THE CORRELATION BETWEEN MIDDLE SCHOOL STUDENTS' ATTITUDES AND ACHIEVEMENT IN MATHEMATICS

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Abstract

The main purpose of this study is to study the correlation between middle school students' attitudes and achievement in mathematics. A quantitative research method was mainly used to study students' attitudes. A descriptive research design was adopted in this study that was conducted in Yangon Region. The sample schools for this study were selected randomly. Two high schools and one middle school were selected from each district, Yangon Region. Therefore, eight high schools and four middle schools were included in this study. There were (600) Grade Seven Students participated in this study. As instruments, an attitude questionnaire and an achievement test were used. For the reliability of instruments, a pilot testing with (50) Grade Seven students was conducted. The internal consistency (Cronbach's Alpha) of the students' attitudes questionnaire was (.725) and the students' achievement test was (.742). In this study, the data were analyzed by using the descriptive analysis techniques and Pearson product moment correlation. The research findings revealed that there were positive correlations between students' attitudes and their mathematics achievement (r = .705, p<.01), students' confidence in learning mathematics and students' mathematics achievement (r = .728, p < .01), effectance motivation in learning mathematics and students' mathematics achievement (r = .767, p< .01), mathematics usefulness and students' mathematics achievement (r = .786, p< .01) and the general perceptions about teaching and learning mathematics and the students' mathematics achievement (r = .641, p< .01). But there was a negative correlation between students' attitudes in terms of mathematics anxiety and their mathematics achievement (r = -.798, p< .01).

Keywords: Attitude, Mathematics, Mathematics Achievement, Confidence, Effectance Motivation

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Introduction

Mathematics is truly the gateway of engineering and all other scientific and technological fields. It is crucial not only for success in school, but in being an informed citizen, being productive in one's chosen carrier, and in personal fulfillment. An important goal of mathematics education is to develop individuals with a high level of mathematical proficiency which then supports future participation in employment and citizenship. Therefore, in order to achieve this goal, how to improve students' mathematics achievement is essential to think.

An early contribution in the study of attitudes towards mathematics was by Neale (1969, cited in Majeed, Darmawan & Lynch, 2013) who underlined that attitude plays a crucial role in learning mathematics and positive attitudes towards mathematics is thought to play an important role in causing students to learn mathematics. He claimed that there is a relationship between attitudes and achievement. Thus, attitudes towards mathematics play an essential role in the teaching and learning process of mathematics and that effect on students' achievement in mathematics. In order to teach mathematics effectively, mathematics teachers should keep in mind the importance of students' attitudes towards mathematics and cultivate positive attitudes among their students.

Statement of the Problem

According to Strengthening Mathematics and Science in Secondary Education (SMASSE) Project Report (1998, cited in Mutai, 2010), the reason for poor achievement in mathematics examination result from poor learning of the subject is likely to be due to attitudes towards the subject by the students.

Some of the reasons for poor in mathematics achievement are stated as follows.

- The students may lack confidence in learning mathematics.
- The students may have mathematics anxiety while they are learning mathematics.
- There may lack motivation that stimulates the students' desire for learning mathematics.

- The students do not understand how to apply mathematics in their everyday life and they do not know the usefulness of mathematics in their lives.

These reasons may affect the students' mathematics achievement and fall onto the students' attitudes towards mathematics. Therefore, how to promote the students' positive attitudes towards mathematics is a real problem for current mathematics classrooms in order to get high level of achievement in mathematics among the students.

Purposes of the Study

The main purpose of the study is to investigate the correlation between middle school students' attitudes and achievement in mathematics. The specific objectives are as follows:

- To examine the students' mathematics achievement.
- To investigate the students' attitudes towards mathematics.
- To study the relationship between students' attitudes and achievement in mathematics.

Research Questions

(1) To what extent do the students have the level of mathematics achievement?

(2) To what extent do the students possess the level of attitudes towards mathematics?

(3) Is there a relationship between the students' attitudes and achievement in mathematics?

Scope of the Study

This research has its own particular limitations. The first limitation is related to the fact that the participants of the study came from only twelve selected schools from Yangon Region. Eight basic education high schools and four basic education middle schools were included in this study. The second limitation is that this study is only concerned with the four scales of the Fennema-Sherman Attitude Scales. Fennema-Sherman Attitude Scales consist

of (1) attitude towards success in mathematics scale, (2) mathematics as a male domain scale, (3) mother scale, (4) father scale, (5) teacher scale, (6) confidence in learning mathematics scale, (7) mathematics anxiety scale, (8) effectance motivation scale in mathematics and (9) mathematics usefulness scale. This study dealt with only four scales of Fennema-Sherman Attitude Scales (confidence in learning mathematics, mathematics anxiety, effectance motivational scale, usefulness of mathematics), and general perceptions about learning mathematics.

Definition of Key Terms

Attitude

Attitude is a mental and neutral state of readiness, organized through experience, exerting a directive and dynamic influence upon an individual's response to the objects and situations with which it is related (Allport, 1935).

Mathematics

Mathematics is the science that draws necessary conclusions (Benjamin, 1870, cited in Wikipedia, n.d.).

Mathematics Achievement

Mathematics achievement is the proficiency of performance in any or all mathematics skills usually designated by performance on a test (Thiessen & Blasius, 2008, cited in Abang, n.d.).

Significance of the Study

Zubair (2012) expressed that one of the chief objectives of education is the development of desirable attitudes in students. Attitude is a personality trait which indicates towards individual's likes or dislikes. Attitudes influence the way an individual behaves towards an object, institution or a person. Attitude towards a particular object is influenced by parents, teachers, school and society in which the individual lives. Therefore, the teacher must understand the various dimensions of an attitude. It is also kept in views that are required to develop several attitudes in the students, attitude towards studies, attitude towards self, attitude towards colleagues, attitude towards

certain ideals and attitude towards subjects taught in schools (e.g. mathematics). Attitudes of a student are formed due to his experience and interaction with real situations.

Several studies have shown that positive attitudes are conducive to good performance. Michelli (2013) conducted a study deal with the relationship between attitudes and achievement in mathematics among fifth Grade students. This study was conducted to identify specifically how fifth Grade students' attitudes affect their achievement in mathematics. This study indicated that there is significant relationship between attitudes towards mathematics and achievement in mathematics. Therefore, the mathematics teachers should be aware of students' attitudes and seek to improve them in order to positively influence students' academic achievement.

Moreover, a research for studying the relationship between students' attitudes and achievement in mathematics is necessary.

Theoretical Framework

Importance of Mathematics

A person may belong to the lowest or the highest class of society, but he utilizes knowledge of mathematics in one form or another. Whoever earns and spends or uses mathematics; and there cannot be anybody who lives without earning and spending. Counting, notation, addition, subtraction, multiplication, division, weighing, measuring, selling, buying and many more are simple and fundamental processes of mathematics which have got an immense practical value in life. The knowledge and skill in these processes can be provided in an effective and systematic manner only by teaching mathematics in schools.

According to Mishra (2009), mathematics does not only help in developing and controlling the facilities of an individual, it also equips him with proper intellect, reasoning and seriousness needed to lead a responsible life. That is why a mind trained through the study of mathematics is more capable of leading a well-disciplined life. Study of mathematics is helpful in having constructive discipline. Every student of mathematics is habitual to think properly without any unnecessary biases and prejudices. He can

discriminate what is good and what is bad, therefore, he does not take decisions through his emotions but tries to apply the logic and intellect. He does not believe in hear saying but tries to investigate the thing before reacting to it.

Moreover, mathematics that not only familiars with culture and civilization but also helps in preventing, promoting cultural heritage and transmitting it to future generations. Through the application of scientific and mathematical discoveries culture and civilization is undergoing constant change. The welfare of civilization is now almost wholly dependent upon scientific as well as mathematical progress. It affects view of life and a way of living as a result of which it also affects philosophy of life. Hence the teaching of mathematics plays a vital role in developing cultural heritage.

Attitudes towards Mathematics

According to Orton (1989, cited in Mubeen, Saeed & Arif, 2013), attitude is a hypothetical construct that indicates an individual's like and dislike towards an item. It may be positive, negative or neutral. Attitude is an approach, temperament, sensation, situation, etc. with regard to a person or thing; inclination or course, especially of mind. Attitude is a way of looking at things. Some students are blamed for having negative attitude towards mathematics yet most of them are not motivated to change that attitude. Students would, therefore, have some measure of success in mathematics lessons if they are motivated to develop positive attitude towards it.

Attitudes are highly composite and they can affect learning comprehensively. Attitudes influence performance and performance in turn influences attitudes. Those who have positive attitudes towards mathematics have a better performance in this subject. Understanding of student's attitude is important in supporting their achievement and interest towards a particular discipline. Attitudes towards mathematics are also the important determinants of academic success and achievement. In order to succeed in a subject, positive attitude towards mathematics is a necessary prerequisite (Schereiber, n.d., cited in Farooq & Shan, 2008).

Students' attitude towards mathematics tended to be more positive in classroom where students perceived greater leadership and helping/friendly

behaviors in their teachers, and more negative in their classrooms where students perceived their teachers as admonishing and enforcing strict behaviors. Science learners engaging in mathematics activities (including participating in mathematics competitions) are affected by external and internal influences on their perceptions and attitudes towards mathematics, it was felt that an investigation into the relationship between attitude towards mathematics and performance in mathematics was important (Fisher & Rickards, 1998, cited in McCoach & Siegle, n.d.).So, students' attitude toward mathematics is very important for their successful learning.

Measurement of Attitudes towards Mathematics

The following techniques will thus be considered for the measurement of attitude toward mathematics: Thurstone scales, summated rating scales exemplified by (the most common) Likert-type scales, semantic differential scales, interest inventories and check lists, preference ranking, projective techniques, enrolment data, other forms of data gathering such as clinical and anthropological methods, and physiological responses While the majority of these techniques are examples of self-report, paper-and-pencil measures. The Fennema and Sherman (1976,cited in Choi, 2015) mathematics attitude scales are also an instrument that can be used to assess different components of attitude to mathematics.

The scale of Fennema and Sherman (1976,cited in Choi, 2015) is, in the words of Tapia and Marsh (2004,cited in Choi, 2015), the most popular measure of attitudes towards mathematics of the last three decades. The origin of this scale lies in the study of differences between men and women in their attitudes towards mathematics as well as their influence on performance. This scale has been the object of extensive studies and it has been translated into various languages, and modified for application in different situations.

In this study, the researcher will use four scales of the Fennema-Sherman Attitude Scales: the confidence in learning mathematics scale, the mathematics anxiety scale, the effectance motivational scale, the usefulness of mathematics, as sub-components of students' attitudes. The domain scales are identified and described as follows:

- The confidence in learning mathematics scale is intended to measure confidence in one's ability to learn and to perform well on mathematical tasks. The dimension ranges from a distinct lack of confidence to definite confidence.
- The mathematics anxiety scale is intended to measure feelings of anxiety, dread, nervousness, and associated bodily symptoms related to doing mathematics. The dimension ranges from feeling at ease to those of distinct anxiety.
- The effectance motivation scale in mathematics is intended to measure effectance as applied to mathematics. The dimension ranges from lack of involvement in mathematics to active enjoyment and the seeking of challenge. The scale is not intended to measure interest or enjoyment of mathematics;
- The mathematics usefulness scale is designed to measure students' beliefs about the usefulness of mathematics currently and in relationship to their future education, vocation, or other activities.

Research Methodology

Research Design

The research design used for this study was a descriptive research design.

Procedure for the Study

The students' achievement in learning mathematics is still under unsatisfactory condition. This is a problem of mathematics teacher. Then the researcher sought out the literature related to this study through books and Internet sources. After that, an attitude questionnaire and an achievement test were constructed for this study. To find the reliability of the instruments a pilot test with (50) Grade Seven students was conducted at No.(1) Basic Education High School, Thingangyun. Then, eight high schools and four middle schools from Yangon Region were selected by using a random sampling method. Six hundred Grade Seven Students were also selected as participants. The required data are collected with the help of the headmaster/headmistress of those schools and the test was administered and

then the data were entered into the computer data file and were analyzed using the Statistical Package for the Social Science (SPSS 22).

Instruments

In this study, a questionnaire and an achievement test for Grade Seven students were used as instruments.

(a) Attitude Questionnaire

Questionnaire developed by Fennema and Sherman (1976, cited in Leder, 1985), which was adapted to investigate students' attitudes towards mathematics. This questionnaire was used to investigate Grade Seven students' attitudes towards mathematics. The total items were (50) on five point Likert-type scale from (1) to (5). Items (6), (7), (8), (9), (10) from each section are negative items and the rest are positive items. For positive items, the score closer to (1) indicated "Never/Strongly Disagree" and "Always/Strongly Agree" was indicated by the score closer to (5). For negative items, the score closer to (1) indicated "Always/Strongly Agree" and (5) indicated "Never/Strongly Disagree".

(b) Mathematics Achievement Test

In order to measure the mathematics achievement of the students, an achievement test was constructed. Firstly, the table of specifications was prepared including number of items according to content areas. This test covered (14) chapters: (10) chapters from mathematics textbook volume I and (4) chapters from mathematics textbooks volume II.

Population and Sample Size

All the participants in the sample were Grade Seven students. This study was conducted in Yangon Region. There are four districts in Yangon Region. One township from each district was randomly selected for this study. The sample schools for the study were selected by using a stratified random sampling technique. Two high schools and one middle school from each township were selected as the sample. Therefore, twelve schools (eight high school and four middle schools) are included in this study. The total number

of students participated in this study were (600). The students in this study were selected by an equal-size (non-proportional) random sampling technique.

Data Analysis

The data were analyzed by using descriptive statistics (mean and standard deviation). Moreover, the Pearson product-moment correlation was used to describe the relationships between students' attitudes towards mathematics and the students' achievement in mathematics.

Research Findings

Findings of Students' Achievement in Mathematics

In order to find out the students' mathematics achievement, an achievement test was administered. The full score of students' mathematics achievement was (50). In order to access the students' achievement level, it was necessary to examine the percentage of students whose achievement level is low, moderate and high in all the participants.. The average mean and standard deviation by all the participants were (29.62) and (5.452) respectively. Then, (+1) standard deviation from mean and (-1) standard deviation from mean were calculated. So, based on these results, if the score was from (0) to (23), it would be defined as low achievement level. If the score was from (24) to (35), it would be defined as moderate achievement level. If the score was from (36) to (50), it would be defined as high achievement level. The findings of students' achievement in mathematics were presented in Table 1 in terms of three levels. From the total number of participants, (19%) of the students were at low level, (60%) of the students were at moderate level and (21%) of the students were at high level of mathematics achievement.

Table 1: Students' Level of Mathematics Achievement

Achievement Level	Score	Number of Student	Percentage
Low	0-23	112	19%
Moderate	24-35	362	60%
High	36-50	128	21%
Total	50	600	100%

Findings of Students' Attitudes towards Mathematics

In order to find out the students' attitudes towards mathematics, (50) items were used. The full score of students' attitudes questionnaire was (250). In order to examine the percentage of students who have the attitudes of low, moderate, high levels towards mathematics, a descriptive statistics (percentage) was used. The average mean score and the standard deviation by all the participants were (193.35) and (19.59) respectively. Then, (+1) standard deviation from mean and (-1) standard deviation from mean were calculated. So, based on these results, if the score was from (0) to (172), it would be defined as low attitudes level. If the score was from (173) to (213), it would be defined as moderate attitudes level. If the score was from (214) to (250), it would be defined as high attitudes level. From the total number of participants, (1%) of the students have low level, (83%) of the students have moderate level and (16%) of the students have high level of attitudes towards mathematics.

Table 2: Students' Level of Attitudes towards Mathematics

Attitude Level	Score	Number of Student	Percentage
Low	0-172	7	1%
Moderate	173-213	497	83%
High	214-250	96	16%
Total	250	600	100%

Findings of the Correlations between Students' Attitudes and Students' Mathematics Achievement

The correlation analysis was performed between students' attitudes (overall attitude, five sub-components of students' attitudes) and their achievements using the Pearson product-moment correlation. Table 3 shows the correlation between students' mathematics achievement and their attitudes towards mathematics in terms of confidence in learning mathematics, mathematics anxiety, effectance motivation in learning mathematics, mathematics usefulness, general perceptions, and overall students' attitudes.

Table 3: The Correlations between Students' Attitudes and Students' Mathematics Achievement

Attitude	Correlation (Mathematics Achievement)
Confidence in Learning Mathematics	**.728****
Mathematics Anxiety	**-.798****
Effectance Motivation in Learning Mathematics	**.767****
Mathematics Usefulness	**.786****
General Perceptions	**.641****
Overall Students' Attitudes	**.705****

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion, Suggestions, Conclusion

Discussion

According to the research findings of students' achievement in mathematics, it was found that (19%) of the students possessed low level of achievement, (60%) of the students possessed moderate level of achievement, and (21%) of the students possessed high level of achievement. These findings revealed the answer to research question (1): To what extent do the students have achievement in mathematics?

Concerning with the students' attitudes towards mathematics, (1%) of the students possessed low level of attitudes, (83%) of the students possessed moderate level of attitudes and (16%) of the students possessed high level of attitudes. These findings revealed the answer to research question (2): To what extent do the students possess positive attitudes towards mathematics?

The correlation between the students' attitudes and the students' mathematics achievement was found that the correlation ($r(10) = .705$, $p < .01$). This result showed that the direction of correlation was positive and it indicated that if the students' attitudes were high, the students' mathematics achievement was also high and if the students' attitudes were low, the students' achievement was also low. So, this finding revealed the answer to research question (3): Is there a relationship between students' attitudes and achievement in mathematics?

Suggestions

Some suggestions for improving confidence in learning mathematics, reducing mathematics anxiety, motivating to learn mathematics, highlighting the usefulness of mathematics and promoting the students' attitudes in terms of general perceptions about learning mathematics are presented as follows.

Improving Confidence in Learning Mathematics: The teachers need to apply various methods to promote the students' attitudes in terms of confidence in learning mathematics. In the classroom, the teacher should provide opportunities for students to succeed, help young teens feel safe and trust in themselves and also praise and encourage.

Reducing Mathematics Anxiety: The students' attitudes in terms of mathematics anxiety also have impact on students' mathematics achievement. The teachers should help the students to be relax and enjoyable while teaching and learning mathematics. But the teachers should never humiliate the students and never use mathematics as a punishment. The teachers should not use the techniques of curb excessive competitiveness and speed tests. The teacher should use the techniques of praising pupils' efforts, developing a sense of humor, teaching how to read mathematics, developing spatial relations and so on. By doing so, the students would gain positive attitudes deal with mathematics anxiety and their achievement may improve.

Motivating to Learn Mathematics: The teachers also have to motivate students in learning mathematics in order to get students' high mathematics achievement.

The teacher should:

- adopt child centered approach,
- provide appropriate learning situation and environment,
- praise, reproof, reward and punishment,
- competition and co-operation,
- develop proper attitude in children which will help in setting of their mind or preparing them mentally for doing particular task of learning, and
- keep in mind individual difference of the learner while teaching.

Highlighting the Usefulness of Mathematics: Mathematics performance relates to usefulness of mathematics and the teachers should point out the activities concerned with mathematics in the students' everyday life. The teacher should point out some of out of school activities, for example- awareness of time, reading a clock or watch, planning one's routine, cost accounting, related to mathematics. Even, drinking coffee, tea, or milk, it is needed to have the knowledge of ratio and proportion which are concerned with mathematics. And also teachers should explain the students that mathematics is needed for their future work and it will help them earn a living. By doing so, the students' positive attitudes will increase and the students' mathematics achievement will improve too.

Promoting the Students' Attitudes in terms of General Perceptions about Learning Mathematics: The general perceptions concerned with parents, teachers and peers have impact on students' attitudes which in turn impact on students' mathematics achievement. The parents need to drive to develop their children's mathematical interest, to provide mathematical settings and to explore mathematical patterns and ideas with them. The parents should also give their children problems and puzzles at home and other activities deal with mathematics, for example – a set of pattern blocks. The teacher also needs to

develop students' positive attitudes. The teacher should use up to date methods, have the best intentions to help students' success.

And also, the teacher should also have high expectations for the students' achievement because when students perceive a teacher has low expectations for them, they show less academic progress and will tend to act out more in negative ways. The parents and teachers should also have an understanding of the issues of negative peer influence, because it has an influence on children's academic performance. By doing so, the students' attitudes may improve and they may gain successful achievement in mathematics.

Conclusion

There were relationships between students' attitudes and the students' mathematics achievement; i.e., students' attitudes in terms of confidence in learning mathematics, of mathematics anxiety, of effectance motivation in learning mathematics, of usefulness of mathematics and of general perceptions about teaching and learning mathematics. All of these five sub-components influence the students' attitudes towards mathematics and students' mathematics achievement. In order to have high attitudes and mathematics achievement, firstly, the students can construct their own confidence based on their history of prior success. Encouragement can be most effective if the task is within the students' reach, but it can also be damaging if the task is out of reach and the students fail miserably. The students can also construct their confidence based on how they feel when they are in class or working on a particular task.

In addition, mathematics anxiety can also affect the students' attitudes towards mathematics. At about age 12, students who feel weak in mathematics start to avoid mathematics courses, do poorly in the few mathematics classes they do take, and earn low scores on mathematics achievement tests. Mathematics anxiety may also prevent students from passing fundamental mathematics courses or prevent the pursuit of advanced courses in mathematics. Therefore, teachers must reduce students' mathematics anxiety based on the suggestions mentioned above.

Similarly, motivation to learn mathematics also becomes a problem for cultivating positive attitudes towards mathematics. The students may have interest in learning mathematics when they gain sufficient motivation to lean mathematics. Both intrinsic motivation and extrinsic motivation are required. Intrinsic motivation can encourage the students to do an activity for its inherent satisfactions rather than for some separable consequence. Extrinsic motivation can encourage the students to do an activity in order to attain some separable outcomes. The teachers need to encourage students to learn mathematics based on their intrinsic motivation and by applying extrinsic motivation.

Besides, the teachers need to support the students who aim to acquire the power of the knowledge of mathematics because the knowledge of it is useful only when they know how to apply it in solving life problems. The teachers can point out that mathematics play a very important role in different vocations in everyday life. By doing so the students may appreciate the usefulness of mathematics, concentrate on this subject and have tendency to learn mathematics. Subsequently, their attitudes in terms of mathematics usefulness will improve.

Moreover, parents, teachers and peers can influence the students' attitudes towards mathematics. Parents can play crucial roles in the education of a child. In order to improve students' attitudes towards mathematics, the parents can encourage their children's learning at home because parents' support of students learning is directly correlated to students exhibiting more of a positive attitude, better attendance, increased positive outlook, higher motivation to learn, and higher test scores. The teachers' attitudes can also have a profound impact on students' education growth because the teachers' attitudes shape the treatment of students. Adolescents can also influence each other. Peer influence can provide many positive attitudes towards mathematics in an adolescent's life and also potentially have a deadly impact or other various negative effects. It is vital for both teachers and parents to understand the complex aspects of peer in order to stop these negative effects before they occur.

Research findings pointed out students' attitude is impact on their mathematics achievement. The teachers should also try to change the students' attitudes to learning mathematics just as a compulsory requirement

in schooling and for realizing the functional value of mathematics. Indeed, this study cannot fulfill all the aims of teaching mathematics in the middle school, but it is hoped that it can support, to some extent, the struggle for improving middle school students' attitudes and their mathematics achievement in Myanmar.

References

Abang, B. K. (n.d.). *Evaluation of mathematics achievement test: A comparison between classical test theory (TTAS) and items response theory (IRT).* Retrieved October 11, 2016, from http://www.mcser.org/wiki/definitions-of-mathematics

Allport, G. W. (1935). *Handbook of social psychology*. Worcester, Mass: Clark University Press.

Choi, C. (2015). *Junior students' attitude towards mathematics in Hong Kong secondary school.* Retrieved November 10, 2016, from http://hub.hku.hk>brainstream> Fulltext.pdf.

Farooq, M. S., & Shah, S. Z. U. (2008). *Students' attitude towards mathematics*. Retrieved October 21, 2016, from http://pu.edu.pk/images/journal/...20Attitude.pdf.

Leder, G.C. (1985). Measurement of attitude to mathematics. *For the Learning of Mathematics, 5*, 29.

Majeed, A. A., Darmawan, I. G. N., & Lynch, P. (2013). A confirmatory factor analysis of attitudes towards mathematics inventory (ATMI). *The Mathematics Educators*, *15* (1), 121-135. Retrieved October 15, 2016, from http://www.mathsnie.edu.sg >tme>tmeV15-1>7.pdf.

McCoach, D. B., & Siegle, D. (n.d.). *A comparison of highers' and low achievers' attitudes, perception, and motivations*. Retrieved December 11, 2016, from http://www.gifed.cuconn.edu/siegle/pubications

Michelli, M. P.(2013). The relationship between attitudes and achievement in mathematics among fifth grade students. *Honors Theses, 126*. Retrieved October, 19, 2016, from http://www.aquila.usm.edu>cgi>viewcontent.pdf.

Mishra, L. (2009). *Teaching of mathematics.* New Delhi: APH Publishing Corporation.

Mubeen, S., Saeed, S., & Arif, M. H. (2013). Attitude towards mathematics and academic achievement in mathematics among secondary level boys and girls. *IOSR Journal of Humanities and Social Science- General, 6* (4), 38-41.

Mutai, J. K. (2010). *Attitudes towards learning and performance in mathematics among students in selected schools in Bureti district, Kenya*. Retrieved August 30, 2016, from http://www.ku.ac.ke>docs>abstracts>iune-pdf.

Wikipedia, the free encyclopedia (n.d.). *Definition of Mathematics.* Retrieved October 25,2015, from http://enwikipedia org/wiki/Definition of mathematics

Zubair, P. P. (2012). *Teaching of mathematics*. New Delhi: APH. Publishing Corporation.

Appendix A
Attitude Questionnaire

þar;cGef;vTmonf tv,fwef;tqifh ausmif;om;^ausmif;olrsm;\ ocsFm bmom&yf ty:xm;&dSaom oabmxm;rsm;udk od&dSvdkygojzifh ar;jref;aom ar;cGef;vTmjzpfygonf/
ausmif;om;^ausmif;olrsm;\ ajzqdkcsufrsm;udk okawoe jyK&eftwGufom jzpfygonf/ a&;om;ajzqdkcsufrsm;ESifh ywfoufí rnfol wpfOD;wpf a,mufxHodkU owif;ay;ydkYjcif; vkH;0jyKvkyfrnf r[kwfyg/ odkUjzpfygí ar;cGef;tm;vkH;udk yGifhvif;rSefuefpGmjzifh ulnDajzqdkay;yg&ef arwåm&yfcHtyfygonf/ ajzqdkolrsm;tm; trnfazmfxkwfjcif; r&dSygaMumif;ESifh xdckdufepfemrI r&dSap&ef wm0ef,lygonf/ ulnDaqmif&Gufay;rIudk txl;aus;Zl;wif&dSygonf/

okawoD

ausmif;om;^olrsm;\ ocFsmbmom&yftay:xm;&dSaom rdrdudk,fudk ,kHMunfrIqdkif&m ar;cGef;vTm

(Confidence in Learning Mathematics Scale)

atmufygtaMumif;t&m wpfckpDudk zwfíoif\ oabmxm;ESifh udkufnDaom tuGufudk (Â) oauFwjzifhjyyg/

(1)vkH;0oabmrwlyg/ (2) tenf;i,f oabmwlygonf/

(3)rqkH;jzwfwwfyg/ (4) oabmwlygonf/

(5) tvGefoabmwlygonf/

pOf	**azmfjycsufrsm;**	**1**	**2**	**3**	**4**	**5**
1	uREfkyfonf ocFsmbmom&yfudk oif,lEdkifol wpfa,mufjzpfonf[k ,kHMunfygonf/					
2	uREfkyfonfocFsmbmom&yfwGif trSwfaumif;aumif; &Edkifonf[k ,kHMunfygonf/					
3	uREfkyfonf ocFsmoifcef;pmtopfrsm;udk vG,fulpGm oif,lEdkifonf[k ,kHMunfygonf/					
4	uREfkyfonf ocsFmykpämrsm;udkajz&Sif;& mwGif enf;vrf; trsdK;rsdK; tokH;jyKum tajz&&dSatmif					

	wGufxkwfEdkif onf[k ,kHMunfygonf/					
5	uREfkyfonf ocsFmxl;cRefjydKifyGJrsm;w Gif yg0if,SOf jydKifEdkifonfh t&nftcsif;&dSonf [k,kHMunf ygonf/					
6	uREfkyfonf ocsFmbmom&yfwGif xl;cRefol wpfa,mufr[kwfyg/					
7	ocFsmbmom&yfonf uREkfyftwGuf tcufcJqkH; bmom&yfjzpfonf/					
8	uREfkyfonf em;vnf&ef cufcJaom t"dyÜm,f owfrSwfcsufrsm;? ay:pusLvdwfrsm;? oDtdk&rfrsm;udk rrSwfrdyg/					
9	uREfkyfonf cufcJaom ocsFmykpämrsm;udk ajz&Sif; Edkifrnfr[kwfyg/					
10	uREkfyfonf rsm;aomtm;jzifh ocsFmoifcsdefwGif q&m^ q&mrrS ar;jref;aom arcGef;rsm;\ tajzukd rodyg/					

ausmif;om;^olrsm;\ ocFsmbmom&yftay:xm;&dSaom pdk;&drfrIqdkif&m ar;cGef;vTm

(Mathematics Anxiety Scale)

atmufygtaMumif;t&m wpfckpDudk zwfíoif\ oabmxm;ESifh udkufnDaom tuGufudk (Â) oauFwjzifhjyyg/

(1)vkH;0oabmrwlyg/ (2) tenf;i,f oabmwlygonf/

(3)rqkH;jzwfwwfyg/ (4) oabmwlygonf/

(5) tvGefoabmwlygonf/

pOf	azmfjycsufrsm;	1	2	3	4	5
1	ocsFmbmom&yfonf aMumufp&maumif;aom bmom&yf r[kwfyg/					
2	ocsFmbmom&yfukdoif,l&jcif;ES ifhywfoufí uREkfyfonf pdwf&IyfaxG;rI r&Sdyg/					
3	uREkfyfonf rsm;aomtm;jzifh ocsFmwGuf&jcif;? oif,l&jcif;ukd aysmf&Tifygonf/					
4	uREkfyfonf rsm;aomtm;jzifh ocsFmpmar;yGJajzqkd&csdef twGif; pdwfayghyg;ygonf/					
5	uREkfyfonf tjcm;bmom&yfrsm;ukd oif,ljcif;xuf ocsFmbmom&yfukd					

	oif,l&onfukdykdí pdwf0ifpm;yg onf/					
6	ocsFmykpämrsm;onf uREkfyftm; rl;a0apygonf/					
7	ocsFmbmom&yf pmar;yGJonf uREkfyftm; aMumufvefYap ygonf/					
8	uREfkyfonf ocsFmykpämrsm;ukd rnfokdUajz&Sif;&rnfukd rpOf; pm;wwfyg/					
9	uREkfyfonf rsm;aomtm;Nzifh ocsFmoif,lcsdefwGif pdwf"gwfuswwfygonf/					
10	uREkfyfonf oif,ljyD;aom oifcef;pmrsm;ESifh topf oif,l&aom ocsFmoifcef;pmrsm;ukd rcsdwfquf wwfyg/					

ausmif;om;^olrsm;\ ocFsmbmom&yftay:xm;&dSaom vHIUaqmfrIqdkif&m ar;cGef;vTm

(The Effectance Motivational Scale)

atmufygtaMumif;t&m wpfckpDudk zwfíoif\ oabmxm;ESifh udkufnDaom tuGufudk (Â) oauFwjzifhjyyg/

(1)vkH;0oabmrwlyg/ (2) tenf;i,f oabmwlygonf/

(3)rqkH;jzwfwwfyg/ (4) oabmwlygonf/

(5) tvGefoabmwlygonf/

pOf	azmfjycsufrsm;	1	2	3	4	5
1	uREkfyfonf ocsFmESifhoufqkdifaom OmPfprf;? ya[Vdrsm;ukd MudKufESpfoufygonf/					
2	ocsFmbmom&yfonf uREkfyftm; wGufcsifpdwfNzpfatmif vIHUaqmfEkdifaom bmom&yfNzpfonf/					
3	uREkfyfonf ocsFmykpämrsm;ukd em;vnf&ef enf;vrf; rsdK;pkHNzifh MudK;pm;ygonf/					
4	uREkfyfonf ocsFmbmom&yfESifh oufqkdifaom jyify Aymkokwrsm;ukd avhvm&onfukd ESpfouf ygonf/					
5	uREkfyfonf ay;xm;aom ocsFmavhusifhcef;rsm;ESifh tdrfpmrsm;tNyif tNcm;aom OmPfprf;ykpämrsm;ukd aNz&Sif; vkdpdwf&Sdygonf/					

6	uREkfyfonf cufcJaomocsFmykpämrsm;ukd ukdifwkdiftaNz &atmif wGufonfxuf tNcm;ol\ tultnDukd ykdívkdcsifygonf/					
7	ocsmFbmom&yfukd tb,faMumifh tcsdefukefcH oif,laeMu onfukd uREkfyfem;rvnfyg/					
8	ocsFmbmom&yfwGif awGUMuKH&aom tcuftcJrsm;aMumifh uREkfyfonf ocsFmbmom&yfukd roif ,lvkdyg/					
9	ocsFmbmom&yfonf ykHaoenf;rsm;ukdom tvGwfusuf rSwf&aom bmom&yfNzpfonf/					
10	uREkfyfonf ocsFmoifcef;pmwpfckukd em;rvnf ygu em;vnfatmif rMudK;pm;bJ vufavsmh wwfygonf/					

ocFsmbmom&yf\ tokH;0ifrIqdkif&m ar;cGef;vTm

(Mathematics Usefulness Scale)

atmufygtaMumif;t&m wpfckpDudk zwfíoif\ oabmxm;ESifh udkufnDaom tuGufudk (Â) oauFwjzifhjyyg/

(1)vkH;0oabmrwlyg/ (2) tenf;i,f oabmwlygonf/

(3)rqkH;jzwfwwfyg/ (4)oabmwlygonf/

(5) tvGefoabmwlygonf/

pOf	azmfjycsufrsm;	1	2	3	4	5
1	ocsFmbmom&yfonf uREkfyf\ tem*wfwGif vkyfaqmif& rnfh vkyfief;rsm;twGuf tokH;0ifygonf					
2	ocsFmbmom&yfukd uRrf;usifNcif;onf vlYb0&yf wnfa&; twGuf rsm;pGmtaxmuftulay;ygonf/					
3	ocsFmbmom&yfonf oif,loifhaom? r&SdrNzpf vkdtyfaom bmom&yfwpfckNzpfonf/					
4	ocsFmbmom&yfonf t&m&mwkdif;ukd vufawGU usus? pepfwus pDrHwwf&ef taNccHrsm;ay;ygonf/					
5	tNcm;aombmom&yfrsm; oif,lEkdif&ef ocsFmbmom&yf onf r&SdrNzpf vkdtyfygonf/					
6	ocsFmbmom&yfonf vufawGUb0ESifh					

	ukdufnDrI r&Sdyg/					
7	ocsFmbmom&yfukd oif,lNcif;onf tcsdefjzKef;wD;rINzpf onf/					
8	atmifjrifaom tem*wfukd ykdifqkdifEkdif&ef ocsFm bmom&yf ukd uRrf;usifykdifEkdifatmif avhvmxm;&ef rvkdtyfyg/					
9	ocsFmbmom&yfonf ausmif;wGifavhvm&efom rvkdtyf aom bmom&yfwpfckNzpfonf/					
10	ocsFmbmom&yfukd wwfajrmufjcif;onf tvkyfwpfck&&Sd &eftwGuf ta&;rygyg/					

ausmif;om;^olrsm;\ ocFsmbmom&yftay:xm;&dSaom taxGaxG,lqcsufqdkif&m ar;cGef;vTm

(General Perceptions)

atmufygtaMumif;t&m wpfckpDudk zwfíoif\ oabmxm;ESifh udkufnDaom tuGufudk (Â) oauFwjzifhjyyg/

(1)vkH;0oabmrwlyg/ (2) tenf;i,f oabmwlygonf/

(3)rqkH;jzwfwwfyg/ (4) oabmwlygonf/

(5) tvGefoabmwlygonf/

pOf	azmfjycsufrsm;	1	2	3	4	5
1	uREkfyfonf ocsFmtawG;tac:opfrsm;ukd oif,lvkdaomqE´ &Sdygonf/					
2	ocsFmykpämrsm;ukdajz&Sif;&mwGif ocsFmq&m (okdUr[kwf) twef; azmfrsm;ESifhrwlaom enf;vrf;opfrsm;ukd &SmazGwGufcsuf&ef pdwftm;xufoef ygonf/					
3	uREkfyf\ ocsFmq&m^rrsm;onf ocsFmbmom&yfukd uRrf;usi fMuygonf/					
4	uREkfyfem;rvnfaom ocsFmykpämrsm;ukd twef;azmf oli,fcsif; rsm;u &Sif;jyavh&Sdygonf/					
5	uREkfyf\rdbrsm;onf uREkfyfem;rvnfaom ocsFm					

	ykpämrsm;ukd &Sif;jyavh&Sdygonf/					
6	uREkfyfonf ocsFmtdrfpmrsm; jyKvkyf&onfukd rESpfoufyg/					
7	uREkfyfonf ocsFmykpämwpfyk'fukd ajz&Sif;&ef pOf;pm;awG;ac: jcif;xuf tajzrSef&&Sdjcif;ukd ykdítav;ay;ygonf/					
8	uREkfyf\ocsFmq&m^rrsm;onf ausmif;om;^olrsm;\ ocsFm bmom&yfwGif wkd;wufrIukd pddwfr0ifpm;yg/					
9	twef;azmfoli,fcsif;rsm;ESifh twlwuG ocsFmykpämrsm;ukd ajz&Sif;&jcif;ukd rESpfoufyg/					
10	uREkfyf\ rdbrsm;onf ocsFmbmom&yfukd pdwf0ifpm;Mu olrsm; r[kwfyg/					

Appendix B
Mathematics Achievement Test
owårwef; ausmif;om;^olrsm;\ ocsFmbmom&yfqdkif&m wwfajrmufrIppfaq;vTm 2016 ckESpf?------v

cGifhjyKcsdef (1) em&D nTefMum;csuf/ / ar;cGef;tm;vkH;udk owfrSwfxm;aom ajzvTmwGif ajzqdkyg/

tydkif;(u) ar;cGef;tm;vkH;ajzqdkyg/

1. atmufygudef;rsm;teuf &m&Sife,fr[kwfaom udef;rSm

(A) 0.333… (B) -8.95 (c) $\sqrt{6}$ (D) 0 jzpfonf/

2. a onf tEkwf &m&Sife,fudef;jzpfvQif

(A) $-a>0$ (B) $-a\geq 0$ (C) $-a<0$ (D) $-a\leq 0$ jzpfonf/

3. $17(\frac{1}{7})^0$ tajzonf/

(A) 17 (B) 18 (C) 19 (D)20 jzpfonf/

4. $\sqrt{17^2-8^2}$ =

(A) 12 (B)13 (C)14 (D)15 jzpfonf/

5. pwk&ef;ykH Murf;jyifwpfck\ {&d,mrSm 2.56m^2 tem;wpfzufrSm

(A) 1.5m (B) 1.6 m (c) 1.7m (D) 1.8m jzpfonf/

6. $(x-y)^2(x+y)^2$ =

(A) x^2-y^2 (B) x^2+y^2 (C) $x^4-2x^2y^2+y^4$ (D) $x^4+2x^2y^2-y^4$

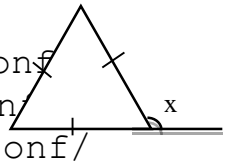
7. $\frac{2x+3y}{2x+y}=3.9, \frac{x}{y}=$ ... (A) $\frac{1}{2}$ (B) $\frac{3}{2}$ (C) $\frac{5}{2}$ (D) $\frac{7}{2}$

8. axmifhrSefMwd*Hwpfck\ tem;rsm;tcsdK;onf

(A) 1:2:3 (B) 2:3:4 (C) 3:4:5 (D) 4:5:6 jzpfonf/

9. ykHwGifx \wefzdk;rSm

(A) 90° (B) 100° (C) 110° (D) 120° jzpfonf



10. pwk*HcGufwpfck\ axmifhwpfaxmifhonf

(A) 360° (B) 180° (c) 90° (D) 60° xufMuD;onf/

11. axmifhjzwfrsOf;ESpfaMumif; wpfckudk wpfck axmifhrSefusvsuf xuf0ufydkif;aom pwk*Hudk (A) &Grf;Awf (B) MwmyDZD,rf (C) tem;jydKifpwk*H (D) axmifhrSefpwk*H [kac:onf/

tydkif;(c)

ar;cGef;tm;vkH;ajzqdkyg/

1. $\frac{1}{4}(x+5) - \frac{1}{2}(x+1) \geq 3$ udk qcGJudef;cGJyg/
2. $x^2 - 4b^2 + 4b - 1$ udk qcGJudef;cGJyg/
3. Bwd*HwpfckwGif∠ rSefaqmif tem;ESpffem;onf 2.4 cm ESifh3.7 cm toD;oD;jzpfvQif usefwwd, tem;udk&Smyg/

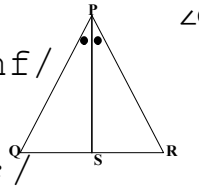
tydkif;(*)

ar;cGef;tm;vkH;ajzqdkyg/

1. $a^4+2a^3-15a^2-15a+25\sqrt{b^2-4ac}$ udk a^2+3a-5 jzifhpm;vQif tMuGif;r&dSap&ef wnfudef; rS rnfrQEkwf&rnfenf;/
2. vlwpfa,mufonf c&D;wpfckudk oGm;&m c&D;\ 3 ykH 1 ykH udk wpfem&DvQif 15 rdkifEIef;usoGm;í 2 ykHudk wpfem&DvQif 20 rdkifEIef;us oGm;ojzifh pkpkaygif; 1 em&D 20 rdepfMum\c&D;tuGmta0;udk &Smyg/
3. $\frac{x+3}{x^2-4} - \frac{x-5}{x^2+9x+14}$ udk&Sif;yg/

4. Δ ABC wGif ∠A = 90° jzpfonf/ ∠ B onf ∠ C \ ESpfqjzpfvQif ∠B ESifh ∠C udk &Smyg/

5. Δ PQR onf ESpfem;nD Mwd*Hwpfckjzpfí PQ = PR jzpfjyD; PS onf ∠QPR \axmifhxuf0ufydkif;rsOf;jzpfonf/



(i) ΔPQS ≅ Δ PRS jzpfygovm;/

(ii) S onf QR \ tv,frSwfjzpfygovm;/

(iii) ∠PSR = 90° jzpfygovm;/

taMumif;jycsufjzifhajzqdkyg/

6. A[dk O ESifh tcsif;0uf 2cm &dSaom puf0dkif;wpfckudkqGJyg/∠AOB = 90° jzpfaprnfh trSwfESpfck A ESifh B udk puf0dkif;ay:wGif,lyg/ A ESifh kUü qGJaom0ef;xd rsOf;rsm;onf C ü jz)ACB onf pwk&ef;wpfckjzpfygovm;/ ;jy csufay;yg/