

Khalifa University Students' Attitudes Towards Mathematics in the Light of Variables Such as Gender, Nationality, Mathematics Scores and the Course they are Attending

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Abstract: This study was aimed at identifying the attitudes of the students of Khalifa University towards mathematics. The sample of this study consisted of 88(out of 216) students distributed evenly according to gender. 56.9% of the sample were Emiratis and 53.1% were expatriates. The Attitude Towards Mathematics Inventory (ATMI) was implemented in collecting the data. The results of this study indicated that there were slight statistically significant differences between students' attitudes towards mathematics and mathematics achievement scores, age, the course they are attending, students' high school type, gender and their academic level. Additionally, the results indicated that there were statistically significant differences between self-confidence, enjoyment and value with and students' nationalities. Expatriates students showed higher positive attitudes towards mathematics than the Emirati students. Also, the results showed that there was a slight statistical relationship between enjoyment and students' academic level. Finally, this study revealed that 62.67% of the sample have self-confidence in dealing with mathematics, 84.4% felt that mathematics has a great value to them, and 75.49% showed enjoyment in dealing with mathematics.

Keywords: Attitudes, Mathematics, Gender, Nationality, Course Attending

1. Introduction

Researches on students' attitudes toward mathematics have acquired increasing attention. Many studies outlined that mathematics learning is influenced by several factors; such as motivation, curriculum, teacher and his way of teaching and educational teaching aids he used (Cote & Levine, 2000; Singh et al., 2002; Olatunde, 2009; Howie, 2005; Singh, et al., 2002). Also, Hill (2004) indicated that integrating mathematics and science curriculum does improve students' attitude toward mathematics. Yet, regardless of the amount of effort spend in the improvement and development of mathematics learning process, efforts will have a slight impact on achievement unless there is a positive attitude towards mathematics. (Ma & Kishor, 1997; Ma, & Xu, 2004). However, many factors have influences on students' attitudes toward mathematics. Teachers, parents, and peers, as well as the school environment, all have influences on an individual's attitude. Wilkins and MA (2003) showed that teachers', peers', and parents' positive support will help in creating positive attitude and beliefs about mathematics and thus help restrain

negative attitudes and beliefs. Whereas Ames (1992) considered student's home environment and access to instructional materials can all have an impact on his/her attitude and achievement.

1.1. Purpose of the Study

The general purpose of this study was to find out the attitudes of the students of Khalifa University towards mathematics. The study is focused on the relationship of their attitudes towards mathematics with other factors such as; gender, mathematics scores, high school type, nationality, academic level, age and the mathematics course they are attending.

1.2. Research Questions

This study aimed to answer the following questions:

1. What is the relationship between students' attitudes towards mathematics and academic achievement?
2. What is the relationship between students' attitudes towards mathematics and gender?

3. What is the relationship between students' attitudes towards mathematics and nationality?
4. What is the relationship between attitudes towards mathematics and academic level (foundation or freshmen year)?
5. What is the relationship between attitudes towards mathematics and age?
6. What is the relationship between attitudes towards mathematics and mathematics courses they are attending?
7. What is the relationship between attitudes towards mathematics and high school type?

1.3. Definition of Terms

The following definitions are provided for terms having special applications to this study.

1. Attitude – “refers to someone’s basic liking or disliking of familiar target” (Hannula, 2002; p.25)
2. High School Type: The high school type refers to either private or government school.
3. Academic Level: The academic level refers to whether the student is in foundation or freshman year.
4. Nationality: The nationality refers to whether the student is an Emirati or an Expatriate.

1.4. Literature Review

Many studies have studied the students' attitudes towards mathematics and the impact of that on their achievement. Gottfried (1985) reported in his study that students who value and enjoy mathematics have a higher level of achievement. As well as, Ma and Xu (2004) outlined in their study that poor achievement has been linked to a decline in mathematics attitude. Therefore, achievement in mathematics caused a positive attitude. However, a positive attitude towards mathematics does not lead to a good achievement. Other factors might affect students' achievement in mathematics such as textbooks, and teacher quality (Howie, 2005). Yet, both Tapia and Marsh II (2004) argue that students who do well in mathematics showed positive attitudes, consequently they are likely to take more mathematics courses. So, attitude and achievement affect each other in a cyclical manner (Schiefele & Csikszentmihalyi, 2004). Whereas, Ma and Kishor (1997) concluded that the relationship between attitudes towards mathematics and mathematics achievement is not a strong enough. Along with that, Phonguttha, et al. (2009) agreed with Ma and Kishor that mathematics achievement and attitude towards mathematics are not correlated. Furthermore, Casey et al. (1997) and Ma (1999) showed that the relationship between attitude and mathematics achievement exists only with respect to specific or particular mathematics content areas. Maple and Stage (1991) indicated that students' attitude towards mathematics could be used as a predictor of selecting a mathematics major but not for achievement. Whereas, Oakes (1990) argued that students with lower levels of achievement in mathematics confine students' career alternatives involving mathematical

skills.

Other studies outlined that students' achievement in mathematics is influenced by a variety of factors other than students' attitudes towards mathematics, such as gender, teacher's experience, parents, socioeconomic status, ethnicity, cultural background, grade level and peers (Casey et al, 1997; Ho, et al., 2000; Ma & Kishor, 1997; Ma, 1999, 1997; Carrier, 2008; Isiksal, 2008). Moreover, other researchers outlined that students' attitudes towards mathematics can be affected by teacher attitudes and beliefs (Uusimaki & Nason, 2004; Beswick, 2006; Wilkins & Brand, 2004; Swan, Bell, et al., 2000; Schoenfeld, 1985; Beswick, 2007). Along with that, teaching techniques were considered by many researchers as other factors that could affect students' attitudes toward mathematics (Anderson, 2005; Townsend et. al., 1998; Higgins, 1997; Pearce et. al., 1999; Mitchell, 1999; Kinney, 2001; Yusof & Tall, 1998; Elliott et. al., 2001; Raymond & Leinenbach, 2000; Whitin, 2007). Furthermore, Tymms (2001) stated that the most important factors affecting students' attitudes towards mathematics were the teacher and student academic level; while gender, age and language were weakly related with students' attitudes. Koller, et al. (2001) researched gender differences in mathematics achievement, which showed that male achievement is higher than that of female one especially in advanced mathematics courses. However, other researchers (Tapia & Molavan (2007; Tapia & Marsh II, 2004; Isiksal & Cakiroglo, 2008) showed that gender had no impact on students' attitudes towards mathematics and male and female students had the same average mathematics score. Vaughan (2002) introduced another factor that has a direct impact on students' attitudes towards mathematics. He stated that using cooperative learning in our schools will increase the interaction between students and consequently produce positive attitudes towards mathematics and academic achievement.

2. Methods

This study was aimed at identifying the attitudes of the students of Khalifa University towards mathematics in the light of variables such as gender, nationality, mathematics scores and the course they are attending

2.1. Data Collection Instrument

In this study the Attitudes Towards Mathematics Inventory (ATMI) was used to collect the data about students' attitudes towards mathematics. ATMI consists of 40-items, 5-points Likert scale ranging from strongly disagree to strongly agree distributed by using exploratory factor analysis into four areas or domains related to attitudes towards mathematics including self-confidence (15 items), value(10 items), enjoyment(10 items), and motivation(5 items) as shown in table 1. The instrument has a reliability coefficient alpha of 0.97 with standard error of measurement of 5.67 (Tapia, 1996). Also, the inventory demonstrates content and constructs validities.

Table 1. The distribution of the ATMI scale according to the four domains.

Domain	Items	Total
Self-confidence	9,10,11,12,13,14,15,16,17,18,19,20,21,22,40	15
Value	1,2,4,5,6,7,8,35,36,39	10
Enjoyment	3,24,25,26,27,29,30,31,37,38	10
Motivation	23,28,32,33,34	5
Total		40

2.2. Sample

The sample of this study consisted of 88 out of 216 undergraduate students at Khalifa University randomly selected from all students enrolled in the pre-calculus, calculus-I, and calculus-II courses whose ages ranged from 18 to 22 years old and agreed to participate in this research. As shown in table 2, 44 (50%) students of the sample were male and the same number was female. 58(66%) students were Emiratis and 30 (34%) students were expatriates.

Table 2. The sample distribution according to gender, age, and nationality.

Gender	Nationality	Age(years)					Total
		18	19	20	21	22	
Male	UAE	1	19	12	1	0	33
	Expatriates	3	6	1	0	1	11
	Total	4	25	13	1	1	44
Female	UAE	4	14	7	0		25
	Expatriates	2	11	4	2		19
	Total	6	25	11	2		44
Total		10	50	24	4		88

Table 3 and figure 1 demonstrate the sample distribution according to the mathematics courses they are attending and the type of the school they obtained their high school diploma from. 67(76.1%) of them obtained their high school diploma from government school and 21 were from private ones. Whereas, 24(23.9%) students are in Pre-calculus, 27(30.7%) students are in Calculus I and 37(42.04%) students are in Calculus II.

Table 3. The sample distribution according to high school type, and course they are attending.

High School Type	Course			Total
	Pre-Calculus	Calculus-I	Calculus-II	
Government	19	18	30	67
Private	5	9	7	21
Total	24	27	37	88

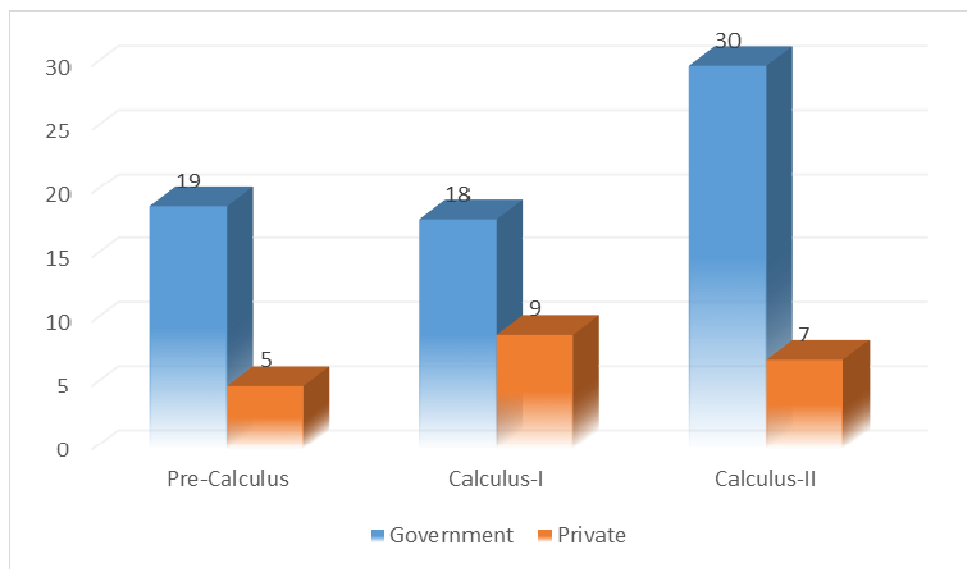


Figure 1. The sample distribution according to high school type and course they are attending.

2.3. Results and Findings

Research Question 1

What is the prelateship between students' attitude towards mathematics and academic achievement?

In order to the answer the first research question, and by assuming that the data is normally distributed according to

Kolomogrov and Shapirotests tests with $p > 0.05$, Pearson correlations were calculated. The results shown in table 4 outlined that there is a slight significant relationship between students' attitudes towards mathematics and mathematics achievement scores. However, this relation can explain 9.24% of the variance, 90.76 % unjustified or unexplained.

Table 4. Pearson correlations between students' attitudes and academic achievement.

		Attitude	Math Grade
Attitude	Pearson Correlation	1	0.304*
	Sig. (2-tailed)		0.017
	N	76	61
Math Grade	Pearson Correlation	.304*	1
	Sig. (2-tailed)	0.017	
	N	61	69

*. Correlation is significant at the 0.05 level (2-tailed).

Research Question 2

What is the relationship between students' attitude towards mathematics and gender?

In order to find out if there is statistically significant differences between students' attitudes towards mathematics and gender. By assuming the homogeneity of the two variances according to Levene's test with $p > 0.05$ as shown in table 5, and according to Kolmogorov-Smirnov and Shapiro-Wilk normality tests, we can assume that the data achieved the normality condition with $p > 0.05$ as shown in table 6. As shown in table 7 the means and standard deviations for the two groups are: 140.67, 140.70, 9.78, and 9.16

Table 8. The four analysis of variances (ANOVA) according to the gender.

Domain		Sum of Squares	df	Mean Square	F	Sig.
Self_ Confidence	Between Groups	20.555	1	20.555	.867	.355
	Within Groups	1848.195	78	23.695		
	Total	1868.750	79			
Value	Between Groups	.705	1	.705	.030	.862
	Within Groups	1933.601	83	23.296		
	Total	1934.306	84			
Enjoyment	Between Groups	2.012	1	2.012	.076	.784
	Within Groups	2174.690	82	26.521		
	Total	2176.702	83			
Motivation	Between Groups	.440	1	.440	.079	.779
	Within Groups	460.383	83	5.547		
	Total	460.824	84			

Research Question 3

What is the relationship between students' attitudes towards mathematics and nationality?

In order to find out if there is a statistically significant difference between students' attitudes toward mathematics and nationalities, the homogeneity of the two variances was assumed according to Levene's test with $p > 0.05$ as shown in table 9 and descriptive statistics shown in table-10. As shown previously in table-6, it can be assumed that the data is normally distributed. Four separate analyses of variances (ANOVA) were conducted as shown in table 11. The results indicated that there is a statistically significant difference between self-confidence $F(1, 78) = 9.699$ and $p = 0.03$, enjoyment $F(1, 82) = 15.285$ and $p = 0.001$, and value $F(1, 83) = 6.419$ and $p = 0.013$, and students' nationalities at $\alpha = 0.05$.

respectively. Four separate analyses of variances (ANOVA) were conducted as shown in table 8. The results indicated that no statistically significant differences between the four domains and gender with $p > 0.05$.

Table 5. The levene's test of variances homogeneity.

Levene's Test for Equality of Variances			
		F	Sig.
Attitude	Equal variances assumed	0.032	0.859

Table 6. The normality test

Kolmogorov-Smirnov Shapiro-Wilk						
Attitude	Statistic	df	Sig.	Statistic	df	Sig.
	0.086	76	.200*	0.971	76	0.076

Table 7. The descriptive statistics according to the gender.

Attitude	Gender	N	Mean	Std. Deviation	Std. Error Mean
	Male	39	140.67	9.78	1.56563
Female	37	140.7	9.16	1.50667	

However, the results showed that there is no statistically significant difference between motivation $F(1,83) = 1.148$ and $p = 0.228$, and nationality at $\alpha = 0.05$. No Post Hoc comparisons were conducted because the number of values in each domain is less than three values. However, according to the descriptive statistics mentioned in table 10, we can conclude that the other nationalities with a mean value of 142.79 have higher positive attitudes towards mathematics than UAE students with a mean of 139.46.

Table 9. The levene's test of variances homogeneity.

Levene's Test for Equality of Variances			
		F	Sig.
Attitude	Equal variances assumed	0.393	0.532

Table 10. The descriptive statistics according to the nationalities.

Nationality		N	Min.	Max.	Mean	Std. Deviation
UAE	Attitude	48	108	160	139.4583	9.25745
	Valid N (leastwise)	48				
Others	Attitude	28	117	158	142.7857	9.49213
	Valid N (leastwise)	28				

Table 11. The four analyses of variances (ANOVA) according to the nationalities.

Domain		Sum of Squares	df	Mean Square	F	Sig.
Self_Confidence	Between Groups	206.67	1	206.67	9.699	
	Within Groups	1662.08	78	21.309		0.003
	Total	1868.75	79			
Value	Between Groups	138.85	1	138.85	6.419	
	Within Groups	1795.456	83	21.632		0.013
	Total	1934.306	84			
Enjoyment	Between Groups	342.002	1	342.002	15.285	
	Within Groups	1834.7	82	22.374		0
	Total	2176.702	83			
Motivation	Between Groups	8.063	1	8.063	1.478	
	Within Groups	452.76	83	5.455		0.228
	Total	460.824	84			

Research Question 4

What is the relationship between attitudes towards mathematics and academic level (foundation or freshmen year)?

In order to find out if there is statistically significant differences between students' attitudes towards mathematics and their academic level. The homogeneity of the two variances and the data that was normally distributed were assumed according to Levene's test with $p > 0.05$ as shown in table 12. Based on the descriptive statistics shown in table 13 and according to Kolmogorov-Smirnov and Shapiro-Wilk normality tests, four separate analyses of variances (ANOVA) were conducted as shown in table 14. The results indicated that there is no statistically significant difference between

students' attitudes towards mathematics and students' academic year at $\alpha = 0.05$. However, the analysis showed that there is a slight statistically significant difference between enjoyment and student's academic level $F(1, 82) = 4.198$ with $p = 0.044$ favor to freshman students ($\bar{x} = 140.88$).

Table 12. The levene's test of variances homogeneity.

Levene's Test for Equality of Variances			
		F	Sig.
Attitude	Equal variances assumed	1.038	0.312

Table 13. The descriptive statistics according to attitude and academic level.

Academic Level		N	Mean	Std. Deviation	Std. Error Mean
Attitude	Foundation	18	140.0556	7.97402	1.87949
	Freshman	58	140.8793	9.88189	1.29756

Table 14. The four analysis of variances(ANOVA) according to the academic level and attitude.

Domain		Sum of Squares	df	Mean Square	F	Sig.
Self_Confidence	Between Groups	88.817	1	88.817	3.892	
	Within Groups	1779.933	78	22.82		0.052
	Total	1868.75	79			
Value	Between Groups	9.287	1	9.287	0.4	
	Within Groups	1925.019	83	23.193		0.529
	Total	1934.306	84			
Enjoyment	Between Groups	106.002	1	106.002	4.198	
	Within Groups	2070.7	82	25.252		0.044
	Total	2176.702	83			
Motivation	Between Groups	1.32	1	1.32	0.238	
	Within Groups	459.504	83	5.536		0.627
	Total	460.824	84			

Research Question 5

What is the relationship between students' attitudes towards mathematics and age?

In order to answer the fifth research question, and by assuming that the data is normally distributed according to Kolomogrov and Shapirotests with $p > 0.05$, Pearson correlations were calculated. The results shown in table 15 outlined that there is no meaningful relationship between students' attitudes towards mathematics and age at $\alpha = 0.05$. However, only this relationship can explain 4.7% of the variance, 95.3 % unjustified or unexplained.

Table 15. The correlations between students' attitude towards mathematics and age.

		Attitude	Age
Attitude	Pearson Correlation	1	-0.217
	Sig. (2-tailed)		0.06
	N	76	76
Age	Pearson Correlation	-0.217	1
	Sig. (2-tailed)	0.06	
	N	76	88

Research Question 6

What is the relationship between attitudes towards mathematics and mathematics course they are attending?

In order to find out if there is a statistically significant difference between students' attitudes towards mathematics and the course they are attending. The homogeneity of the variances according to Levene's test with $p > 0.05$ shown in table 16, the data is normally distributed according to Kolomogrov and Shapiro tests with $p > 0.05$ were assumed. Four separate analyses of variances (ANOVA) were conducted as shown in table 18. The results indicated that there is no statistically significant difference between students' attitudes towards mathematics and the course they are attending at $\alpha = 0.05$.

Table 16. The levene's test of variances homogeneity.

Levene's Test for Equality of Variances			
		F	Sig.
Attitude	Equal variances assumed	0.001	0.979

Table 17. The four analyses of variances (ANOVA) according to the math. courses they are attending.

Domain		Sum of Squares	df	Mean Square	F	Sig.
Self-Confidence	Between Groups	101.007	2	50.504	2.2	0.118
	Within Groups	1767.743	77	22.958		
	Total	1868.75	79			
Value	Between Groups	69.607	2	34.803	1.53	0.223
	Within Groups	1864.699	82	22.74		
	Total	1934.306	84			
Enjoyment	Between Groups	140.077	2	70.038	2.786	0.068
	Within Groups	2036.626	81	25.144		
	Total	2176.702	83			
Motivation	Between Groups	7.588	2	3.794	0.686	0.506
	Within Groups	453.236	82	5.527		
	Total	460.824	84			

Research Question 7

What is the relationship between attitude towards mathematics and high school type?

In order to find out if there is a statistically significant difference between students' attitudes towards mathematics and high school type. By assuming that the homogeneity of the two variances according to Levene's test as shown in table 18, and the data is normally distributed according to Kolomogrov and Shapiro tests with $p > 0.05$. Four separate

analyses of variances (ANOVA) were conducted as shown in table 19 .The results indicated that there is no statistically significant difference between students' attitudes and students' high school type.

Table 18. The levene's test of variances homogeneity.

Levene's Test for Equality of Variances			
		F	Sig.
Attitude	Equal variances assumed	0.001	0.979

Table 19. The four analyses of variances (ANOVA) according to the high school type.

Domain		Sum of Squares	df	Mean Square	F	Sig.
Self_ Confidence	Between Groups	28.017	1	28.017	1.187	.279
	Within Groups	1840.733	78	23.599		
	Total	1868.750	79			
Value	Between Groups	.090	1	.090	.004	.950
	Within Groups	1934.215	83	23.304		
	Total	1934.306	84			
Enjoyment	Between Groups	32.861	1	32.861	1.257	.266
	Within Groups	2143.841	82	26.144		
	Total	2176.702	83			
Motivation	Between Groups	1.239	1	1.239	.224	.637
	Within Groups					

3. Data Analysis of the Four Domains

3.1. Self-Confidence Domain

Table 20 showed that 62.67% of the sample revealed that

Table 20. The percentages and frequencies of students' responses on the Self-Confidence domain.

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Item 9*	11	15	20	20	16
Item 10*	3	7	17	33	28
Item 11*	3	6	19	40	20
Item 12*	3	5	17	38	25
Item 13*	3	10	19	31	22
Item 14*	1	10	12	37	27
Item 15*	1	15	13	35	23
Item 16	1	14	18	32	21
Item 17	4	6	26	31	19
Item 18	2	13	31	33	8
Item 19	2	6	20	39	20
Item 20*	6	6	22	38	15
Item 21*	2	13	23	33	17
Item 22	1	5	27	39	16
Item 40	0	4	24	39	21
Total	43	135	308	518	298
Percent	3.30%	10.37%	23.66%	39.78%	22.89%

Khalifa University students felt self-confidence in their ability to do mathematics, whereas, 13.67% of them showed low self-confidence in their ability to do mathematics.

3.2. Value Domain

Table 21 showed that 84.40% of the sample revealed that Khalifa University student felt that mathematics has a great value to them. Whereas, 4.29% of them indicated that mathematics has no value for them.

Table 21. The percentages and frequencies of students' responses on the Value domain.

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Item 1	4	1	1	17	63
Item 2	3	0	3	9	70
Item 3	0	3	17	35	30
Item 4	1	1	5	30	49
Item 5	1	1	16	38	32
Item 6	0	2	7	36	43
Item 7	0	6	7	38	37
Item 8	2	8	30	35	12
Item 35	0	4	9	46	28
Item 36	0	2	6	41	38
Item 39	0	2	7	37	42
Total	11	30	108	362	444
Percent	1.15%	3.14%	11.31%	37.91%	46.49%

* Indicated Reversed Items

3.3. Motivation Domain

Table 22 showed that 67.13% of the sample revealed that Khalifa University students are highly motivated to learn mathematics, whereas, 10.35% of them lack motivation.

Table 22. The percentages and frequencies of students' responses on the Motivation domain.

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Item 23	0	6	15	45	22
Item 28*	3	7	7	38	33
Item 32	3	12	28	30	14
Item 33	1	7	24	37	18
Item 34	0	6	24	36	19
Total	7	38	98	186	106
Percent	1.61%	8.74%	22.53%	42.76%	24.37%

* Indicated Reversed Items

3.4. Enjoyment Domain

Table 23 showed that 75.49% of the sample reveals that Khalifa University students showed enjoyment in doing mathematics. Whereas, 7.90% of them indicated that mathematics is not an interesting subject.

Table 23. The percentages and frequencies of students' responses on the Enjoyment domain.

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Item 3	0	3	17	35	30
Item 24	3	5	10	38	32
Item 25*	4	5	5	38	36
Item 26	2	5	15	44	21
Item 27	8	4	10	20	46
Item 29	2	1	10	38	36
Item 30	2	11	21	36	17
Item 31	0	4	12	40	31
Item 37	2	3	25	41	17
Item 38	1	4	20	39	24
Total	24	45	145	369	290
Percent	2.75%	5.15%	16.61%	42.27%	33.22%

* Indicated Reversed Items

4. Discussion and Conclusions

A common understanding around the world that is students of different ages and of different studying levels are facing difficulties when they attempting to do mathematics. Many researches indicated that these difficulties might due to mathematics teachers, curricula, assessment methods or/and teaching strategies used in schools and universities.

Many researches studied the effect of students' attitudes towards mathematics (see e.g. Tapia, 1996, 2004; Tapia& Molavan, 2007) on academic achievement. Some studies outlined that there is no impact of the students' attitudes towards mathematics on their academic achievement (see e.g. Ma and Kishor, 1997; Phonguttha, et al., 2009). Other studies showed that there is a relationship between attitudes towards mathematics and achievement (see e.g. Gottfried 1985; Ma and Xu, 2004; Popham, 2005; Koller, et al. (2001).

This study aimed at identifying the attitudes of Khalifa University students towards mathematics in the light of some variables such as gender, nationality, mathematics scores and the course they are attending. The results of this study showed that there were no statistically differences between students' attitudes towards mathematics according to gender, academic level, high school type and nationality. The results of this study agreed with other studies (see e.g. Casey et al, 2001; Ho, et al., 2000; Ma & Kishor, 1997; Ma, 1999, 1997; Tapia & Molavan, 2007; Tapia & Marsh II ,2004) in that there is no statistical difference between students' attitudes towards mathematics and other factors such as : gender, ethnicity, mathematics scores. In addition, this study outlined that 62.67% of Khalifa University students felt self-confidence in their ability to do mathematics, 84.40% of them felt that mathematics has a great value to them, 67.13% of them are highly motivated to learn mathematics, and 75.49% of the sample reveals that KUSTAR students showed enjoyment in doing mathematics.

Many factors have influences on students' attitudes towards mathematics. Teachers, parents, teaching strategies, assessment methods, and peers, as well as the school environment all have influences on an individual's attitude.

Tymms (2001) stated that the most important factors affecting students' attitudes towards mathematics such as the teacher and student academic level. Therefore more studies have to be conducted in the future to clarify the relationship between teachers' and teaching characteristics on students' attitudes towards mathematics. As well as, to determine how teachers can modify or change their students' attitudes towards mathematics if that is possible, and what the effect of using collaborative learning in schools and universities on changing students' attitudes towards mathematics is. Personally, I think class size, teaching methods and assessment techniques used in our schools and universities might have an impact on the students' attitudes towards mathematics and consequently on their achievements.

Finally, students' attitudes towards mathematics changed overtime because it could be replaced by other activities. Students in the early stages of schooling are given the mathematical concepts slowly and repeatedly by using different teaching aids, resulting in positive attitudes and high achievement for the majority of students. As the mathematical subjects gets more abstract and more diverse, students' attitudes and achievement started to decline or decrease (Ma & Kishor, 1997; Hannula, 2002; Sanchez et al., 2004). The decline in students' attitude towards mathematics could be justified by the huge number of alternatives available for today's students.

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