value varies from 10% to 20%, 20% to 30%, and 30% to 50% respectively in the four sampled schools to evaluate students. Also, even though there was some variation from school to school, the teachers also used group assignment with assessment value varies from 15% to 20%, class room participation with assessment value varies from 5% to 10%, and checking exercise book with assessment value varies from 5% to 10%. Because of the subject teachers subjectivity in evaluation of the students in group assignment, class room participation, checking exercise book, and also due to the contribution of peers and others on the students' work in one way or the other in the assigned individual tasks and group works, the strength of the latter ways of evaluation system of students in the subject is less as compared to tests, mid-exam and final exam. Thus, only tests, mid-exam and final exam of respondents with value varies from 60% to 80% in the four schools were used as students' first semester mathematics achievement. This was converted into 100% for each school. In addition, though their education status and professional qualification are the same, the subject teachers have different knowledge, skills and experiences in conducting the assessment activities and in constructing the test/the exam items. Thus, it was found that the different assessment activities prepared by the teachers in the four sampled schools have different qualities. Accordingly, students in the four schools with the same first semester mathematics result cannot be categorized at the same achiever level, for instance, two students one from Gedeb Hasasa and the other from Dodola (sampled schools) who scored the same 59 cannot be assigned at the same achiever level. Because of this, prior to classifying respondents into low, middle, and high achiever, their respective mathematics scores out of 100 was standardized (converted to z-score), that is, converted to standard distribution of values about a mean of zero and standard deviation one. As consequence, for instance, the student who scored 59 in Gedeb Hassa assigned as high achiever, where as the student who scored the same score 59 in Dodolaassigned as middle achiever. This z-score transformation is useful to compare the relative standings of students exam results from distributions of the four schools with different means and/or different standard deviations.

Based on the transformed score, the concept of quartiles, the percentage points that break down the ordered data set into quarters, is applied to divide the score of the students into low middle and high achiever. Accordingly, in this research the z-scores below the first quartile, that is, with Z-scores < -0.78, are considered as low achiever, the scores between the first quartile and the third quartile including the first quartile, that is, with Z-scores > or = -0.78 and < 0.31, are considered as middle achiever, and the z-scores above the third quartile including the third quartile, with Z-scores > or = 0.31, are considered as high achiever. Thus, from 600 respondents of this study, 300 (50%) of the students were located in middle achiever level, 150 (25%) of the students were located in the lower achiever level, and 150 (25%) of the students were located in the higher achiever level. Consequently, from 545 respondents, whose responses used for the main data analysis, about 150 (27.5%) of the students were located in the high achiever level, about 262 (48.1%) of the students were located in the middle achiever level, and about 133 (24.4%) of the students were located in the low achiever level.

Hence, the research question of this study related to achiever level of students, that is, is there a significant difference among students' beliefs in mathematics education according to achiever level?, was answered depending upon the basic assumptions of one-way ANOVA. In this case the one-way ANOVA evaluates whether the means values of students' beliefs in mathematics education for the three achiever level that is, high, middle, and low differ significantly. However, before applying the one-way ANOVA assumptions underlying this test required to meet (Leech, *et al.*, 2005). These include the assumption of independence, the assumption of normality, and assumption of homogeneity of variance. For this research the scores of the three achiever level are independent of each other and the dependent variable, which is, students' beliefs in mathematics education and the sixteen belief components are normally distributed within each of the three achiever level, so that the assumptions of independence and normality met. Regarding assumption of homogeneity of variance, the Levene'sF test for equality of variances, which is the most commonly used statistic to test the assumption of homogeneity of variance, was applied setting α = .05. Hence, the one-way ANOVA was conducted for the above research question in this section according to the two assumptions, that are equal variances assumed, and equal variances not assumed, indicated in Levene statistic. Now, to answer the first research question the one-way ANOVA was applied to check whether there is a significant belief difference among the three achiever level. The results appeared in Table 3.

Table 3: One-Way ANOVA for comparing Achiever Level'sBeliefs in Mathematics Education

Belief Variable	**Achiever level**	***N***	***M***	***SD***	***SE***	***F***	***P***
Students' beliefs in mathematics education						206.99	.000*
	High achiever	150	3.70	.43	.03		
	Middle achiever	263	3.00	.58	.04		
	Low achiever	132	2.40	.40	.03		

*$p < .05$ (2-tailed)

When Table 3 given above is analyzed, it can be seen that the mean of students' beliefs in mathematics education showed statistically significant difference ($F(2, 542) = 206.99$, $p < .05$) according to achiever level variable amongst high, middle and low achiever students. This suggested that overall there was statistically significant students' beliefs in mathematics education difference according to achiever level. Indeed, to answer the second research question from the Levene'sF test for equality of variances there was a significant difference among the three groups' variances of achiever levels. Thus, homogeneity of variance was violated. So, the Games-Howell applied for Post Hoc tests (Leech, *et al*., 2005). The results indicated in Table 4.

Table 4: Post Hoc Tests for Multiple Comparisons of Achiever Level'sBeliefs in Mathematics Education using Games-Howell

Belief Variable	**(I) Achiever Level**	**(J) Achiever Level**	**Mean Difference (I-J)**	***SD***	***p***
Students' beliefs in mathematics education	High achiever	Middle achiever	.70	.05	.000*
		Low achiever	1.22	.05	.000*
	Middle achiever	Low achiever	.52	.05	.000*

* $p < .05$ (2-tailed)

Table 4 indicated that there was statistically significant difference between high achiever and middle achiever, high achiever and low achiever, and middle achiever and low achiever students' beliefs in mathematics education ($p < .05$).According to Belachew (2015) the main reason for the significance difference between high achiever and middle achiever, and high achiever and low achiever are problems related to students (e.g., students' perception that mathematics is difficult, dependency on the teacher, and poor time management), inappropriate survices from mathematics teachers (e.g., teachers' partiality, lack of consideration, using exams as punishment stick), insufficient survices from parents, insufficient survices from the school, lack of strong mathematics bases in the previous classes, insufficient survices from the education system of the country.

To examine the belief difference in mathematics education across achiever level in detail, the mathematics belief scale was further analyzed across the three belief categories: students' beliefs about mathematics learning and problem solving, students' beliefs about self in mathematics education, and students' beliefs about contexts support in mathematics education. In doing so following the same principle in testing students' beliefs in mathematics education difference according to achiever level, the one-way ANOVA was also applied to answer the sub-question: is there a significant difference among students' beliefs across the three belief categories according to achiever level? The results appeared in Table 5.

Table 5: One-Way ANOVA for Comparing Belief Categoryaccording to Achiever Level

Belief Category	Achiever level	*N*	*M*	*SD*	*SE*	*F*	*P*
Students' beliefs about						60.35	.000*
mathematics learning	High achiever	150	3.46	.59	.05		
and problem solving	Middle achiever	263	2.99	.70	.04		
	Low achiever	132	2.64	.40	.03		
Students' beliefs						205.44	.000*
about self	High achiever	150	3.97	.61	.05		
	Middle achiever	263	2.92	.85	.05		
	Low achiever	132	2.23	.59	.05		
Students' beliefs						154.83	.000*
about context's	High achiever	150	3.61	.49	.04		
support	Middle achiever	263	3.02	.57	.03		
	Low achiever	132	2.53	.44	.04		

*$p< .05$ (2-tailed)

Table 5 indicated that the mean of students' beliefs about the three belief categories: students' beliefs about mathematics learning and problem solving, students' beliefs about self in mathematics education, and students' beliefs about contexts support in mathematics education showed statistically significant difference ($F(2, 542) = 60.35$, $p< .05$; $F(2, 542) = 205.44$, $p< .05$; $F(2, 542) = 154.83$, $p< .05$) according to achiever level variable amongst high, middle and low achiever students. This suggested that overall there was statistically significant students' beliefs about mathematics learning and problem solving, students' beliefs about self in mathematics education, and students' beliefs about contexts support in mathematics educationdifference according to achiever level variable amongst high, middle and low achiever students. This was due to the statistically significant belief difference observed in components of students' beliefs about mathematics learning and problem solving, students' beliefs about self in mathematics education, and students' beliefs about contexts support in mathematics education. For instance, as indicated in Table 6, the means of both students' beliefs about mathematics learning, and students' beliefs about mathematics problem solving showed statistically significant differences according to achiever level variable amongst high, middle and low achiever students, $F(2, 542)= 12.75$, $F(2, 542)= 192.28$, $p< .05$, respectively.

Table 6: One-Way ANOVA for Comparing Achiever Level's on Components of Students' Beliefs about Mathematics Learning and Problem Solving

Belief Components	Achiever Level	*n*	*M*	*SD*	*SE*	*F*	*P*
Students' beliefs about						12.75	.000*
mathematics	High achiever	150	3.02	1.13	.09		
learning	Middle achiever	263	3.31	.86	.05		
	Low achiever	132	3.56	.68	.06		
Students' beliefs about						192.28	.000*
mathematics	High achiever	150	3.91	.87	.07		
problem solving	Middle achiever	263	2.68	1.04	.06		
	Low achiever	132	1.80	.65	.05		

* $p < .05$ (2-tailed)

In addition, from the Levene'sF test for equality of variances, there was a significant difference among the three groups' variances of achiever level of the three belief categories. Thus, homogeneity of variance was violated. Accordingly, the Games-Howell applied for Post Hoc tests (Leech, *et al*., 2005). The result was displayed in Table 7

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Table 7: Post Hoc Tests for Multiple Comparisons of Achiever Level'sBeliefs about Belief Category using Games-Howell

Belief Category	(I) Achiever Level	(J) Achiever Level	Mean Difference (I-J)	*SE*	*p*
Students' beliefs about mathematics learning and problem solving	High achiever	Middle achiever	.47	.06	.000*
		Low achiever	.78	.06	.000*
	Middle achiever	Low achiever	.31	.06	.000*
Students' beliefs about self	High achiever	Middle achiever	1.05	.07	.000*
		Low achiever	1.74	.07	.000*
	Middle achiever	Low achiever	.68	.07	.000*
Students' beliefs about context's support	High achiever	Middle achiever	.60	.05	.000*
		Low achiever	1.09	.06	.000*
	Middle achiever	Low achiever	.49	.05	.000*

* $p < .05$ (2-tailed)

When Table 7 is analyzed, it can be seen that there was statistically significant difference between high achiever and middle achiever, high achiever and low achiever, and middle achiever and low achiever students' beliefs about: mathematics learning and problem solving ($p < .05$), self in mathematics education ($p < .05$), and context's support in mathematics education ($p < .05$). This was also due to the statistically significant belief difference observed in components of students' beliefs about mathematics learning and problem solving, self in mathematics education and context's support in mathematics education, which in turn was due to the belief difference revealed in the items contained in students' beliefs related to mathematics learning and problem solving, self in mathematics education, and context's support in mathematics education.

Conclusion and Recommendations

The purpose of this study was to investigate grade eleven students' beliefs in mathematics education related to achiever level. Specifically, the study was to analyze whether there is a significant students' belief difference in mathematics education amonghigh, middle, and low achiever students; and to describe whether there are significant students' belief difference in mathematics education between high achiever and middle achiever, high achiever and low achiever, middle achiever and low achiever. Also, to analyze whether there is a significant students' belief difference about mathematics learning and problem solving, self in mathematics education, and context's support in mathematics education; and to describe whether there are significant students' belief difference about mathematics learning and problem solving, self in mathematics education, and context's support in mathematics education between high achiever and middle achiever, high achiever and low achiever, middle achiever and low achiever.

Therefore, from the result and discussion this study displayed that overall there was statistically significant students' beliefs in mathematics education difference according to achiever level. There was also statistically significant belief difference in mathematics education between high achiever and middle achiever, high achiever and low achiever, and middle achiever and low achiever students' ($p < .05$). The main reason for the significance difference between high achiever and middle achiever, and high achiever and low achiever are problems related to students (e.g., students' perception that mathematics is difficult, dependency on the teacher, and poor time management), in appropriate services from mathematics teachers (e.g., teachers' partiality, lack of consideration, using exams as punishment stick), insufficient survices from parents, insufficient services from the school, lack of strong mathematics bases in the previous classes, insufficient services from the education system of the country. In addition, overall there was statistically significant belief difference among achiever level's according to the three belief categories: students' beliefs about mathematics learning and problem solving, students' beliefs about self in mathematics education, and students' beliefs about contexts support in mathematics education ($p <$

.05). Moreover, there was statistically significant belief difference about mathematics learning and problem solving, self in mathematics education, and contexts support in mathematics education between high achiever and middle achiever, high achiever and low achiever, and middle achiever and low achiever students' (*p*< .05). This was due to the belief difference observed in components of mathematics learning and problem solving, self in mathematics education, and contexts support in mathematics education.

In order to narrow the significance belief difference amonghigh, middle and lowachiever students and to improve the beliefs of middle and low achiever students the following recommendations were proposed.

1) It is important middle and low achiever students to take the first initiatives to improve their beliefs in mathematics education in general and their beliefs about: mathematics learning and problem solving, self in mathematics education, and context's support in mathematics education in particular. It is also good both middle and low achiever students to believe that they have the potential to be successful in mathematics.
2) It is good middle and low achiever students to believe that effort and hard working makes a difference in once success; and to do accordingly using the time wisely starting from the begging before concepts are piled up.
3) It is also important parents to culturally value education and to make aware students the emphasis placed by the society and by them on the importance of academic success in education in general and in mathematics in particular from the time they enter school. It is also important parents to help their children not to face conflict in devoting their time and effort to academic activities in general and in mathematics activities in particular.
4) It is important the school to treat high, middle and low achiever students equally, to facilitate mathematics tutorial programs for low and middle achiever students and to organize contest to awake low and middle achiever students and to draw them toward competition, and to facilitate rewards for them.
5) It is also good to strength mathematics club within the school to inspire and to encourage middle and low achiever students to actively participatein mathematics learning and problem solvingusing different mechanisms suchas awareness creation and experience sharing programs related to mathematics inviting high achiever students, mathematics teachers, and others both from the school and outside the school community on how to be successful in mathematics.
6) What is important as mathematics teacher is to be free from the spirit of partiality, so that to treat equally high, middle and low achiever students. Even, it is very important teachers to avoid symptoms of teachers caused variation among students as much as possible. For instance, it is good mathematics teachers to call the low and the middle achiever students by their names as they do for the high achiever students.
7) Both low and middle achieverstudents to come to learn mathematics in the high school with courage, building students' mathematics knowledge basis at the lower level is very crucial. Thus, to realize this and to see a living mathematics in low and middle achiever students' heart when they come to high school and in the subsequent higher institution strong collaboration is very important among the concerned bodies, such as families, schools, teachers and education professionals.

Conflict of Interests

The author has not declared any conflict of interests.

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