Predicting the Attitudes and Self-esteem Of the Grade 9th Lower Secondary School Students Towards Mathematics From their Perceptions of the Classroom Learning Environment

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Abstract

This study reports the validity of the hypothesis that students' perceptions of the learning environment of mathematics classroom may predict their attitudes and self-esteem towards mathematics. It examines data from 487 grade 9th students from 14 mathematics classes in 7 Vietnamese lower secondary schools to identify how students' perceptions of the learning environment variables, and the extent to which these predict the attitudes and self-esteem. The results obtained from correlation and multiple regression analyses indicated that if students were satisfied with mathematics learning, and if they found their mathematics class as cohesive, then their self-esteem and attitudes towards mathematics would be positive. In contrast, if students perceived mathematics as difficult, and if they perceived the learning atmosphere as competitive, then their self-esteem and attitudes towards mathematics would be negative. The findings show that a positive learning environment should be created to promote the positive attitudes and self-esteem of students in learning.

1. Introduction

One of the major objectives of educators alike is to make the classroom learning environment more stimulating for students to improve their cognitive and affective outcomes. The aspects of classroom learning environment such as satisfaction, friction, competitiveness, difficulty and cohesiveness are the most important variables which may be used for the prediction of the cognitive variables (e.g. stages of mental processing such as knowledge, comprehension, application, analysis, synthesis, & evaluation; and achievement) and evaluation of affective variables (e.g. self-esteem, attitudes, motivation, and satisfaction) (Wong, Young & Fraser, 1997; LaRocque, 2008). Classroom learning environments include several characteristics which influence socio-psychological growth, intellectual development and academic achievement of students (LaRocque, 2008). The classroom climate that is perceived as safe, friendly, warm, supportive and non-threatening has been reported to improve achievement, develop higher self-esteem, and promote more positive student attitudes toward their learning (Chionh & Fraser, 2009). It has been also argued by Fraser & Fisher (1982) and LaRocque (2008) that making the aspects of classroom environment more congruent with the perceptions favoured by students may improve learning outcomes of students. In Vietnam the issues of classroom environment are rarely addressed at both the class and school levels. The classroom learning environment, as perceived by students, show that the Vietnamese classroom learning environments are likely to be passive, competitive, and difficult (Ministry of Education and Training of Vietnam [MOET], 2008). Therefore, the purpose of this study is to investigate associations between the classroom environment and two types of student outcomes (attitudes and self-esteem) in Vietnamese lower secondary schools. Since students' self-esteem and their attitudes toward mathematics are considered important factors in mathematics classrooms (Majeed, Fraser & Aldridge, 2001), this study investigates their correlations with the aspects of the mathematics classroom learning environment. The findings obtained from the possible relationships between student outcomes and the classroom environment factors in the present study may provide teachers with valuable ideas for improving students' attitudes and their self-esteem in learning through altering the aspects of the classroom activities to make the classroom climate more motivating for students.

2. Research on Learning Environments

Classroom social climate or learning environment refers to several aspects of the classroom and school. It is defined as "the interpersonal relationship among pupils, relationships between pupils and their teachers, relationships between pupils and both the subject matter studied and the method of learning, and finally, pupil perception of the structural characteristics of the class" (Fraser, Anderson and Walberg, 1982, p. 7). In recent decades, studies involving the learning environment have emerged as an internationally necessary scope of social science research among researchers (Chionh & Fraser, 2009). Several studies have been conducted in different subjects using different types of instruments for the prediction of cognitive variables and evaluation of affective variables. Such instruments are Individualized Classroom Environment Questionnaire (Fraser, 1990), Questionnaire on Teacher Interaction (Goh, Young & Fraser, 1995), Science Laboratory Environment Inventory (Fraser, Giddings, & McRobbie, 1995; Fraser & McRobbie, 1995), Constructivist Learning Environment Survey (Aldridge, Fraser, Taylor, & Chen, 2000; Taylor, Fraser, & Fisher, 1997), and What is happening in this class? (WIHIC) (Opolot-Okurut, 2010). A series of research studies in the area of classroom climate which investigated students' perceptions of classroom activities indicated that the socio-psychological characteristics of the classroom activities measured by The My Class Inventory (MCI) developed by Fraser, Anderson, & Fraser (1982) may be used as both dependent and independent variables (Fraser & Walberg, 1995). The MCI consists of the five scales, namely satisfaction, friction, competitiveness, difficulty and cohesiveness. The results of several research studies (Walberg, 1969; Hofstein, Gluzman, Ben-Zvi & Samuel, 1979; Wong & Fraser, 1996; Wong et al., 1997; Aldridge et al., 2000; Majeed et al., 2002; LaRocque, 2008; Chionh & Fraser, 2009; Opolot-Okurut, 2010) found a strong correlation between the aspects of the MCI instrument and measures of cognitive and affective learning outcomes.

Various studies reviewed by Anderson (1973) provide credible evidence that the aspects of classroom environment may account for 13% to 46% of significant variance in learning outcomes. Accordingly, students learn more when they perceived their classroom activities as positive (e.g. satisfaction, cohesiveness), and that students learn less when they perceived their classroom activities as negative (e.g. difficulty, friction, competitiveness). The findings of these associations show that the classroom environment has the predictive ability for student cognitive and affective learning outcomes (Fraser, 1998). The results of a meta-analysis conducted by Haertel, Walberg & Haertel (1981) involving 17,805 students in four countries found that student outcomes are positively correlated with some classroom environment factors such as satisfaction and cohesiveness, and negatively correlated with others such as difficulty and friction. Furthermore, Fraser & Fisher's (1982) study involving a sample of 116 grade 8^{th} and 9^{th} science classes, and Wong et al.'s (1997) study involving the use of multilevel analysis with 1592 mathematics students showed that student perception of the learning environment appears to correlate to student outcomes. Additionally, the results obtained by Fraser's (1994) tabulation of 40 past studies in science education, using a variety of classroom environment instruments and samples ranging across numerous countries and grade levels, confirmed that associations between measures of cognitive and affective outcomes and student perceptions of the learning environment have been replicated.

In addition to the established influence of the classroom environment on student outcomes, some aspects of classroom environment have been found to be predictors of a number of students' cognitive and affective outcomes (Majeed et al., 2002; Webster & Fisher, 2003; LaRocque, 2008; Chionh & Fraser, 2009; Opolot-Okurut, 2010). For example, Majeed et al. (2002) reported a study of mathematics classroom learning environment in Brunei Darussalam and its association with students' satisfaction among a sample of 1565 students from 81 classes in 15 government secondary schools. The results revealed that students generally perceived a positive learning environment in mathematics classes, and associations between satisfaction and all of the MCI scales were statistically significant both at student and class levels. Moreover, an investigation on associations between school-level environment and student outcomes among 620 teachers and 4645 students from 57 Australian secondary schools conducted by Webster & Fisher (2003) showed the existence of outcome-environment relationships. Similarly, LaRocque (2008) examines students' perceptions of their classroom activities and the possible effect of these perceptions on academic learning outcomes among 2387 students from 22 American elementary schools. The results obtained from correlation analyses and multivariate analysis of variance indicated that the perceptions of the general classroom activities were significantly related to both math and reading achievement. Furthermore, a recent analysis of associations between the classroom environment and several student outcomes among 2310 Singaporean grade 10^{th} students in 75 geography and mathematics classes in 38 schools conducted by Chionh & Fraser (2009) revealed that greater achievement scores were found in classrooms with more student cohesiveness, while attitudes and self-esteem were more favorable in classrooms with more teacher support, task orientation and equity. Similarly, Opolot-Okurut (2010) reports a study of 81 Ugandan secondary students' perceptions of mathematics classroom learning environment and their associations with their motivation towards mathematics. The results of the t tests for independent samples indicated a statistically significant difference in student perceptions between different school types. The study also indicated that student perceptions on some of the modified classroom

environment scales were statistically significantly associated with student motivation.

The review of literature shows that the classroom environment appears to have a greater predictive ability of cognitive and affective outcomes. The review also shows that almost all studies which supported the importance of the classroom environment for the prediction of achievement and evaluation of self esteem and attitudes were conducted in the setting of western education (Fisher & Khine, 2006; Fraser, 2007). The issues of classroom environment have only been studied and addressed in the settings of Asian education in recent years (Goh & Khine, 2002). Until now no known study has examined the issues of the classroom environment on student learning in the setting of Vietnamese schools. The current study adds to the literature by reporting the results of an investigation to determine if students' perceptions of the learning environment of the mathematics classroom in Vietnamese lower secondary schools may predict their self-esteem and attitudes towards mathematics. The results of the study may provide Vietnamese lower secondary teachers with potentially additional information to improve their teaching practice and facilitate student learning.

3. Research Method

3.1 Design

A survey research design was utilized to examine correlations between the learning environment factors of the mathematics classroom and both the scales of self-esteem and attitudes towards mathematics. The My Class Inventory (MCI) was used to investigate the students' perceptions of the classroom learning environment. The attitude scale was used to measure the attitudes of students toward mathematics. The self-esteem scale was used to measure the self-esteem of students in learning mathematics.

3.2 Participants

The sample used for this research consisted of 487 grade 9^{th} students (212 females and 275 males) from 14 mathematics classes in 7 Vietnamese government lower secondary schools. All students were in the fourth year of mathematics instruction from the sixth to the ninth grade at the lower secondary education.

3.3 Instruments

The My Class Inventory

The My Class Inventory (MCI) developed by Anderson, Walberg & Fraser (1982) was utilized to investigate students' perceptions of their mathematics environment. The MCI included five scales with 9 items for satisfaction, 8 items for friction, 7 items for competiveness, 8 items for difficulty, and 6 items for cohesiveness. For each item, respondents indicated on a five point scale. Items designated (+) are scored 1, 2, 3, 4 and 5, respectively, for the responses SD (Strongly Disagree), D (Disagree), U (Undecided), A (Agree), SA (Strongly Agree). Items designated (-) are scored in the reserve way. The present study indicated that the internal consistency reliability (alpha coefficient) based on a sample of 487 secondary school students was accepted for all of the five scales. Table 1 described scales, sample items, and alpha coefficient of each scale.

< Table 1 about here>

The Aiken Attitude Scale

Aiken's (1974) two scales of attitude toward mathematics (Table 2) were used to measure attitudes of students toward mathematics. This questionnaire consisted of two scales, namely E scale (enjoyment of mathematics) and V scale (value of mathematics). The 11 items of the E scale and the 10 items of V scale were in a format of Likert type. The responses to each item on both scales were coded as 1 (Strongly Disagree), 2 (Disagree), 3 (Undecided), 4 (Agree), or 5 (Strongly Agree). The higher scores on the items of both E and V scales indicated a more positive attitude toward mathematics. The students' responses to the two scales were checked for internal consistency by computing respective Cronbach Alpha coefficients. Based on students' responses (n = 487), Coefficient alpha for the V scale was .77, and for E scale was .82, high internal-consistency reliability.

< Table 2 about here>

The Self-Esteem Scale

The present study used the self-esteem scale developed by the researcher to measure the students' self-esteem in mathematics. This questionnaire included two subscales, namely self-esteem in the academic ability (AA), and self-esteem in the social support (SS). The former scale consisted of 10 items, and the later scale consisted of 11 items. All items in both subscales were arranged in a format of Likert type. Items designated (+) are scored 1, 2, 3, 4 and 5, respectively, for the responses SD (Strongly Disagree), D (Disagree), U (Undecided), A (Agree), SA (Strongly Agree). Items designated (-) are scored in the reserve way. The higher scores on both AA and SS scales indicated the higher

self-esteem in mathematics. Based on students' responses (n = 487), total scores on the AA and SS scales were computed and the internal consistency of each scale analysed by correlating item scores with total scores. Item 8 was omitted on the final scale because the correlation coefficient between that item and total score on the AA scale was only .43. All remaining 9 items on the AA scales had correlation above .69 with total score on the scale. The item-total correlations for SS scale were higher than those for the AA scale. Item 6 was omitted on the final scale because the correlation coefficient between that item and total score on the SS scale was only .47. All remaining 10 items on the SS scale had correlation above .75 with total score on the scale. Cronbach alpha for the AA and SS scales was .74, and .79, respectively.

< Table 3 about here>

4. Procedure

All of grade 9th students from 14 mathematics classes in 7 lower secondary schools were invited to participate in this study after the permission for access to the study was obtained from the principals of schools and the Department of Education and Training. All participants were clearly explained that they were free to withdraw from the research at any time. The privacy of participants was ensured concerning the information they supplied in the questionnaires. No questions or statements required the participants to provide their names or schools where they are studying. After students completed the 9th grade mathematics program in the second semester at the end of the academic year, the researcher administered the MCI questionnaire and the attitude questionnaire as well as the self-esteem questionnaire to the head teachers of mathematics classes in each school, who delivered the questionnaires to the students. Participants completed the three questionnaires in 60 minutes. The researcher personally collected the completed questionnaires from the head teachers of classes in each school.

5. Data Analysis

The relationships between the variables of learning environments and both scales of attitudes and self-esteem were investigated using Pearson product-moment correlation coefficient. Multiple regression analyses were also conducted to find out if there were any attitude-environment associations, as well as any self-esteem-environment associations. All analyses were tested for significance at the .05 level.

6. Results and Discussions

Figure 1 shows the graph of students' perception scores on the five MCI measures. Data obtained from the analyses shows that students perceived high mean scores in difficulty, satisfaction, cohesiveness and competitiveness scales but slightly low in only friction scale. The general results show that the mathematics students perceived the classroom environment as more satisfied, cohesive, competitive, and difficult, and they perceived the environment less frictional.

< Figure 1 about here>

An analysis using Pearson's correlation coefficient (Table 4) indicates that correlations among the five variables of the learning environment were statistically significant at the .01 and .05 levels (2-tailed). The smallest relationship was r (487) = .122, p = .007 between F scale and CH scale. The largest relationship was r (487) = .595, p = .004 between CH scale and D scale. The descriptive statistics (Table 5) show that the bivariate correlations between MCI scales and both attitude and self-esteem scales were statistically significant for all scales except F scale. The CH (M = 3.71, SD = .838) and S (M = 3.74, SD = .951) variables are positively and significantly correlated with the E (M = 3.56, SD = .629), V (M = 3.57, SD = .363), AA (M = 3.54, SD = .768), and SS (M = 3.64, SD = .826) scales. The D (M = 3.68, SD = .564), and CM (M = 3.70, SD = .406) variables are negatively correlated with the E, V, AA, and SS scales. The only F variable (M = 3.54, SD = .943) was not statistically significant with all scales of attitudes and self-esteem.

< Tables 4 & 5 about here>

Table 6 reports the results of the five multiple regression analyses on the predicted measures and dependent variables. The first multiple regression model with all five predictors explained 27.3% of the variance in E scale (R^2 = .273), *F* (5, 481) = 36.100, p < .001. The two variables were positively and statistically significant, with the value of CH (β = .171, t = 3.339, p < .05), and S (β = .114, t = 2.710, p < .05). The D and CM variables of the learning environment were negatively significantly related to E scale, with the beta value of D (β = -.304, t = -5.573, p < .001), CM (β = -.009, t = -.174, p < .05). The only F (β = .147, t = 3.661, p > .05) scale was not statistically significant with E scale. Similarly, the second multiple regression model with all five predictors produced 39.7% of the variance in V scale (R^2 = .397), *F* (5, 481) = 43.197, p < .05. The D and CM variables of the learning environment were negatively significantly related to V scale, with the beta value of D (β = -.267, t = -3.921, p < .001), CM (β = -.357, t = -2.869, p < .05). The two variables were positively and statistically significant, with the value of CH (β = .597, t = 5.032, p < .001), and S (β = .386, t =

6.431, $p < .05$). The F ($\beta = .111$, $t = 1.825$, $p > .05$) scale was not a statistically significant predictor in this model. The findings obtained from the first two models indicated that when students perceive the environment as more difficult and competitive they tend to perceive mathematics less enjoyable and valuable. Conversely, students tend to value importance of mathematics, and enjoy in learning mathematics when they find the environment more satisfied and cohesive. The results of this study are consistent with the findings of previous research (Hofstein et al., 1979; Wong & Fraser, 1996; Wong et al., 1997; Aldridge et al., 2000; Majeed et al., 2002; LaRocque, 2008; Chionh & Fraser, 2009) which indicate a significant relationship between the classroom environment and student attitudes.

< Table 6 about here>

The third multiple regression model with all five predictors explained 19% of the variance in AA scale ($R^2 = .190$), F (5, 481) = 22.494, $p < .001$. The two variables were positively and statistically significant, with the value of CH ($\beta = .103$, $t = 1.901$, $p < .05$), and S ($\beta = .268$, $t = 6.035$, $p < .001$). The D, and CM variables of the learning environment were negatively significantly related to AA scale, with the beta value of D ($\beta = -.248$, $t = -4.305$, $p < .001$), CM ($\beta = -.016$, $t = -.301$, $p < .005$). The only F ($\beta = .137$, $t = 3.226$, $p > .05$) scale was not statistically significant with AA scale. Similarly, the last multiple regression model with all five predictors explained 69% of the variance in SS scale ($R^2 = .690$), F (5, 481) = 214.003, $p < .05$. The D, and CM variables of the learning environment were negatively significantly related to SS scale, with the beta value of D ($\beta = -.054$, $t = -1.506$, $p < .001$), CM ($\beta = -.255$, $t = -7.693$, $p < .05$). The two variables were positively and statistically significant, with the value of CH ($\beta = .677$, $t = 20.267$, $p < .001$), and S ($\beta = .029$, $t = 1.044$, $p < .05$). The F ($\beta = .074$, $t = 2.828$, $p > .05$) scale was not a statistically significant predictor in this model. The findings obtained from the last two models also indicated that when students perceive the environment as more difficult and competitive they tend to have less self-esteem in both academic ability and social support in solving mathematics issues. In contrast, when students find the classroom environment more satisfied and cohesive they tend to more self-esteem in learning mathematics. The findings of this study supported the results reported from recent studies (Chionh & Fraser, 2009; Opolot-Okurut, 2010) that indicate an appreciable self-esteem-environment relationship.

7. Conclusion

This study may be one of the first studies of the mathematics classroom environment in the setting of Vietnamese lower secondary schools. The results of this study show that certain aspects of the classroom learning environment significantly influence the self-esteem and attitudes of a group of Vietnamese secondary school students towards mathematics. The correlation and multiple regression analyses obtained support the hypothesis that students' perceptions of the learning environment of the mathematics classroom may predict their self-esteem and attitudes towards mathematics. The findings reveal that if students are more satisfied with mathematics learning, and if they find their mathematics classroom atmosphere more cohesive, then their self-esteem and attitudes towards mathematics would be positive. In contrast, if students perceived mathematics as difficult, and if students perceived the learning atmosphere as competitive, then their self-esteem and attitudes towards mathematics would be negative. Only the friction factor was not statistically significant with E and V scales as well as AA and SS scales. The results of this study show that the low mean scores in E and V scales as well as AA and SS scales related to the high mean scores in D and CM scales. In this case, the centered-student learning approaches such as cooperative learning should be applied in the mathematics classrooms (LaRocque, 2008). This learning approach has been reported to help students perceive the learning activities more cohesive and less difficult, and perceive the learning atmosphere less competitive because students in cooperative situations are encouraged to work together in groups rather than to work individually (Johnson & Johnson, 2009). All of the five factors such as friction, cohesiveness, satisfaction, difficulty and competitiveness are major components of the classroom environment, which may be affected by the secondary school teachers. In the classroom level, mathematics teachers should pay more attention to all aspects of the classroom learning environment because these aspects may provide valuable ideas to help teachers to become more reflective and improve their teaching practice (Yarrow, 1977, p.68). It seems that, from the results obtained in this study, fostering students' positive attitudes towards mathematics and enhancing their self-esteem in learning mathematics are the most necessary mandates of teachers. Therefore, a positive learning environment should be created to promote the positive attitudes and self-esteem of students in Vietnamese secondary schools.

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Table 1. Scales, Description, Sample items, Number of items & Cronbach's Alpha Values

Scales	Description/Sample items	Number of items	Cronbach's Alpha Values
Satisfaction (S)	Extent of enjoyment of class work. e.g. Most pupils are pleased with the class. (+)	9	.79
Friction (F)	Amount of tension and quarrelling among students. e.g. Some pupils don't like other pupils. (+)	8	.81
Competitiveness (CM)	Emphasis on students competing with each other. e.g. Most children don't care who finishes first. (-)	7	.77
Difficulty (D)	Extent to which students find difficulty with the work of the class. e.g. In our class the work is hard to do. (+)	8	.76
Cohesiveness (CH)	Extent to which students, know, help and are friendly toward each other. e.g. Some people in my class are not my friends. (-)	6	.82

** Items designated (+) are scored 1, 2, 3, 4 and 5, respectively, for the responses SD (Strongly Disagree), D (Disagree),U (Undecided), A (Agree), SA (Strongly Agree). Items designated (-) are scored in the reserve way.*

Table 2. The Aiken Attitude Scale

E Scale: Enjoyment of Mathematics						
Directions: Draw a circle around the letter(s) that show(s) how closely you agree or disagree with each statement: SD (Strongly Disagree), D (Disagree), U (Undecided), A (Agree), SA (Strongly Agree).						
1.	I enjoy going beyond the assigned work and trying to solve new problems in mathematics.	SD	D	U	A	SA
2.	Mathematics is enjoyable and stimulating to me.	SD	D	U	A	SA
3.	Mathematics makes me feel uneasy and confused.	SD	D	U	A	SA

4.	I am interested and willing to use mathematics outside school and on the job.	SD	D	U	A	SA
5.	I have never liked mathematics, and it is my most dreaded subject.	SD	D	U	A	SA
6.	I have always enjoyed studying mathematics in school.	SD	D	U	A	SA
7.	I would like to develop my mathematics skills and study this subject more.	SD	D	U	A	SA
8.	Mathematics makes me feel uncomfortable and nervous.	SD	D	U	A	SA
9.	I am interested and willing to acquire further knowledge of mathematics.	SD	D	U	A	SA
10.	Mathematics is dull and boring because there is always a correct answer.	SD	D	U	A	SA
11.	Mathematics is very interesting, and I have usually enjoyed courses in this subject.	SD	D	U	A	SA
V Scale: Value of Mathematics						
Directions: Draw a circle around the letter(s) that show(s) how closely you agree or disagree with each statement: SD (Strongly Disagree), D (Disagree), U (Undecided), A (Agree), SA (Strongly Agree).						
1.	Mathematics has contributed greatly to science and other fields of knowledge.	SD	D	U	A	SA
2.	Mathematics is less important to people than art or literature.	SD	D	U	A	SA
3.	Mathematics is not important for the advance of civilization and society.	SD	D	U	A	SA
4.	Mathematics is a very worthwhile and necessary subject.	SD	D	U	A	SA
5.	An understanding of mathematics is needed by artists and writers as well as scientists.	SD	D	U	A	SA
6.	Mathematics helps develop a person's mind and teaches him to think.	SD	D	U	A	SA
7.	Mathematics is not important in everyday life.	SD	D	U	A	SA
8.	Mathematics is needed in designing practically everything.	SD	D	U	A	SA
9.	Mathematics is needed in order to keep the world running.	SD	D	U	A	SA
10.	There is nothing creative about mathematics; it's just memorizing formulas and things.	SD	D	U	A	SA

**Source: Lewis R. Aiken, 1974, p.68*

Table 3 The Self-Esteem Scale

Self-Esteem in Academic Ability						
Directions: Draw a circle around the letter(s) that show(s) how closely you agree or disagree with each statement: SD (Strongly Disagree), D (Disagree), U (Undecided), A (Agree), SA (Strongly Agree).						
1.	I believe in my ability to study mathematics. (+)	SD	D	U	A	SA
2.	At times, I feel I am not able to do mathematics well. (-)	SD	D	U	A	SA
3.	I can use mathematics outside the class. (+)	SD	D	U	A	SA
4.	I am able to solve a mathematics issue in some different ways. (+)	SD	D	U	A	SA
5.	I am able to solve the complex issues of mathematics. (+)	SD	D	U	A	SA
6.	I am not good at learning mathematics. (-)	SD	D	U	A	SA
7.	I feel that I have good qualities to study mathematics. (+)	SD	D	U	A	SA

*8.	I can comprehend the knowledge of mathematics well. (+)	SD	D	U	A	SA
9.	I certainly feel I am useless to do the simple issue of mathematics. (-)	SD	D	U	A	SA
10.	Most of time I feel that I can contribute my knowledge to the mathematics class. (+)	SD	D	U	A	SA
*This item was omitted on the final scale.						
Self-Esteem in Social Support						
Directions: Draw a circle around the letter(s) that show(s) how closely you agree or disagree with each statement: SD (Strongly Disagree), D (Disagree), U (Undecided), A (Agree), SA (Strongly Agree).						
1.	I like working with my classmates on mathematics. (+)	SD	D	U	A	SA
2.	My classmates hardly help me to do mathematics. (-)	SD	D	U	A	SA
3.	My teacher is very supportive in helping me to study mathematics. (+)	SD	D	U	A	SA
4.	My teacher discusses mathematics with our class members. (+)	SD	D	U	A	SA
5.	I am encouraged by my teacher to do mathematics. (+)	SD	D	U	A	SA
*6.	I like to work by myself on my assigned task of mathematics. (-)	SD	D	U	A	SA
7.	My friends respect my personal ideas on the issues of mathematics. (+)	SD	D	U	A	SA
8.	I always to get the valuable support and help from my classmates to do mathematics. (+)	SD	D	U	A	SA
9.	I do not like studying with my friend on mathematics. (-)	SD	D	U	A	SA
10.	My classmates like working individually on their own mathematics tasks. (-)	SD	D	U	A	SA
11.	The mathematics teacher tells me that I am brilliant enough to study mathematics. (+)	SD	D	U	A	SA
*This item was omitted on the final scale.						

Table 4 Correlations between Variables of Learning Environment

Variable	F	CH	S	D	CM
F	1	.122**	.210**	.197*	.154**
		.007	.002	.037	.001
		487	487	487	487
CH		1	.157**	.595**	.553*
			.000	.004	.047
			487	487	487
S			1	.345**	.247**
				.000	.019
				487	487
D				1	.585**
					.000
					487
CM					1

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

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

Table 5 Correlations between Variables of LE and Scales of Attitudes and Self-esteem

Variable	M	SD	N	Correlations with E and V Scales				Correlations with AA and SS Scales			
				E		V		AA		SS	
				r	p	r	p	r	p	r	p
E	3.56	.629	487								
V	3.57	.363	487								
AA	3.54	.768	487								
SS	3.64	.826	487								
F	3.54	.943	487	.250	.057	.237	.068	.227	.061	.191	.072
CH	3.71	.838	487	.782**	.004	.662**	.000	.495**	.007	.799**	.000
S	3.74	.951	487	.274*	.019	.493**	.000	.362**	.000	.195*	.025
D	3.68	.564	487	-.468**	.007	-.384*	.015	-.697*	.017	-.522**	.010
CM	3.70	.406	487	-.314*	.017	-.241*	.011	-.159*	.000	-.616**	.000

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

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

Table 6 Results from Multiple Regression Analyses

Variable	Multiple Regression Weights											
	Model 1 - E Scale			Model 2 - V Scale			Model 3 - AA Scale			Model 4 - SS Scale		
	R^2	F	p	R^2	F	p	R^2	F	p	R^2	F	p
	.273	36.100	.000	.397	43.197	.017	.190	22.494	.000	.690	214.003	.011
	β	t	p	β	t	p	β	t	p	β	t	p
F	.147	3.661	.057	.111	1.825	.074	.137	3.226	.083	.074	.2.828	.059
CH	.171	3.339	.001	.597	5.032	.000	.103	1.901	.048	.677	20.267	.000
S	.114	2.710	.007	.386	6.431	.017	.268	6.035	.000	.029	1.044	.019
D	-.304	-5.573	.000	-.267	-3.921	.000	-.248	-.4.305	.000	-.054	-.1.506	.000
CM	-.009	-.174	.006	-.357	-2.869	.026	-.016	-.301	.004	-.255	-.7.693	.015

a. Predictors: F, CH, S, D, and CM

b. Dependent variables: E, V, AA, and SS

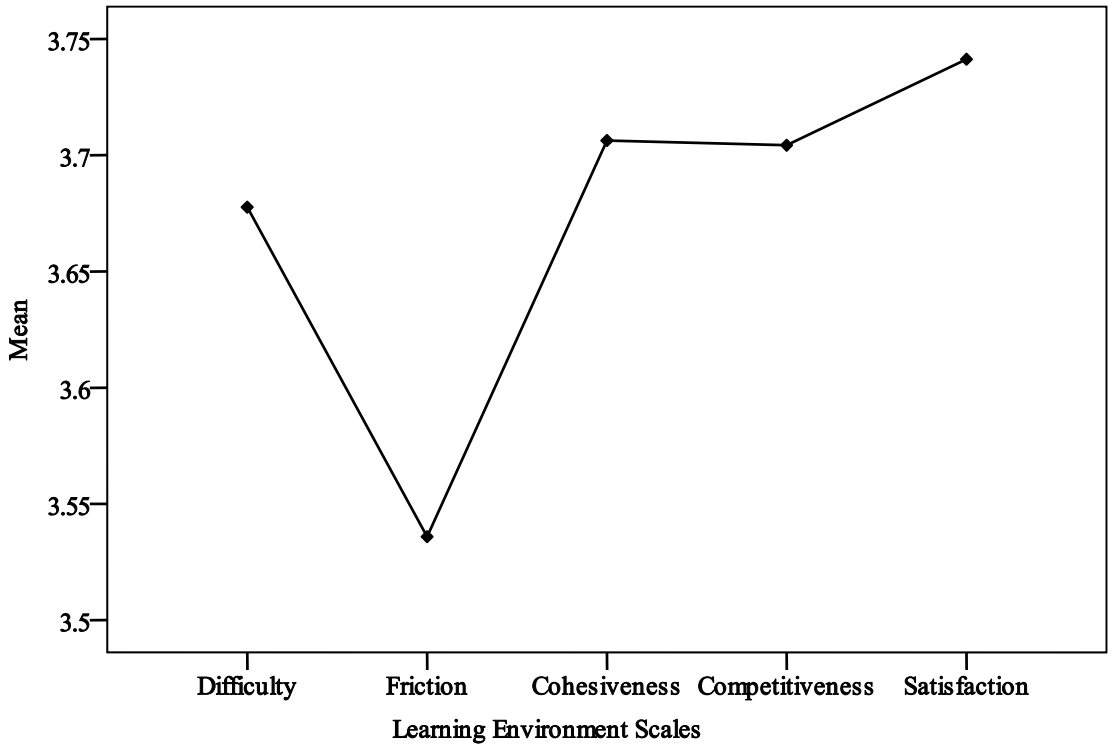

Figure 1. Student's Perception Scores on the Five MCI Measures.

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