THE INFLUENCE OF ACADEMIC ATTITUDE AND SELF-EFFICACY TOWARDS STUDENTS' ACHIEVEMENT IN PRIVATE HIGHER LEARNING INSTITUTION, MALAYSIA

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Abstract
This study aimed to examine the influence of two constructs – academic attitude and academic self-efficacy in mathematics – and their influence towards students' mathematics achievement. For this purpose, a sample of 200 allied health college students was randomly selected from two campuses of Masterskill Global College (formerly known as Masterskill College of Nursing and Health). The questionnaire was a combination of two sets of inventories that had been modified to suit the purpose of study. They were the Attitude towards Mathematics Inventory (ATMI) and College Academic Self-Efficacy Scale (CASES). Two statistical procedures were utilized to examine the demographic and data analyses, which were descriptives and inferential statistics. The analyses reported respondents had high and positive mean score on both constructs, and there were also significant difference in respondents' mean score based on campuses and mathematics achievement grades. Moreover, different construct significantly influence achievement in mathematics. Thus, for future research purposes, it is hoped that other contributing factors will be studied on, so as to fill this knowledge gap. Additional research could also be conducted in other allied health colleges.

Keywords: academic, attitude, self efficacy, mathematics, achievements

1. Background of Study

Teaching and learning mathematics are complex tasks (Grouws and Cebulla, 2000). Teachers need to ensure that their teaching techniques are effective so that their students are able to grasp what was being imparted to them during teaching and learning process. Students, on the other hand, need to have the interest to learn and have strong foundation in mathematics to prevent them from having difficulties when learning mathematics at a higher level. As stated by Graham and Provost (2012), without strong foundation in early mathematics, students are not prepared to enrol in more advance mathematics at high school and college level.

There are actually quite a wide range of factors that could lead to difficulty in learning mathematics. These factors can be in an intrinsic or extrinsic form. Among the extrinsic influences are entry mastery; opportunities to learn; external motivation; financial resources and language barriers (Saxe (1988); Capraro (2009)). Meanwhile, the intrinsic influences could be from the learner's will to learn; attitude; self-efficacy; cognitive ability and anxiety level towards mathematics.

Despite the different types of factors, some students do find it difficult to cope with the mathematics syllabus offered in the Masterskill Global College, although the syllabus covers similar topics during secondary school. Some of these students even managed to achieve good grades during their Malaysian Certificate of Education examination and yet could not handle the challenges portrayed in the syllabus. As stated by Pandit (2004), there are students who have average or above average intelligence but continuously fail to maintain normal progress in school subjects, even though these students are not handicapped.

The mathematics syllabus in Masterskill Global College is quite similar to those in the Malaysian secondary school mathematics curriculum. Students still need to focus on Geometry, Algebra, Calculus, Trigonometry and Statistics, but the problem solving situations are more likely to be linked to their own area of study. For instance, students in Environmental Health would use logarithm in identifying the pH value of a river, whereas Medical Lab Technology students would use logarithm in investigating cell duplication. Although the area of study is different, students still need to know the rules of logarithm when solving their respective problem, which is the very basic thing to index and logarithm.

Since the importance of higher education has increased several folds in the world, the awareness on the importance of mathematics in higher learning institution such as Masterskill Global College need to be established (Rizwan and Rafaqaat, 2010). Educators need to know how to generate students' optimal potential in this subject by identifying what factor affects students' performance the most. This indirectly requires educators to change their teaching approaches, strategies and practices in the classroom.

Thus, the purpose of this paper is to examine the influence of two intrinsic contributing factors towards students' mathematics achievement. These factors are academic attitude and students' academic self-efficacy in mathematics. Although quite a number of researchers had studied on these two constructs, related studies in mathematics for tertiary level involving all two constructs are relatively few in comparison to those carried out at the primary and secondary level.

2. Objectives

This research would consist of the following objectives:

a) To identify students' academic attitude and academic self-efficacy in mathematics.
b) To determine the differences in student's academic attitude and students' perception of academic self-efficacy in Mathematics based on campus.
c) To determine the differences in student's academic attitude and students' perception of academic self-efficacy in Mathematics based on mathematics achievement.
d) To determine the relationship among student's academic attitude in mathematics, academic self-efficacy and mathematics achievement.
e) To identify the influence of student's academic attitude in mathematics and academic self-efficacy towards mathematics achievement.

3. Research Hypotheses

H_{o1} There is no significant difference in students' academic attitude in mathematics based on campus.

H_{o2} There is no significant difference in students' academic self-efficacy in Mathematics based on campus.

H_{o3} There is no significant difference in students' academic attitude in mathematics based on mathematics achievement.

H_{o4} There is no significant difference in students' academic self-efficacy in Mathematics based on mathematics achievement.

H_{o5} There is no significant relationship between students' academic attitude and academic self-efficacy.

H_{o6} There is no significant influence of students' academic attitude and academic self-efficacy towards mathematics achievement.

4. Conceptual Definitions

4.1. Academic Self-Efficacy in Mathematics

Based on the definition of academic self-efficacy by Zimmerman (1995), May and Glynn (2008) had developed a Mathematics Self-Efficacy Questionnaire (MSEQ) that provides college mathematics instructors and mathematics-education researchers with information about students' self-efficacy (specific confidence) in their ability to learn mathematics. The questionnaire covered three subscales that are academic habits, mathematics anxiety and mathematics self-efficacy.

However, the MSEQ is not going to be used for the purpose of this research. Instead, a College Academic Self-Efficacy Scale (CASES) will be adapted. Similarly, CASES will also measures students' academic self-efficacy. It was designed by Owen and Froman (1988) to measure academic self-efficacy by asking students to rate how confident they feel regarding their abilities to perform common academic-related behaviours in college. In addition, Carroll *et al.* (2009) stated that academic self-efficacy had a strong relationship with academic achievement and young people who believe in their capabilities to exercise over their educational performance, achieve higher results academically than counterparts who have less efficacious beliefs in their academic pursuits.

Consequently, Ryan and Pintrich (1997) in Chamdimba (2008) stated that confidence in mathematics has been associated with mathematics achievement. Students who perceived themselves with high capability performed better than those who did not. According to Zimmerman (2000), self-efficacy beliefs have been found to be sensitive to subtle changes in students' performance context, to interact with self-regulated learning processes, and to mediate students' academic achievement. In another research of English language performance, the researcher found that when there is academic self efficacy or self perceptions of competence, the students succeed in their English language performance (Rahil *et al*., 2006).

Then in a research conducted by Cheng and Westwood (2007), although there was not a strong relationship, they proved that there was indeed an association between achievement and self-efficacy ($r = .31$) among primary school students in Hong Kong. Moreover, the similar findings was found in research among post-secondary first-term students'. It resulted that both General and Specific Self-Efficacy was related to first term academic success and grades (Becker and Gable, 2009).

In another study conducted by Dorman *et al.* (2003), they found that mathematics classroom environment is significantly associated with academic efficacy, which was based on four sources of academic efficacy, namely (a) performance; (b) vicarious experience; (c) persuasion; and (d) physical and affective states, which were designated by Bandura (1997). Another study also indicated the same result, whereby mathematics self-efficacy and mathematics achievement were positively related (Liu and Koirala, 2009).

There was probably no research that proves otherwise on the association between academic self-efficacy and academic achievement, especially among tertiary level students. Thus, this study will use this advantage to explore this research gap.

4.2. Students' Attitude towards Mathematics

Students' attitude towards Mathematics can be measured using Aiken's Mathematics Attitude Scale, developed in 1974. Aiken claimed that attitude may be multi-dimensional rather than uni-dimensional and contain two components, enjoyment and value of mathematics (Chamberlain, 2010). This basically means to have a positive attitude students need to enjoy the subject as well as appreciate it during teaching and

learning process.

The introduction of Aiken's scale has led to the development Tapia and Marsh's Attitude towards Mathematics Inventory (ATMI) in 2004, which dealt with attitudes that may contribute to math anxiety and to expand beyond measurement of enjoyment (Tapia and Marsh, 2005). The inventory consists of four scales, namely (a) self-confidence; (b) value of mathematics; (c) enjoyment of mathematics; and (d) motivation. The descriptions of these scales are as illustrated in Table 1 below.

Table 1: Descriptive Information for Each Scale in ATMI

Scale Name	Scale description
Self-confidence	To measure students' confidence and self-concept of their performance in mathematics.
Value	To measure students' beliefs on the usefulness, relevance and worth of mathematics in their life now and in the future.
Enjoyment	To measure the degree to which students enjoy working mathematics and mathematics classes
Motivation	To measure interest in mathematics and desire to pursue studies in mathematics

Source: Martha Tapia and George E. Marsh II (2004)

Consequently, a cross-national study of 8th graders in several countries found that each dimension of mathematics attitude (self-confidence in learning mathematics; liking mathematics; and usefulness of mathematics) was positively related to mathematics achievement for almost all 33 countries (Kadijevich, 2009). This portrays that attitude do plays an important role in either to predict of to affect students' mathematics achievement.

Another study conducted by Lim in 2010 further supported Kadijevich's findings. Lim (2010) found that achievement correlated positively with some of the domains of attitudes, which were self-confidence, value and enjoyment. The study was conducted among junior college students. Simillarly, in a research by Kouassi among Ivorian female students, it was apparent that certain components of students' attitudes relate positively to achievement (Frazier-Kouassi, 1999).

There was a study that proved the association between learning environment and attitude towards mathematics, which was carried out by Siti and Efandi (2010). The study was performed amongst engineering technology students. Here, students who responded positively towards classroom learning environment showed that they also have positive attitude towards the subject.

In the contrary, there are some studies that did not find any association between attitude and academic achievement (Yenilmez *et al.*, 2007). Furthermore, White *et al.* (2006) indicated that a negative attitude regarding the nature of mathematics does not preclude (hinder) a positive attitude to achievement in mathematics. In other words, both positive and negative attitude can affect student's mathematics achievement. At different times, students could be keen about doing mathematics but not have the necessary background to succeed. The reverse situations could also apply. Likewise, MacLeod (1992) in Siti and Effandi (2010) pointed an issue that students' attitude is triggered by the situation rather than the emotion.

Another research that showed students' high performance in mathematics is not necessarily associated with positive attitude towards mathematics was conducted by Mullis *et al.* in the year 2000. They revealed that while Japanese students outperformed students from many other countries in mathematics, they (students) displayed relatively negative attitudes towards mathematics (Mullis *et al.*, 2000). Although there are many other researches that proved the other way around, this evidence indicates that there is no

consistent result in the relationship between students' attitudes and achievement in mathematics.

Theoretically, engineering students' attitude towards mathematics would differ from those who are studying in other programs like allied health programs because the importance of mathematics between these students varies. Engineering students would feel that mathematics is important to them for they need to use it in their future career and would have like the subject beforehand. Allied health students, on the other hand, would feel like it is just one of the requirements for them to pass the subject so that they would be able to graduate from their course.

Hence, this study would investigate on this knowledge gap that would involve allied health students as respondents, to determine if attitude could be a predictor in students' performance or achievement in mathematics.

5. Methodology

This study applied quantitative approach with non-experimental design by using servay. Samples were 200 allied health college students from two campuses of Masterskill Global College (formerly known as Masterskill College of Nursing and Health) who participated in the study, applying purposive and random sampling technique. The instruments were a combination of two sets of inventories that had been modified to suit the purpose of study. They were the Attitude towards Mathematics Inventory (ATMI) and College Academic Self-Efficacy Scale (CASES) All instruments used 5 Likert Scale from Strongly Disagree – Strongly Agree. To check the validity and reliability, exploratory factor analysis showed that all items for both variables carried minimum factor loadings (>.40) for each construct. In addition, Cronbach's alphas were also adequate for both variables (>.70). Two statistical procedures were utilized to examine the demographic and data analyses, which were descriptives and inferential statistics.

6. Findings

The findings will be discussed based on the hypotheses as mentioned previously.

H_o^1: There is no significant difference in students' attitude towards Mathematics based on campus.

For the first hypothesis, its result is shown in Table 2. Here, there was significant difference in students' attitude towards mathematics between Kuching and Kota Kinabalu respondents because the significant value is less than the alpha value , and the null hypothesis (H_0^1) was rejected at a 95% confidence level.

This result suggested that Kuching campus' respondents had perceived their attitude towards mathematics to be slightly lower than those in Kota Kinabalu campus .

Table 2: Independent Samples *t* - test for ATMI

Campus	Mean	SD	*p* - value
Kuching	3.386	0.562	0.042*
Kota Kinabalu	3.527	0.416	

*Note: * indicates significance at 0.05 ($p < 0.05$)*

H_o2: There is no significant difference in students' academic self-efficacy in Mathematics based on campus.

In Table 3, the outcome suggested that there was a significant difference in students' perception of academic self-efficacy in mathematics between Kuching and Kota Kinabalu respondents because the significant value is lesser than the alpha value, and therefore the null hypothesis (H_02) was rejected at a 95% confidence level. This result suggested that Kuching campus' respondents had lower academic self-efficacy in mathematics as compared to Kota Kinabalu respondents.

Table 3: Independent Samples *t* - test for CASES

Campus	Mean	SD	*p* - value
Kuching	3.637	0.415	0.023*
Kota Kinabalu	3.786	0.478	

*Note: * indicates significance at 0.05 ($p < 0.05$)*

H_{o3}: There is no significant difference in students' attitude towards Mathematics based on mathematics achievement.

For this next hypothesis, Levene's test reported that the *F* - value was 1.585, with a significant value of 0.180 (> 0.05). Since the null hypothesis that states the variances of the five populations from which the samples drawn are equal was not rejected, the variances for students' attitude levels towards mathematics for all five grades in the population were assumed to be equal.

Table 4 reported that there was a significant difference on the respondents' attitude towards mathematics based on mathematics achievement [F (4, 195) = 3.140,]. In other words, the null hypothesis ($H_0$5) was rejected, and at least one pair of mean score showed a statistically significant difference.

The Post-Hoc comparisons using Tukey HSD method reported that the mean difference for Distinction-Average Pass () pair was significantly different than the other pairs of mean (*p* - value = 0.024 < 0.05). This means that respondents with higher grade level had better attitude towards mathematics as compared to those of lower grade levels.

Table 4: ANOVA Result for ATMI

	SS	df	MS	F	*p* - value
Between Groups	2.842	4	.710	3.140	0.016*
Within Groups	44.121	195	.226		
Total	46.963	199			

*Note: * indicates significance at 0.05 ($p < 0.05$)*

H_{o4}: There is no significant difference in students' academic self-efficacy in Mathematics based on mathematics achievement.

From Table 5, it was reported that there was a significant difference on respondents' perception of academic self-efficacy in mathematics based on mathematics achievement [F (4, 195) = 2.662,]. Thus, the null hypothesis (H_{04}) was rejected, and at least one pair of mean score showed a statistically significant difference. Consequently, the Post-Hoc comparisons using Tukey HSD method in showed that the mean difference for Distinction-Average Pass pair was significantly different than the other pairs of mean (*p* - value = 0.023 < 0.05). This indicates that respondents with higher grade level perceived academic self-efficacy in mathematics positively as compared to those of lower grade levels.

Table 5: ANOVA Result for CASES

	SS	df	MS	F	*p* - value
Between Groups	2.163	4	.541	2.662	0.034*
Within Groups	39.621	195	.203		
Total	41.784	199			

*Note: * indicates significance at 0.05 ($p < 0.05$)*

H_{o5}: There is no significant relationship between students' attitude towards Mathematics with student's academic self-efficacy in Mathematics.

In Table 6, both constructs were positively correlated to one another. In addition, the relationship that between ATMI and CASES indicated a moderate strength as well, r = 0.541, n = 200. Therefore, the null hypothesis (H_{05}) was rejected at a 99% confidence level. This result suggested that there is significant positive relationship between student's attitude with academic self-efficacy in Mathematics.

Table 6: Correlation between Constructs

		CASES
ATMI	Pearson Correlation	0.541
	Sig. (2-tailed)	0.001*
	N	200

H_{o6}: There is no significant influence of students' attitude and academic self-efficacy towards mathematics achievement.

Multiple regression analysis was used to test the above hyphotesis. Table 7 illustrates the model summaries. It was found that only attitude towards mathematics variable significantly predicted on the Distinction (1) grade, with and p – value = 0.016 (< 0.05). Thus the null hypothesis (H_{06}) was rejected at 95% confidence level. The table also shows that only attitude towards mathematics significantly infleunce Distinction grade by 2.9% (F=5.85, ß=1.169).

Table 7: Model Summary (Multiple Regression Analysis)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Beta	Sig.
1	.169(a)	.029	.024	.414	5.853	.169	.016

Model 1: Attitude towards Mathematics

7. Discussioon and Conclusion

Additionally, results of the two independent samples t-tests portrayed that all three constructs had a significant difference between Kuching and Kota Kinabalu campuses. The only similarity between these tests was students from Kuching campus had lower mean score on both constructs as compared to those in Kota Kinabalu campus. These findings suggested that students in Kota Kinabalu campus were more positive towards the mathematics, and were more confident in solving mathematical problem.

Moreover, looking into the differences based on mathematics achievement, the one-way ANOVA analysis reported that both attitude and academic self-efficacy constructs revealed that the Distinction-Average Pass pair of mean had a significant difference. This implied that students who obtained Distinction for mathematics had higher perception on all variables as compared to those who obtained Credit and below.

The result of the correlation analysis, on the other hand, indicated that there were positive relationships between variables. The relationship between attitude and academic self-efficacy were also positively related (r = 0.541). Students with high attitude towards mathematics were associated with high perception on academic self-efficacy in mathematics.

Finally, the outcomes of the multiple regression analyses reported that mathematics achievement of grade Distinction could be significantly predicted by only one construct, which was student's attitude

towards Mathematics. These results obviously revealed an inconsistency with the findings in the literature that proved both constructs to be associated with mathematics achievement (Dorman *et al*. (2003); Chionh and Fraser (2009); Fraser and Khale (2007); Rizwan and Rafaqat (2010)).

This basically meant that even though student's attitude and academic self-efficacy are high or positive, it is yet not a good predictor for mathematics achievement in Masterskill Global College. This is probably due to the fact that students would have liked the subject and have confidence in answering or solving mathematical problem beforehand. Consequently, it could be caused by other contributing factors such as socio-economic, family and psychosocial problem, knowledge background, as well as peer influence.

The results of this study demonstrated a new breakthrough in the relationship of both constructs (attitude and academic self-efficacy) towards mathematics achievement. Students with positive attitude towards the subject might not tend to obtain higher grades; and students who had positive perception on their academic self-efficacy in mathematics also might not develop better grades in the said subject as well.

In addition, this study provides empirical evidence that there is a difference between allied health and engineering technology students when it comes to utilizing self efficacy and attitude in predicting students' achievement in mathematics. It was clear that both constructs would not necessarily influence achievement, and would have been caused by other contributing factors. The outcomes of the findings also suggested that only student's attitude can predict one grade in mathematics achievement that was Distinction.

Although both constructs had no overall influence on achievement in mathematics, the importance of having positive judgement on both constructs among college students are vital. This is because in order to ensure that they can perform well in mathematics, students need to be developed holistically. As stated in our National Education Philosophy (NEP), education in Malaysia is to produce individuals who are intellectually, spiritually, emotionally and physically balanced. In this case, students seem to be physically, emotionally and spiritually balanced for they had good attitude and confidence. But, they might be lack of intellectual ability, which could be researched on in the near future.

Consequently, results from this study can be generalized to the population of all nursing and allied health college that offers similar programs and core subjects. Here, instead of using ATMI and CASES questionnaires in predicting achievement, academicians can use them to identify the strengths and weaknesses in their teaching and learning process, for it could identify poor attitude towards mathematics or poor academic self-efficacy in mathematics. That way, they could focus on improving their weaknesses and at the same time, maintain the strengths of their teachng strategies.

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