Eighth Grade Students' Attitude Toward Algebra in Maldivian Schools

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Abstract

Students' attitude towards algebra is important in deciding the factors that influence students' achievement in algebra as well as mathematics learning. This is a quantitative study which has explored the algebra attitudes of eighth grade students. The study population included students from two main schools in Male' who were selected using stratified random sampling. One component of the Fennema Sherman Mathematics Attitudes Scale and three components of the Attitude Towards Mathematics Inventory (ATMI) by Tapia and Marsh were used to survey the algebra attitudes of 39 boys and 45 girls in grades eight. The results show that the learners have a neutral attitude for the components of the attitude towards algebra as well as for the total attitude and that there is no gender difference in their attitude.

1. Introduction

This study explores the attitude of eighth grade students towards algebra. The teaching of algebra and students' attitude towards algebra is a major issue in Maldivian schools. It is a great concern among school teachers and among teacher educators that children have low or negative attitudes towards algebra. Teachers of Majeediyya School, one of the oldest schools in the Maldives, have indicated low performance in algebra by their students and its impact on overall mathematics achievement (Personal Communication, 14th June 2012). According to the Statistics of Majeediyya School (2012), students of grade eight exhibit very low performance in algebra. The statistics show that only 94 students out of 212 students who did the algebra test in 2012 passed. This means that more than half of the students of grade eight failed algebra in Majeediyya School.

The problems that teachers identified regarding low performance include the lack of students' basic algebra skills and thinking when they come to grade eight. Moreover, teachers have stated that many students seem to have negative feelings towards the topics in algebra and this leads to a major issue in students' attitudes towards the subject. Teachers have noted that students, especially the low achievers, do not like algebra topics and that they are very demotivated in learning algebra. Moreover, my own observation as a teacher has also shown students' negative attitudes towards algebra topics and the effects of this on students' overall mathematics achievement. If the students have a negative attitude towards algebra, their performance may be lower in that topic. If the performance is lower in algebra topics, it affects overall mathematical achievement since most of the topics in mathematics require algebraic thinking. The literature has also highlighted the importance of attitude in academic achievement and the importance of attitudinal variables in promoting learning (Miller & David, 2004; Singh, Granville & Dika, 2002).

Evidently, there is a problem of low or negative attitude towards algebra by the students. Since algebra has been identified as one of the most influential topics in mathematic assessments (35- 40%) and a large numbers of students have expressed negative attitudes to algebra, the topics of algebra have to be researched with respect to this issue. Thus, it is important to understand student attitudes toward algebra and their impact on performance in mathematics. Subsequently, teachers can use this as a basis for developing their instruction in algebra. This study uses the four dimensions of algebra attitude, namely: students' confidence in algebra, students' value of algebra, students' enjoyment of algebra learning, and the teacher expectations of students' ability in learning algebra.

1.1 Purpose and objective

The purpose of the study is to identify eighth grade students' attitudes towards algebra. The literature has identified various affective variables towards learning algebra. This study will use these variables in studying students' attitude towards algebra. The objective of the study is as stated below.

> *To find the attitudes of eighth grade students with respect to confidence in algebra, value of algebra, enjoyment of algebra learning, and the teacher expectations of students' ability in learning algebra.*

1.2 Education in the Maldives

Throughout its history Maldivians have placed great importance on educating their children. It has a long history of education. The traditional system provided learning homes called 'edhuruge', where students learned Dhivehi language, Arabic script and Holy Quran. The first government school was established in 1927 in the capital Male', which provided education for boys only. However, in 1944, a section for young women and girls was opened in this traditional government school. The education that was provided in this school covered Dhivehi language, Islam, Arabic and basic Arithmetic. By 1945, all the inhabited islands of the Maldives had a traditional school which provided education to its dispersed community with instruction limited to Dhivehi language, Islam, Arabic and Arithmetic (EFA Mid-Decade Assessment, 2008). However, with the governments' policy to provide primary education to all throughout the country, rapid development in the education system of the was seen. In Maldivian primary education, students start their schooling at the age of 6 years and they enrol for 7 years in the school, from grade 1 to grade 7. The curriculum in this primary education comprised environmental studies, science, Dhivehi language, mathematics, English language, fine arts, and physical education (EFA Mid-Decade Assessment, 2008). The provision of secondary education and higher secondary education in the country had also developed rapidly. Lower secondary education consists of grades 8, 9 and 10, and higher education consists of grade 11 and 12. Currently, almost all the islands have education up to the lower secondary level and many islands have higher secondary education as well.

From 2002, almost all the secondary schools have been offering the IGCSE and GCE O/L syllabuses of the Cambridge International Examinations, and students are expected to sit for the International General Certificate of Secondary Education (IGCSE), the General Certificate of Education (GCE) Ordinary Level examinations and the GCE Advanced Level examinations of the Cambridge International Examinations (CIE) or the London Examinations (Edexcel International) (EFA Mid-Decade Assessment, 2008). The country assessment of lower and higher secondary education is based on these international assessments. The availability of sufficient trained teachers is a major problem in the Maldivian education system. According to the School Statistics booklet (2012), around 14.13% of primary teachers, 57.76 % of lower secondary teachers and 64.11 % of higher secondary teachers were expatriates and 4.73% of all teachers were untrained.

1.3 Learning of algebra in Maldivian Mathematics Education

According to Primary Mathematics in the National Curriculum (n.d.), primary students learn numbers, measures, fractions, geometry and two operations (namely addition and subtraction) in their first grade and continue throughout their primary education. These contents in the primary curriculum develop a foundation for students to develop their mathematical knowledge and thinking. In the second grade, students learn the other two operations of multiplication and division and they develop the concept of area and continue these contents throughout primary education. In grade three, perimeter and statistics are introduced, and the only new topic in grade 4 is volume. The concept of decimal is introduced at grade 5 level and students start learning algebra, ratio, proportion, directed numbers, and percentages when they reach grade six. The only new topics in grade seven are indices and straight line graphs.

The Cambridge IGCSE Mathematics curriculum which is used in lower secondary education in the Maldives is developed based on four main topics namely numbers, algebra, space and shape and statistics and probability. The assessment in this syllabus provides two levels, namely core assessment and extended assessment. The core assessment weightage for the topics are 30- 35% for numbers, 20-25% for algebra space, 30-35% for shape and 10-15% for statistics and probability. The extended assessment weightage for the topics are 15- 20% for numbers, 35-40% for algebra, 30-35% for space and shape and 10-15% for statistics and probability. In this syllabus, algebra topics have the highest assessment weightage compared to all other topics in extended assessment. This indicates the importance of algebraic knowledge and algebraic thinking in the syllabus. Moreover, other topics require students to have algebraic thinking in order to succeed in those topics.

Primary education exposes students to algebra topics for one or two years, and expects students to do algebra in grade eight under the Cambridge syllabus. Even though there is no clear gap between these two syllabuses in terms of algebra content, it can be seen within the methodology and assessment process. Mostly, instruction in primary and secondary mathematics education is limited to the text book that is used by both teachers and students. Most of the teachers use the exact examples in the text book for the particular topic instead of using examples appropriate to the context of the learners and the class environment. Teachers not only use the examples from the text but also give exercises from only the set text book .

This heavy dependence on the text book in teaching mathematics becomes a barrier to the creative and in depth teaching of content and many teachers use the text book exercises as a measure to achieve the curriculum objectives at primary level, and IGCSE past paper questions as a measure to achieve the curriculum objectives at secondary level.

The text books used in primary and secondary do not explain algebra topics in a conceptual manner, instead more emphasis is given to procedural learning. Teachers rely heavily on these procedural teaching methodologies in their classroom. For example, the textbook does not emphasize the meaning of factorization or expansion in algebra and how they relate to real life. Moreover, it does not explain the different representations of algebraic expression such as writing the same expression in two or more ways. In addition, it does not provide conceptual meaning to the properties of real numbers, namely commutative, symmetry, distributive and associative properties, which are widely used in algebra topics. Another major issue in both primary and secondary education is that teachers do not provide a clear link with arithmetic knowledge that students have mastered in previous grades to the algebraic knowledge when students learn algebra topics in grade six, seven and eight.

Moreover, heavy reliance on simple arithmetic content in grade 1 to grade 5 forms another issue in developing students' algebraic knowledge. Teachers at primary level should have created different representations of numbers and property of real numbers in grades 3 to 5 which could help students to develop that kind of thinking before they start algebra topics in grade 6 and 7. On the other hand, there is no common assessment among the primary schools of the Maldives to decide the level of grade seven learners before starting the Cambridge syllabus in grade eight. To summarise, heavy reliance on text books and less motivation to teach conceptually impede students from developing their algebraic knowledge conceptually at primary and secondary level.

2. Literature Review

2.1 Students' Attitude towards Mathematics

There is a high growth of interest in research on attitude toward mathematics and its relation to mathematics achievement (Miller and David, 2004; Singh, Granville & Dika, 2002). In this setting, many researchers who have used quantitative research designs have based their research mostly on similar categories and concepts of attitude towards mathematics. Even though these researchers have used different instruments, their studies on students' attitude towards mathematics learning have centred on similar categories such as confidence, value or usefulness, enjoyment, and teacher expectations in learning mathematics (Mariano, 2005; Kiamanesh & Kabiri, 2004; Miriam & Clayde, 2000; Sian, Choo & Parmjit, 2010). These concepts are the emerging concepts of the Fennema-Sherman Mathematics Attitude Scale (1976) and the Attitude Towards Mathematics Inventory (ATMI) by Tapia and Marsh (1996).

2.3 Confidence in Learning Mathematics

According to Atnafu (2009), confidence is students' confidence and self-concept with regard to their performance in mathematics. There are many researches who have focused on the concept of confidence in learning about students' attitude. Sian, Choo & Parmjit (2010) studied the factors that explain the motivation of mathematics students in a university. They found out that the four main factors that significantly contribute to student motivation in mathematics learning are the significance of learning, confidence, interest and efforts. This study pointed out the importance of confidence in learning mathematics.

2.4 Usefulness of Mathematics

The usefulness of mathematics relates to students' beliefs about the usefulness, relevance and worth of mathematics in their life (Atnafu, 2009). Sian, Choo & Parmjit (2010) have studied the factors that explain the motivation of mathematics students in a university which showed significance of learning as one of the main factors that motivate students in mathematics. This suggests the importance of making meaning or explaining the uses of mathematics in motivating students in mathematics classes. Similarly, Chuinard, Karsenti & Roy (2007) have studied the relationships among competence, belief, utility value, achievement goals and effort in mathematics. The result showed a positive relationship which indicated that students assign more value for those tasks in which they feel competent and that they make more attempts to succeed in those task. Moreover, Sullivan (2008) explained that when mathematics becomes exciting and more interesting, it influences a positive attitude towards learning mathematics.

2.5 Enjoyment of Learning Mathematics

The students' enjoyment in mathematics learning has been explained in the literature. Sullivan (2008) has studied variables that affect attitude towards mathematics in a qualitative research. One of the concepts that emerged was enjoyment of learning mathematics. Many students stated that when mathematics is fun, it leads to a positive attitude towards learning mathematics. Moreover, this research showed that more female students relate fun of mathematics to a positive attitude towards mathematics. In addition to this, Howard (2008) indicated that when students experience success in learning mathematics, they enjoyed learning mathematics, which led to a positive attitude towards learning.

2.6 Teachers' Expectations

The teacher expectations of the students' ability and performance in mathematics has also been studied in the literature. Sullivan (2008) studied students' perception of people who influence their attitude towards learning mathematics. The result has shown that teachers influence students' attitude towards learning mathematics, especially that of female students. Moreover, some students mentioned that teachers influence their shift in positive attitude towards learning mathematics. These students, who indicated a positive perspective towards teacher, identified teachers as being helpful, fun and well-organized. Importantly, Gallahar (2009) has studied students' perception of teachers' expectations as a predictor of academic achievement in mathematics. This study has measured four dimensions of students' perception of teachers' expectations, namely equal treatment of students, class environment, interaction with students, and classroom management. The result showed that students' perception of classroom management and students' perception of equal treatment variables were predictive of final mathematics performance.

For instance, Martin (2002) indicated that sixth grade students, especially boys, have negative attitudes towards their teachers. However, Mohamed and Waheed (2011) studied students' attitude towards mathematics in selected schools of the Maldives. It was a quantitative study which used the Modified Fennema- Sherman Mathematics Attitude scale to collect data based on two categories, namely confidence and usefulness. The result showed that the students' attitude towards mathematics is at medium level for each category as well as for the overall attitude. Moreover, they found no gender inequality in the attitude towards mathematics.

2.7 Students Attitude toward Algebra

Research on student attitude towards school algebra are comparatively scarce in the literature. Roth (2006) provided some reasons for this scarcity of research in this topic. According to Roth, one of the reasons is that most of the research has not differentiated mathematics from algebra in their studies. Moreover, the research in this area has shown that those students learning algebra have a similar kind of attitude as mathematics students in general. Another reason highlighted was that most of the research on the area of algebra has been conducted in understanding students' conceptualization of algebra and not their attitude. On the other hand, the available research in this area has been conducted from a slightly different perspective than finding student attitude towards algebra.

However, a study conducted with 10th grade learners by Atnafu (2009) examined student attitude towards algebra and its relation to algebra achievement. This study used the variables of confidence, usefulness, enjoyment, subject as male domain, and teacher expectation, in finding student attitude towards algebra. It showed that all these variables have an average (neutral) attitude score in descriptive statistics, with teacher expectation having the lowest average score and usefulness having the highest average score.

3. Methodology

This is a quantitative study which explores students' attitude towards algebra in Maldivian schools. The population of this study was eighth grade students of two major schools in Male'. This population was selected because of the size of the classes and because these two schools are the two oldest secondary schools in the country. This population of 496 students was comprised of different age groups, different academic levels of students with different family backgrounds. One of the schools is a boys' school and the other one is a girls' school. However, in 2011, these two schools started mixed-gender classes at grade one level under a new policy of the government. These two schools are government comprehensive schools now but most of the learners in grade eight at the time the study was conducted were graduates from other schools in Male'.

The sample of this research represents randomly selected boys and girls of grade eight from two major schools in Male'. The study involved 84 students selected randomly from the two schools. This 84 represented 17% of the population, considering that more than 10% of a population is a suitable number for a quantitative research. Seventeen percent was used for this research since the number of participants using the 10% scale was less than the number required for the proposed techniques of analysis and since 17% provided an adequate number of participants for this research. The stratified random sampling method was used for selecting these 84 learners and each school represented a stratum. Stratified random sampling ensures better coverage of the population compared to simple random sampling and it is convenient to collect data from a particular group of participants (Phillips, 2011).

Two attitude scales were used in this study in order to collect data for the research. One of the scales selected was made up of a component selected from the Fennema-Sherman Mathematics Attitude Scales: this was the teachers' expectation component. These scales are widely used and altered by many researchers to suit their respective studies and most of these adjustments are a slight variation in the phrasing of items or the number of items to be used (Brandell & Staberg, 2008; Forgasz, Leder, & Kloosterman, 2004). Likewise, the attitude scale selected was modified for use with algebra.

The second attitude scale in this study was comprised of components selected from the Attitude Towards Mathematics Inventory (ATMI) by Tapia and Marsh (1996). This included the confidence, value and enjoyment components from the inventory. The attitude components

selected for the present study were modified for use with algebra. For the purpose of this study, the three scales were modified to exclude the term “mathematics” and were replaced with the term “algebra”. The questions and the format were retained. The items from the three scales were integrated arbitrarily into one instrument, which consisted of 35 items, 15 items for the confidence component, and 10 items each for the value and enjoyment components.
The attitude surveys were examined using the Likert-scale score for individual questions. The subscales were calculated by averaging the scores for the individual questions in the respective subscales. For favourable items, the values 5, 4, 3, 2, and 1 were allotted respectively to the answer categories beginning with strongly agree. On the other hand, for those items which had been negatively stated, the weighting was reversed, assigning 1 for strongly agree and 5 for strongly disagree. This scoring system in this research implied that a high score reflects a positive attitude towards algebra. For analysing data for this research, descriptive statistics were used. For statistical purposes, the Statistical Package for the Social Sciences (SPSS) was used to analyse the data.

4. Results and Discussion

This section of the study is divided into two main parts, namely students’ demographic information and their attitude towards algebra.

Table 1: Participants’ Information

	School 1	*School 2*
Number of participants	*39(boys)*	*45(girls)*
Grade	*Eight*	*Eight*
Final achievement(marks) of the learners	*1st Term mathematics marks of 2012*	*1st Term Mathematics marks of 2012*

4.2 Students’ attitude towards algebra

The scores for each component of attitude were calculated by adding the scores of the individual items and dividing by the number of items for each component. Likewise, the total attitude score was found by adding all the item scores of both the questionnaires that were used and dividing by the total number of items. The descriptive statistics for total attitude and the components of attitudes towards algebra are given in Table 2. The descriptive statistics included mean, standard deviation, maximum score, minimum score and skewness.

Table 2: Descriptive Statistics for the Total Attitude and Components of Attitude of Students

	Value	Enjoyment	Confidence	Teachers Expectation	Total Attitude score
Mean	3.1238	3.0107	3.1825	3.6121	3.2432
Std. Deviation	.93919	1.07266	1.02625	.67731	.82918
Skewness	-.394	-.077	-.389	-.339	-.246
Minimum	1.00	1.00	1.00	1.83	1.45
Maximum	4.90	5.00	5.00	5.00	4.94
Mean male Mean Female	3.2821 2.9867	3.2564 2.7978	3.4103 2.9852	3.7628 3.4815	

Table 2 above shows that the value component has a mean score of 3.12, indicating an average score (neutral attitude) for this component of attitude, and the standard deviation of 0.94 shows that 95% of the attitude scores for this scale have fallen between 1.24 and 5. The skewness value of -0.39 indicates a nearly symmetrical distribution for the component. This result can also be seen from the Figure 1 below. Moreover, the results in Figure 1 indicate that a large number of students have scored between 2.5 and 4. In terms of gender, male and female student have a means score of 3.28 and 2.99. This means that both groups have an almost average (neutral) score for this component.

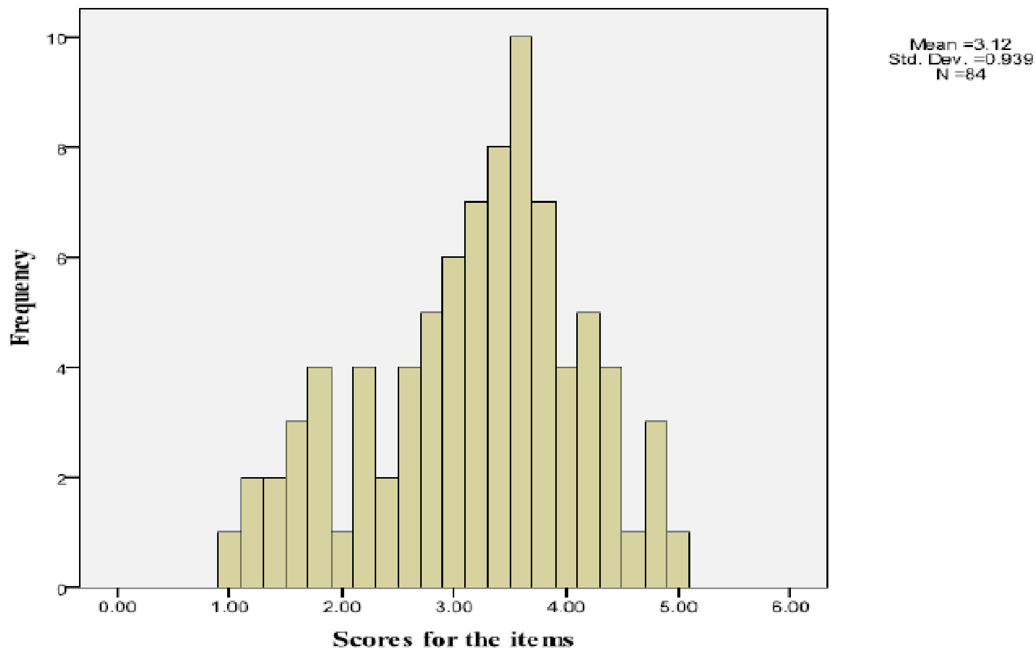


Figure 1: *Histogram for Value scale*

The mean enjoyment score was 3.01 and the standard deviation was 1.07. This indicates that the learners have a neutral attitude for this component, and 95% of the scores have fallen between 0.87 and 5.15. In this component, it means that all the scores were between two standard deviations from the mean since the maximum and the minimum values were 5 and 1 respectively. The skewness value of-0.08 shows that the distribution of this component of the attitude was almost a symmetrical distribution, as shown in Figure 2 below. The skewness also indicates that most of the learners have scored average or above average for this particular scale. The mean scores for both male and female students show that there was not much difference in their mean scores and both the groups have an almost neutral score for this attitude component.

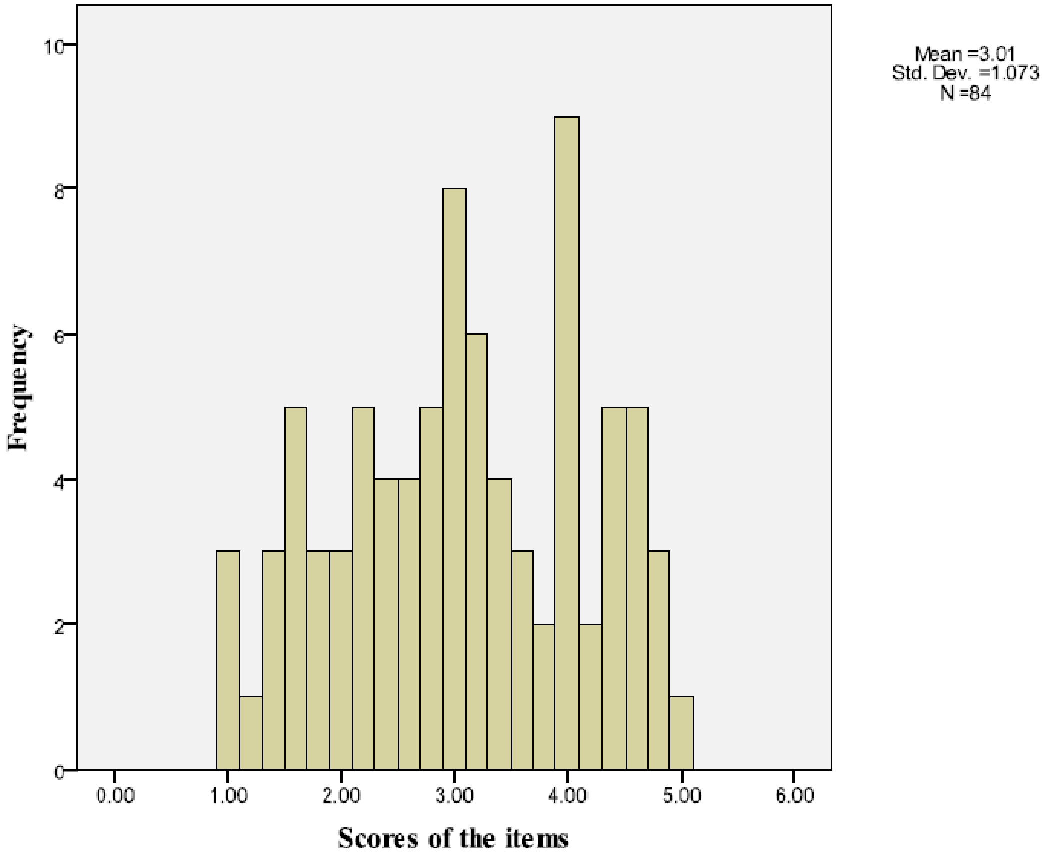


Figure 1: *Histogram for Employment scale*

The score of 3.18 for confidence scale in Table 1 indicates that the learners have an average score (neutral attitude) for this component of the attitude. It has a standard deviation of 1.03 which shows that 95% of the scores for this attitude scale were between 1.12 and 5.24. The skewness of-0.39 indicates that the distribution for this scale was nearly a symmetrical shape. This indication can also be seen from the histogram in Figure 3 below. Moreover, Figure 3 indicates that a large number of students have scored between 2.5 and 4.5 for this component of the attitude. The mean scores for both male and female students show that the learners have neutral scores for this scale.

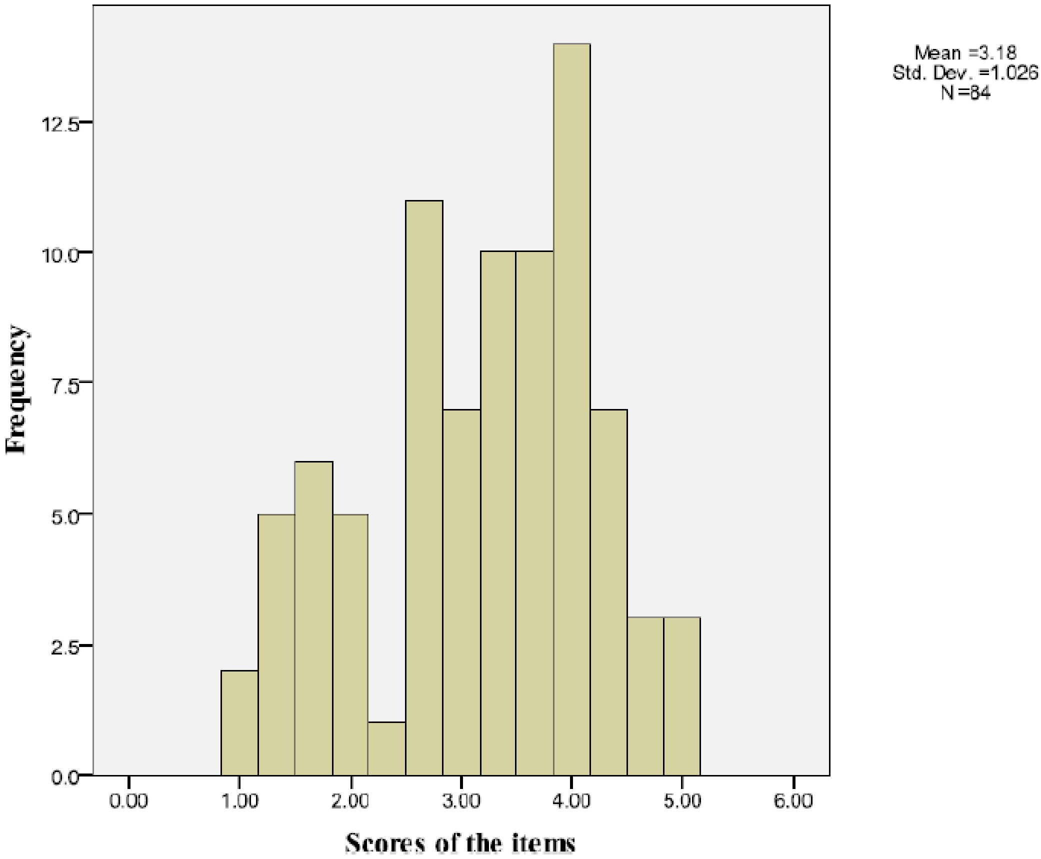
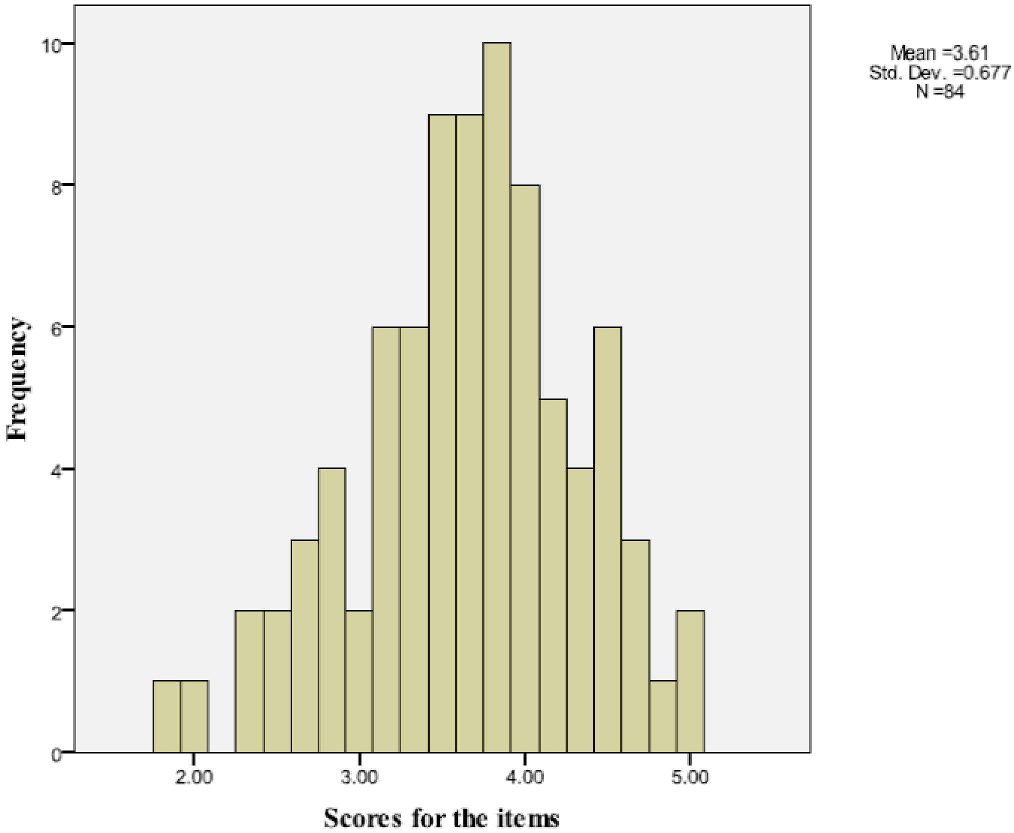


Figure 1: *Histogram for Confidence scale*

The teacher expectation scale has a mean score of 3.61, which shows that the students have more than a neutral score for this particular attitude. The standard deviation of 0.68 indicates that 95% of the scores for this scale were between 2.25 and 4.97. This means that most of the scores were bunched together with the mean for this component. The skewness value of-0.34 indicates that the distribution for this scale was almost a symmetrical shape as shown in Figure 4 below. In addition, Figure 4 shows that a large number of students scored between 3.5 and 4.5. In terms of gender, the male students have a mean score of 3.76 and female students have a mean score of 3.48. This means that male students have more positive scores for the teacher expectation component.



Histogram for teacher expectation scale

The total attitude score in Table 1 shows a mean value of 3.24 and a standard deviation of 0.83. This mean value shows that, in general, learners have a neutral attitude towards algebra. The standard deviation shows that there was not much dispersion of the scores in this sample of students. This implies that 95% of the scores were between 1.58 and 4.9. The maximum and the minimum values show that the range of total attitude score was 3.49. The skewness value of-0.25 means that the distribution is nearly a symmetrical shape. Moreover, the result of this descriptive statistics shows that there is not much difference in the attitude towards algebra by male and female students in the sample.

The result of this descriptive statistics is in line with the result of Atnafu (2009) who has examined 10th grade students' attitude towards algebra and its relation to algebra achievement. That study showed that all these variables have an average (neutral) attitude score in descriptive statistics, with teacher expectation having the lowest average score and usefulness showing the highest average score. However, the present study has the enjoyment component with the least mean score and teacher expectation with the highest mean score. This result is also similar to the result of Mohamed and Waheed's (2011) study of students' attitude towards mathematics in selected schools in the Maldives which showed that the students' attitude is at medium level and that there is no gender difference in attitude. This indicates that the

Maldivian students have an average attitude towards mathematics as well as towards algebra, which is also indicated by Roth (2006).

Since the total attitude scores and scores for each component fell between 3 and 4, these show that there is a problem of getting a positive attitude for algebra. One of the reasons for this might be the way that teachers have taught the topics of algebra. Since the schools are using an exam-based teaching model for all the topics of algebra, students have very little or no chance to enjoy or value the learning of algebra. More focus has been given to the procedural understanding of the topics and therefore students may not have a chance of seeing the importance of algebra learning and how it is related to their lives. Moreover, this type of teaching restricts students from enjoying algebra since the learning involves repeatedly doing the questions directly related to the types of questions that appear in the exam. Most of the algebra contents have been taught through defined algorithms or rules and not by investigation or exploration. Besides, since most algebra learning gives students a passive role instead of an active role, it leads students to have less confidence in their algebra learning. These factors might have led to the development of a neutral attitude among the students.

Another reason for this problem might be the text books that students are using. The text books are not developed in such a way that it provides much focus on valuing algebra by relating algebra contents to the real life situation. Moreover, more focus has been given to the number of varied procedural exercises in all the topics of algebra in the text books. On the other hand, the texts books are not designed to develop students' self-confidence in algebra topics. Rather, it has been developed as reference books for teachers and tutors. Differentiated, authentic student activities are lacking in the texts being used, especially in the algebra topics, which hinders students from enjoying, valuing and building confidence in algebra learning.

A possible reason for the teacher expectation component to have a more positive score than other components might have been the result of good relations between the students and mathematics teachers in these schools. Since the other components showed a neutral attitude score, it cannot be concluded that teachers have taught algebra topics in such a way that the learners enjoy, build confidence and see the value of algebra. On the other hand, it is important to highlight that the attitude of the students in this grade level might have been affected by their primary grades since they had already started learning algebra in grade six and seven.

5. Conclusion and Recommendation

Overall, the descriptive statistics show that the teacher expectation component had the highest mean score and that it indicates more than a neutral attitude among all the components of the attitude towards algebra. The confidence scale had the second highest mean score and the value scale had the third highest mean score. The enjoyment scale was the lowest mean score among all the components. All the attitude scales except the teacher expectation scale have neutral attitude scores, as explained above. Moreover, a total attitude score of 3.24 indicates that overall, students have a neutral attitude towards algebra.

In order to improve the attitude towards algebra and mathematics achievement of grade eight students based on the result of this research, the following implications and recommendation were suggested.

I. The methods that teachers use in teaching algebra content should improve student attitude towards algebra. This can be done through informing the students how algebra is related to real life and how important it is in life. Teachers should develop students' conceptual understanding of algebra in their teaching approaches in order to impart to them that algebra is meaningful. Moreover, the connections among all algebra topics have to be explained to the students. Along with these actions, teachers should also focus on building student confidence in algebra learning by developing appropriate materials and involving learners actively in the learning environment. Furthermore, learning should involve activities such as games and puzzles in order to increase the enjoyment in learning algebra.

II. The scheme of work of mathematics should be designed in a way that it leads to the development of the conceptual understanding of learners. This can be done by incorporating different methodologies in teaching mathematics. Moreover, enough time must be allocated to the topics of algebra and the topics should be arranged in such a way that the contents build upon each other. A variety of instructional materials should also be developed through the scheme.

III. The text books used for teaching algebra topics should explain the usefulness of algebra, its meaning and they should include different activities that students can enjoy in their learning of algebra. The books should not only provide the procedural understanding of algebra content: the various conceptual explanations have to be included.

References

Atnafu, M., (2009). *Relation between tenth grade students' attitude and components of attitude in algebra with algebra achievement of Addis Ababa secondary schools, Ethiopia.* Retrieved from http://www.cimt.plymouth.ac.uk/journal/atnafu.pdf

Brandell, G., & Staberg, E. (2008). Mathematics: a female, male or gender-neutral domain? A study of attitudes among students at secondary level. *Gender & Education*, 20(5), 495-509. doi:10.1080/09540250701805771

Cambridge IGCSE Mathematics syllabus. (2012). *Syllabus code 0580.* Retrieved from www.cie.org.uk

Chouinard, R., Karsenti, T., & Roy, N. (2007). Relations among competence beliefs, utility value, achievement goals, and effort in mathematics. *British Journal of Educational Psychology*, 77(3), 501- 517. doi:10.1348/000709906X133589

EFA Mid-Decade Assessment. (2008). National Report. Retrieved from http://planipolis.iiep.unesco.org/upload/Maldives/Maldives_EFA_MDA.pdf

Fennema, E., & Sherman, J. A. (1976). Fenemma-Sherman mathematics attitude scales: Instruments designed to measure attitudes towards the learning of mathematics by females and males. *Journal for research in Mathematics Education*, 7(5), 324-326.

Forgasz, H. J., Leder, G. C., & Kloosterman, P. (2004). New perspectives on the gender stereotyping of mathematics. *Mathematical Thinking & Learning*, 6(4), 389-420.

Gallahar, T. M. (2009). *Students' perceptions of teachers' expectations as predictors of academic achievement in mathematics*. Retrieved from http://search.proquest.com/docview/304825434?accountid=12528

Howard, L. (2008). *Developmental students' perceptions of unsuccessful and successful mathematics learning*. Retrieved from http://search.proquest.com/docview/304433567?accountid=12528

Kabiri, M. & Kiamanesh, A. R. (2004). *The role of self-efficacy, anxiety, attitudes and previous math achievement in students' math performance*. Retrieved from http://www.self.ox.ac.uk/Conferences/2004_Kabiri_Kiamenesh.pdf

Roth, S. M. L., (2006). *Young children's beliefs about arithmetic and algebra. ProQuest Dissertations and Theses*, 159.

Mariano, S. (2005). *An investigation of the relationship between students' attitude toward learning mathematics and mathematics achievement with respect to gender among 10th-grade public school students in Amman, Jordan.* Retrieved from http://search.proquest.com/docview/305436772?accountid=12528

Miller, J. M., & David A. M., P. (2004). Theoretical and empirical implications of attitude strength. *Journal of Politics*, 66(3), 847-867.

Miriam, C. U., & Clayde, R. M. (2000). Researching the attitudes towards mathematics in basic education. *Educational Psychology,* 20(2), 237-243. Retrieved from http://search.proquest.com/docview/208815676?accountid=12528

Mohamed, L., & Waheed, H. (2011). Secondary students' attitude towards mathematics in a selected school of Maldives. *International Journal of Humanities and Social Science*, 15(Special Issue), 277-281. Retrieved from http://www.ijhssnet.com/journals/Vol_1_No_15_Special_Issue_October_2011/34.pdf

Phillips, J.A. (2004). HMEF5113 - *Statistics for educational research*. Location of publication: Open University Malaysia.

Primary Mathematics in the National Curriculum (n.d.). Retrieved from http://www.edc.edu.mv/

School Statistics. (2012). Retrieved from http://www.moe.gov.mv/wpcontent/uploads/2013/08/STAT-BOOK-2012.pdf

Hoon, S. T., Choo, A. K., & Parmjit, S. (2010). Extracting factors for students' motivation in studying mathematics. *International Journal of Mathematical Education in Science & Technology*, 41(6), 711-724. doi:10.1080/00207391003675190

Singh, K., Granville, M., & Dika, S. (2002). Mathematics and science achievement: Effects of motivation, interest, and academic engagement. *The Journal of Educational Research*, 95(6), 323-332

Sullivan, L. A. C. (2009). *A study of students' perceptions about their attitude toward mathematics (ATM), achievement in mathematics (AIM), factors that influence ATM, and suggestions to improve ATM in a "better than average" district: Grades 4 through 8.* Retrieved from http://search.proquest.com/docview/305091564?accountid=12528

Tapia, M., & Marsh, G.E. (2004). *An instrument to measure mathematics attitudes.* Retrieved from http://www.rapidintellect.com/AEQweb/cho25344l.htm