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A STUDY OF THE CORRELATION BETWEEN STUDENT'S AFFECTIVE VARIABLES AND ACADEMIC ACHIEVEMENT IN LEARNING MATHEMATICS

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Abstract

The main purpose of this study was to study the correlation between students' affective variables and academic achievement in learning mathematics. Especially, this research aims to study students' affective variables (motivation, attitudes, anxiety and self-confidence) that correlate students' academic achievement in learning mathematics. A quantitative descriptive research method was used to gather the required data. Eight schools (four high schools and four middle schools) were randomly selected from four townships of four districts in Yangon City Development Area. In this study, (480) Grade Seven students were included as the subjects. As for the instruments, a questionnaire for students' affective variables and an achievement test were constructed. In order to find the correlation between the students' affective variables and academic achievement, Pearson product-moment correlation was used. According to the results, the correlation between the students' affective variables and academic achievement was r = .820, p< .01. Thus, if the students' affective variables are high, their academic achievement is likely to be high or if the students' affective variables are low, their academic achievement is likely to be low.

Keywords: affective variable, motivation, attitude, anxiety, self-confidence, academic achievement

1. INTRODUCTION

Education is that which transforms a person to live a better life and even in a social well-being. It is an important medium of acquiring skills and knowledge. Ones' education begins at home. Thereafter, as they grow and they go to schools, colleges and other educational institutes. It brings positive changes in human life. It enhances the knowledge, skill, and intelligence of a person and enables him to lead a successful life. It helps people to determine what is good or what is bad. Moreover, without education a person is incomplete, so education makes man a right thinker and a correct decision-maker.

1.1. Statement of the Problem

A number of affective variables influencing the learning of mathematics were examined by (Reyes 1984; McLeod, 1992). These variables include motivation, attitudes, self-confidence and anxiety that they are correlated on students' academic achievement. In fact, a major reason for studying affective factors in mathematics education is to find ways to help students learn more mathematics. Another reason to study affective variables is that a positive attitude toward mathematics is an important educational outcome, regardless of achievement level. In improving mathematics education, since the affective variables play a key role in students' achievement, educators, trainers, and researchers have long been interested in exploring variables contributing effectively for quality of academic achievement.

1.2. Purposes of the Study

The main purpose of this study is to study the correlation between students' affective variables and academic achievement in learning mathematics. The specific objectives are as follows:

- To study the students' affective variables in learning mathematics.

- To study the students' academic achievement in learning mathematics.
- To find out the relationship between students' affective variables and academic achievement in learning mathematics.
- To give suggestions based on the data obtained from the study to improve students' mathematics achievement.

1.3. Research Hypotheses

The following points are hypotheses of the study.

- There is a relationship between students' motivation and their academic achievement in learning mathematics.
- There is a relationship between students' attitudes toward mathematics and their academic achievement.
- There is a relationship between students' mathematics anxiety and their academic achievement.
- There is a relationship between students' academic self-confidence and their academic achievement in learning mathematics.
- There is a relationship between students' affective variables and their academic achievement in learning mathematics.

1.4. Definition of Key Terms

Affective Variable: Affective Variable is a learning motivation aspect which is part of the affective domain. Affect refers to the emotions, attitudes, feelings and beliefs that condition behavior (Arnold & Brown, 1999, cited in Ormrod, 2014).

Motivation: Motivation is the process that initiates, guides, and maintains goal-oriented behaviors (Cherry, 2020).

Attitude: an attitude refers to a set of emotions, beliefs, and behaviors toward a particular object, person, thing, or event (Cherry, 2020).

Anxiety: Anxiety is a feeling of unease, such as worry or fear, that can be mild or severe (Drummond, 2018).

Self-confidence: Self-confidence refers to personal judgments of performance capabilities in a given do-main of activity that may contain novel, unpredictable, and possibly stressful features (Schunk, 1985).

Academic Achievement: The display of knowledge attained or skills developed in schools, subjects designed by test and examinations scores or marks assigned by the subjects' teachers (Adediwura & Tayo, 2007).

1.5. 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 are Grade Seven students from the eight selected schools of the four strata in Yangon City Development Area (YCDA). The second limitation is that this study is only concerned with the affective variables such as motivation, attitudes, anxiety and self-confidence that correlate students' mathematics achievement. The third limitation is the content area of the subject. The content area is limited to nine chapters from Mathematics Textbook Volume I and four chapters from Mathematics Textbook Volume II to measure students' mathematics achievement.

1.6. Significance of the Study

Motivation is considered as an integral part in the achievement of any goal and important factor that has a positive influence in any educational learning process especially in learning mathematics (Zubair, 2012).

Students' success in mathematics depends upon attitude towards mathematics. Ma and Kishor (1997, cited in Belbase, 2013) stated that attitude towards mathematics is an aggregated measure of liking or disliking of mathematics, a tendency to engage in or avoid mathematical activity. Anxiety is another particular affective variable. It is one of the most prominent and pervasive emotions in learning mathematics. Studies have shown that as fright for mathematics and anxiety increase from students their attitudes toward mathematics decreases and while students are solving mathematical problems, the anxiety they will feel will lead them in not being able to find a solution (Altun, 2004, cited in Karasel, Ayda & Tezer, 2010). So, students' anxiety is a crucial factor in learning and achievement in that subject. According to the variables mentioned above, it is clear that these variables correlate students' academic achievement in learning mathematics. So, it is necessary to study these affective variables that

correlate the academic achievement in learning mathematics.

2. REVIEW OF RELATED LITERATURE

According to Gomez-Chacon (2000), a persistent problem in understanding the role of affect in mathematics teaching and learning has been to settle on a clear definition of what is affect or the affective domain. Affective variables have strong influence on mathematics learning and achievement. Such variables include motivation, attitudes, anxiety, and self-confidence (Reyes 1984; McLeod, 1992).

Motivation is considered to be one of the most important factors in learning process. Intrinsic motivational patterns have been associated with high-perceived ability and control (Fincham & Cain, 1986 as cited in Broussard, 2002). An extrinsic orientation towards learning is characterized by a concern with external reasons for working, such as the judgment of others regarding one's performance, grades, or some anticipated reward (Goldberg, 1994 as cited in Broussard, 2002). So, students' motivation in mathematics classroom is an important issue for teachers and researchers, due to its relation to students' behavior and achievement.

Students' success in mathematics depends upon attitude towards mathematics (McLeod, 1992). Having a positive attitude towards mathematics means generally enjoying working with mathematics and having confidence in one's own ability to do it but it does not mean that a student will display this positive attitude towards the whole area of mathematics all the time (Belbase, 2013).

Anxiety is another particular affective variable. Students with anxiety attending the class will feel nervous and afraid to cooperate with teachers and then they cannot concentrate on the learning points and waste their energy or they just want to flee the learning task. So, students' anxiety is a crucial factor in learning and achievement in that subject.

Self-confidence emerges as an important variable in student learning, because it affects students' motivation and their learning (Reyes, 1984). When facing difficulties, students who have a high sense of confidence for learning should expend greater effort and persist longer than those who doubt their capabilities, Schunk, 1985).

3. RESEARCH DESIGN AND PROCEDURE

3.1. Research Design

The research design for this study was a descriptive research design, in which the researcher seeks to determine whether, and to what degree, a relation exists between two or more affective variables (motivation, attitude, anxiety and self-confidence). In this study, the data were collected through a quantitative method.

3.2. Instruments

In this study, a questionnaire and an achievement test for Grade Seven students were used as the instruments. The questionnaire for students' affective variables was mainly based on Sheri Coates Broussard (2002), Kakai (2012), Plasisance (2009), and Liu and Wang (2005). In order to measure the mathematics achievement of the students, an achievement test was constructed. It was based on the content area of Grade Seven mathematics textbook prescribed by the Department of Educational Planning and Training, Myanmar. This test covers (13) chapters: (9) chapters from mathematics textbook volume I and (4) chapters from mathematics textbook volume II (Basic Education Curriculum, Syllabus and Text Book Committee, 2014-2015).

3.3. Population and Sample Size

All the participants in the sample were Grade Seven Students. This study was conducted in Yangon Region. There are four strata in the Yangon City Development Area (YCDA). One township from each stratum was randomly selected for this study. The sample schools for the study were selected by using a stratified random sampling technique. One high school and one middle school from each stratum were selected as the sample schools. Therefore, eight schools (four high schools and four middle schools) were included in this study. Four hundred and eighty Grade Seven students from the selected schools were selected as the subjects by using a random sampling technique.

3.4. Data Analysis

The data were analyzed by using the Statistical Package for the Social Science (SPSS) with descriptive statistics, mean and standard deviation and correlation.

4. RESEARCH FINDINGS

Students' affective variables in learning mathematics questionnaire were divided into four factors. They are (a) students' motivation, (b) students' attitudes toward mathematics, (c) students' mathematics anxiety, and (d) students' academic self-confidence.

4.1. Relationship of Students' Motivation and their Academic Achievement in Learning Mathematics

To find out the relationship between students' motivation and their academic achievement in learning mathematics, firstly the findings of students' motivation in learning mathematics and secondly the correlation between students' motivation and their academic achievement are presented.

4.1.1. Findings of Students' Motivation in Learning Mathematics

Students' motivation in learning mathematics was divided into two levels (lowly motivated and highly motivated). The result of means and standard deviation of lowly motivated and highly motivated students in learning mathematics were presented (see Table 1).

Table 1 Means of Lowly Motivated and Highly Motivated Students in Learning Mathematics

Position	N	Mean	SD
low	53	27.55	3.117
High	427	42.24	3.512

4.1.2. Findings of Students' Academic Achievement in Learning Mathematics

The result of means and standard deviation of lowly motivated and highly motivated students' academic achievement in learning mathematics were presented (see Table 2).

Table 2 Means of Lowly Motivated and Highly Motivated Students' Academic Achievement in Learning Mathematics

Position	N	Mean	SD
low	53	26.55	4.114
High	427	41.79	4.785

4.1.3. Correlation between Students' Motivation and their Academic Achievement in Learning Mathematics

(i) Table 3 shows the correlation between lowly motivated students and their academic achievement. It was found that there was a significant correlation r = .685, p < .01. This means that if the students' motivation is low, their academic achievement is likely to be low.

Table 3 Correlation between Lowly Motivated Students and their Academic Achievement in Learning Mathematics

Correlation			
		Lowly Motivated Student	**Academic Achievement**
Lowly Motivated Student	Pearson Correlation	1	.685**
	Sig. (2-tailed)		.000
	N	53	53

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

(ii) Table 4 shows the correlation between highly motivated students and their academic achievement. It was found that there was a significant correlation r = .653, p<.01. This means that if the students' motivation is high, their academic achievement is likely to be high.

Table 4 Correlation between Highly Motivated Students and their Academic Achievement in Learning Mathematics

Correlation			
		Highly Motivated Student	Academic Achievement
Highly Motivated Student	Pearson Correlation	1	.653**
	Sig. (2-tailed)		.000
	N	427	427

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

4.2. Relationship of Students' Attitudes toward Mathematics and their Academic Achievement in Learning Mathematics

To find out the relationship of students' attitudes toward mathematics and their academic achievement in learning mathematics, firstly the findings of students' attitudes for all the participants in the selected schools and secondly the correlation between students' attitudes and their academic achievement are presented.

4.2.1. Findings of Students' Attitudes toward Mathematics

Students' attitude in learning mathematics was divided into two levels (low attitude and high attitude). The result of means and standard deviation of low attitude and high attitude students in learning mathematics were presented (see Table 5).

Table 5 Means of Low Attitude and High Attitude Students in Learning Mathematics

Position	N	Mean	SD
low	64	25.47	5.297
High	416	37.72	3.964

4.2.2. Findings of Students' Academic Achievement in Learning Mathematics

The result of means and standard deviation of low attitude and high attitude students' academic achievement in learning mathematics were presented (see Table 6).

Table 6 Means of Low Attitude and High Attitude Students' Academic Achievement in Learning Mathematics

Position	N	Mean	SD
low	64	20.48	8.552
High	416	36.54	7.673

4.2.3. Correlation between Students' Attitudes toward Mathematics and their Academic Achievement in Learning Mathematics

(i) Table 7 shows the correlation between low attitude students and their academic achievement. It was found that there was a significant correlation $r = .670$, $p < .01$. This means that if the students' attitude is low, their academic achievement is likely to be low.

Table 7 Correlation between Low Attitude Students and their Academic Achievement in Learning Mathematics

Correlation			
		Low Attitude Student	Academic Achievement
Low Attitude Student	Pearson Correlation	1	.670**
	Sig. (2-tailed)		.000
	N	64	64

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

(ii) Table 8 shows the correlation between high attitude students and their academic achievement. It was found that there was a significant correlation $r = .729$, $p < .01$. This means that if the students' attitude is high, their academic achievement is likely to be high.

Table 8 Correlation between High Attitude Students and their Academic Achievement in Learning Mathematics

Correlation			
		High Attitude Student	Academic Achievement
High Attitude Student	Pearson Correlation	1	.729**
	Sig.(2-tailed)		.000
	N	416	416

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

4.3. Relationship of Students' Mathematics Anxiety and their Academic Achievement in Learning Mathematics

To find out the relationship of students' mathematics anxiety and their academic achievement in learning mathematics, firstly the findings of students' mathematics anxiety for all the participants in the selected schools and secondly the correlation between students' mathematics anxiety and their academic achievement are presented.

4.3.1. Findings of Students' Mathematics Anxiety in Learning Mathematics

The result of means and standard deviation of low anxiety and high anxiety students in learning mathematics were presented (see Table 9).

Table 9 Means of Low Anxiety and High Anxiety Students' Academic Achievement in Learning Mathematics

Position	N	Mean	SD
low	155	25.36	4.421
High	325	34.27	7.17

The result of means and standard deviation of low anxiety and high anxiety students' academic achievement in learning mathematics were presented (see Table 10).

Table 10 Means of Low Anxiety and High Anxiety Students' Academic Achievement in Learning Mathematics

Position	N	Mean	SD
low	155	18.11	11.211
High	325	26.09	8.833

4.3.3. Correlation between Students' Mathematics Anxiety and their Academic Achievement in Learning Mathematics

(i) Table 11 shows the correlation between low anxiety students and their academic achievement. It was found that there was a significant correlation $r = -.635$, $p < .01$. This means that if the students' anxiety is low, their academic achievement is likely to be high.

Table 11 Correlation between Low Anxiety Students and their Academic Achievement in Learning Mathematics

Correlation			
		Low Anxiety Student	Academic Achievement
Low Anxiety Student	Pearson Correlation	1	-.635**
	Sig. (2-tailed)		.000
	N	155	155

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

(ii) Table 12 shows the correlation between high anxiety students and their academic achievement. It was found that there was a significant correlation $r = -.784$, $p < .01$. This means that if the students' anxiety is high, their academic achievement is likely to be low.

Table 12 Correlation between High Anxiety Students and their Academic Achievement in Learning Mathematics

Correlation			
		High Anxiety Student	Academic Achievement
High Anxiety Student	Pearson Correlation	1	-.784**
	Sig. (2-tailed)		.000
	N	325	325

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

4.4. Relationship of Students' Academic Self-confidence and their Academic Achievement in Learning Mathematics

To find out the relationship of students' academic self-confidence and their academic achievement in learning mathematics, firstly the findings of students' academic self-confidence in learning mathematics for all the participants in the selected schools and secondly the correlation between students' academic self-confidence and their academic achievement were presented.

4.4.1. Findings of Students' Academic Self-confidence in Learning Mathematics

The result of means and standard deviation of low self-confidence and high self-confidence students in learning mathematics (see Table 13) were presented.

Table 13 Means of Low Self-confidence and High Self-confidence Students in Learning Mathematics

Position	No.	Mean	SD
low	50	25.30	3.221
High	430	41.88	5.280

4.4.2. Findings of Students' Academic Achievement in Learning Mathematics

The result of means and standard deviation of low self-confidence and high self-confidence students' academic achievement in learning mathematics were presented (see Table 14).

Table 14 Means of Low Self-confidence and High Self-confidence Students' Academic Achievement in Learning Mathematics

Position	N	Mean	SD
low	50	25.52	5.052
High	430	40.50	5.320

4.4.3. Correlation between Students' Academic Self-confidence and their Academic Achievement in Learning Mathematics

(i) It was found that there was a significant correlation $r = .761$, $p < .01$. The result shows that the direction of correlation was positive. Table 15 shows the correlation between low self-confidence students and their academic achievement. This means that if the students' academic self-confidence is low, their academic achievement is likely to be low.

Table 15 Correlation between Low Self-confidence Students and their Academic Achievement in Learning Mathematics

Correlation			
		Low Self-confidence Student	Academic Achievement
Low Self-confidence Student	Pearson Correlation	1	.761**
	Sig. (2-tailed)		.000
	N	50	50

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

(ii) To examine the correlation between high self-confidence students and their academic achievement, Pearson product-moment correlation was used. It was found that there was a significant correlation $r = .769$, $p < .01$. This means that if the students' academic self-confidence is high, their academic achievement is likely to be high.

Table 16 Correlation between High Self-confidence Students and their Academic Achievement in Learning Mathematics

Correlation			
		High Self-confidence Student	Academic Achievement
High Self-confidence Student	Pearson Correlation	1	.769**
	Sig.(2-tailed)		.000
	N	430	430

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

4.5. Relationship of Students' Affective Variables and their Academic Achievement in Learning Mathematics

The findings of students' affective variables in learning mathematics and the correlation between students' affective variables and their academic achievement are presented.

4.5.1. Findings of Students' Affective Variables in Learning Mathematics

The result of means and standard deviation of students' affective variables and their academic achievement in learning mathematics (see Table 17) were presented.

Table 17 Mean of Students' Affective Variables and their Academic Achievement in Learning mathematics

Position	No.	Mean (Affective variables)	SD (Affective variables)	Mean (Academic Achievement)	SD (Affective variables)
Overall	480	150.59	24.794	146.23	27.234

4.5.2. Correlation between Students' Affective Variables and their Academic Achievement in Learning Mathematics

Table 18 shows the correlation between students' affective variables and their academic achievement. It was found that there was a significant correlation r = .820, p<.01. This means that if the students' affective variables are high, their academic achievement is likely to be high or if the students' affective variables are low, their academic achievement is likely to be low.

Table 18 Correlation of Students' Affective Variables and their Academic Achievement in Learning Mathematics

Correlation			
		Students' Affective Variables	Academic Achievement
Students' Affective Variables	Pearson Correlation	1	.820**
	Sig. (2-tailed)		.000
	N	480	480

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

4.6. The Summary of the Findings

To sum up, the findings can be generalized as follows.

- For students' motivation in learning mathematics, there is a positive relationship between lowly motivated students and their academic achievement (r=.685, p<.01). There is also a positive relationship between highly motivated students and their academic achievement (r=.653, p<.01).
- For students' attitudes toward mathematics in learning mathematics. There is a positive relationship between low attitude students and their academic achievement (r=.670, p<.01). There is also a positive relationship between high attitude students and their academic achievement (r=.729, p<.01).
- For students' mathematics anxiety in learning mathematics. There is a negative relationship

between low anxiety students and their academic achievement (r=-.635, p<.01). There is also a negative relationship between high anxiety students and their academic achievement (r=-.784, p<.01).

- For students' academic self-confidence in learning mathematics. There is a positive relationship between low self-confidence students and their academic achievement (r=.761, p<.01). There is also a positive relationship between high self-confidence students and their academic achievement (r=.769, p<.01).
- For students' affective variables and academic achievement in learning mathematics, there is a positive relationship between students' affective variables and academic achievement (r=.820, p<.01).

Based on the research findings, discussion, suggestions and conclusion will be presented in the next chapter.

5. CONCLUSIONS

After presenting the findings of the research study, discussion, suggestions and conclusion are presented in this chapter.

5.1. Discussion

The research findings reveal that students' motivation, students' attitudes toward mathematics, students' mathematics anxiety and students' academic self-confidence correlate students' academic achievement.

Students who were highly motivated can do well and try hard in the class although they aren't intelligent and wouldn't have mathematics ability. The results of students' attitude can support the finding of Marchis (2013): relation between students' attitude towards mathematics and their academic performance. In this research, there is a relationship between students' mathematics anxiety and their academic achievement. This finding can support the finding of Karasel (2013): relation between students' mathematics anxiety and their academic performance. It can be concluded that students who are low anxiety have higher mathematics performance. The results of students' academic self-confidence and their academic achievement can support the finding of Singh (2010): relation between students' academic self-confidence and their academic performance. It can be concluded that students who are highly motivated have higher performance.

According to the above results, a generalization can be drawn that the students' motivation, students' attitudes towards mathematics, students' mathematics anxiety and students' academic self-confidence are significantly influenced on students' mathematics achievement. Therefore, it can be realized that these variables are essential for improving students' mathematics achievement in learning mathematics.

5.2. Suggestions

Students' mathematics achievements were dependent upon their learning motivation. It is necessary to keep highly motivated students in order to be a support for an effective teaching-learning situation.

Students' attitudes toward mathematics are very much correlated to their mathematics performance in general. To develop students' positive attitude towards mathematics, teachers should use teaching methods which encourage collaboration, put the students in the situation of explaining his/her solution. Anxious students lose information because of the distraction caused by anxiety, especially in learning mathematics. Mathematics anxiety is negatively correlated with mathematics performance. Therefore, teachers should reduce students' mathematics anxiety. Posamentier (1986) expressed (12) ways to overcome mathematics anxiety. Therefore, teacher should use these ways.

Confidence towards problem solving is believed to play a significant role in mathematics achievement and might be one of the factors that influence students in mathematics. So, students should be helpful in building up greater confidence. Teachers should provide opportunities for students to work together in small groups so that they may discuss and explore problem solving techniques.

In addition, this study is dealt with the affective variables that correlate the students' mathematics achievement such as students' motivation, students' attitudes toward mathematics, students' mathematics anxiety and students' academic self-confidence. Therefore, further

studies should be conducted with many other variables such as study habits, self-concept and self-efficacy and so on.

5.3. Conclusion

The research findings revealed that there were positive, negative and moderate correlations between students' motivation and academic achievement, students' attitudes toward mathematics and academic achievement, students' mathematics anxiety and academic achievement and students' academic self-confidence and academic achievement.

So, according to these results, it can be concluded that there is a relationship between students' affective variables and academic achievement. Sometimes, mathematics learning is regarded as complex and technical that most students are afraid of. So, it is necessary to minimize such negative reactions of students and improve their mathematics learning. According to this study, all these factors mentioned above could be applicable to mathematics learning. So, it can be clearly seen that students' affective variables are essential to improve their mathematics learning.

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