

## Modeling Relationship between Studying Approaches and Mathematics Anxiety with Mathematics Achievement Using Structure Equation Modeling

Bahare Soleymani

Department of Mathematics, Abadan branch, Islamic Azad University, Abadan, Iran  
[soleymani\\_bahare@yahoo.com](mailto:soleymani_bahare@yahoo.com)

**Abstract:** The aim of this study was to investigate the relationship between studying approaches and math anxiety with achievement students in math. The statistic population of this study were management and accounting students of the Islamic Azad University-Abadan branch that are enrolled in mathematics pre-college course. The sample included students who were selected by random cluster sampling. Using structural equation model to determine the relationship between studying approaches and math achievement with intermediately of math anxiety showed, the surface studying approach has a significant negative indirect effect on mathematics achievement. The results show that students with a surface studying approach even in surface exams show poor performance in mathematics.

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### 1. Introduction

Study of emotional factors in learning mathematics in recent decades has been considered by many scholar experts based technology education. In this regard, McLeod (1992) in the field of mathematics education believes that efforts to reform mathematics curriculum should be given to the interests of particular importance, If research is concerned with learning to maximize their impact on students and teachers, It is necessary emotional to have a central position in the minds of researchers. The purpose of this study has examined the relationship between emotional variables depth, strategic and surface studying approaches and math anxiety to mathematics achievement when math anxiety is intermediate variable.

Richardson and Suinn (1972) have defined math anxiety according to feelings of stress and anxiety that comes from working with numbers and solving mathematical problems at different stages of life and educational opportunities. Several studies have shown that there is a significant correlation between performance and math anxiety, in other words math anxiety highly related to lower scores in math (Green, 1990; Ma, 1999).

One of the variables probably related to mathematics performance is the studying approach. The studying approach refers to how a learner is engaged in the subject matters. Biggs (2003) has identified three different approaches to studying: i) deep approaches are characterized by a preference to work conceptually and are driven by intrinsic curiosity. ii) Strategic approaches are characterized by a focus on obtaining high marks and organized

studying; and iii) surface approaches are characterized by an intention to achieve a pass, avoid too high a workload, misunderstanding requirements, and or thinking that factual recall is all that is required. Finding indicated that surface approach is associated with a less successful academic performance and deep and strategic approach is associated with higher academic performance (Diseth & Martinsen, 2003).

Unfortunately the relationship between studying approaches and math anxiety studies is low and scattered. Bessant (1995) in their study among 173 students who were enrolled in social psychology and introductory statistics course, States that surface and deep learning are factors in the development of math anxiety, Deep learning in a way that was relevant to the topic of interest, intrinsic motivation and anxiety, lower operating, In the surface learning level, has tended to focus on proven strategies, iterative facts, external pressures and higher anxiety levels. Decrease in the mathematics education of Iranian students are common problems in all educational foundation. Statistically, the high number of educational fall-off in mathematics is a common problem of Iranian students. The

Findings of the third international mathematics and science study (TIMSS, 2003) emphasize the weak performance of Iranian students in the mathematics fields. The results of these researches indicate that Iran ranks 34th in mathematics of the third grade in secondary education among 46 countries and 22nd among 25 countries of fourth grade. Therefore it is necessary to examine the reasons for this lack of success and variables that can

improve math performance among students or students identified. The purpose of this study is to investigate the relationship between study approaches and academic achievement in math when math anxiety is a mediator role, to achieve this purpose we use structure equation modeling to investigate theoretical model in population.

## 2. Material and Methods

The statistics population of these study students of Islamic Azad University, Abadan branch has been studied in the first semester of the academic year 2011. Sampling in such a way that the students who shared billing was elected four classes were taught in the same book of the pre-college mathematics, student samples were taken from these classes. Samples collected included 166 students (98 males and 68 females) and age range of participants is between 18 to 53 years with a mean age of 24.07 and standard deviation 5.61 years.

In this study to measure students' studying approaches short version of the approaches and study skills inventory for students (ASSIST) scale (Entwistle, 2008) and math anxiety is used by Fnm - Sherman math anxiety scale (1976). ASSIST scale consisted of 18 statements, and 3 subscales deep, strategic and surface approach is that each of the subscales is 6 items. In this study item's of ASSIST Likert type scale (1 = strongly agree to 6 = strongly disagree) was measured. The math anxiety Scale of Fnm - Sherman consisted of 12 items, which are any items of Likert type (1 = strongly agree to 5 = strongly disagree). The Cronbach's alpha reliability is achieved through the use of statistical methods. Subscales of studying the approach for deep, strategic and surface Cronbach's alpha value is calculated respectively, 0.61, 0.68 and 0.55 and for Fennema-Sherman math anxiety scale Cronbach's alpha values 0.92 obtained. Math achievement has been to the final score on the final exam is worth mentioning that the pre-college mathematics is designed jointly.

Structural equation modeling (SEM) was performed using maximum likelihood (ML) estimation with LISREL software. The root mean square error of approximation (RMSEA), comparative fit index (CFI) beside  $\chi^2$  statistics indicated for fit the theoretical model.

## 3. Results

Table 1 shows the descriptive statistics for the subscales of studying approaches, mathematics anxiety and mathematics achievement. According to this table, it is clear that the mean of mathematics achievement of students is not very good.

Table 1: Descriptive statistics of research variables (N=166)

variable	Mean	Standard Deviation
Math achievement	7.98	5.00
Math Anxiety	33.57	10.51
Deep Studying Approach	27.51	4.23
Strategic Studying Approach	27.88	4.96
Surface studying Approach	21.04	4.93

Table 2 shows the simple correlation between the mathematics achievement, studying approaches and math anxiety. According to this table, there is no significant relationship between the deep approach and mathematics achievement ( $r=0.041$ ,  $P>0.05$ ), strategic approach and mathematics achievement ( $r=0.046$ ,  $P>0.05$ ) and surface approach with mathematics achievement ( $0.103$ ,  $P>0.05$ ). To investigate the relationship between math anxiety and math achievement as the table 2 is observed, Math anxiety has a negative significant relationship with math achievement in one percentage error ( $r=-0.351$ ,  $P<0.01$ ). So it can be argued that the higher math anxiety is reduced math achievement. Survey the relationship between studying approaches and math anxiety, According to Table 2 show that there is a significant positive relationship between math anxiety and surface approach ( $r=0.297$ ,  $P<0.01$ ). The relationship between math anxiety and deep approach is negative significant ( $r=-0.166$ ,  $P<0.05$ ). Also, there is a significant negative relationship between math anxiety and strategic approach.

Table 3: Simple correlations between research variables

Variable	Math score	Surface	Strategic	Deep
Math Anxiety	-0.351**	0.297**	-0.166*	-0.157*
Deep	0.041	-0.073	0.557**	
Strategic	0.046	-0.193*		
Surface	-0.103			

\*\* $P<0.01$  \* $P<0.05$

Figure 1 shows the path coefficients in structure equation modeling. Given the significance of the surface studying approach indirect effect on mathematics achievement in this figure it path is shown as a dash line.

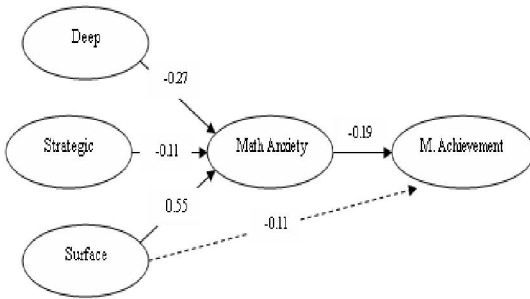


Fig 1. Estimate the path of the theoretical model

Table 3 indices fit the theoretical model presented in this study for model development using studying approaches of mathematics achievement with intermediately of mathematics anxiety role. The null hypothesis indicates that there is a theoretical model is acceptable. According to this table, the chi-square value is not significant at the 5% error level and the null hypothesis is not rejected ( $\chi^2=1.08$ ,  $P=0.78$ ). Thus, the theoretical model presented in this research using the data of this study is acceptable. Other indexes also show the goodness of fit model is also presented. According to these indexes provided for the mathematics achievement model using causal relationship between math anxiety and studying approaches is very good.

Table 3: Indexes of fitness the theoretical model

Index	$\chi^2$	df	CFI	RMSEA	90% CI for RMSEA
Value	1.08	3	0.98	0.00	(0.00,0.09)

**4. Discussions**

The aim of this study was to investigate the relationship between studying approaches and math anxiety with achievement in mathematics among students using structural equation model. Simple correlations between variables showed there is no significant relationship between approaches to studying and academic achievement in math. Eggen, and Kauchak (2001) believe the deep approach and a surface approach can lead to successful learning. This largely depends on how the measurements of student learning or student teacher. If measuring a teacher's emphasis on understanding the subject matter of the learners, Deep approach to learning leads to the achievement of learners. But if the sparse data include measurements of teacher education and

training materials have been reproduced, the surface approach to learning and studying is more successful. On the other hand, many previous studies have shown a negative and significant relationship between math anxiety and math achievement, In this study the relationship between these two variables was significant and negative. Note that the studying approaches relate to math anxiety and math anxiety related to mathematics achievement, so it can be considered a model for the study of the studying approaches the exogenous variables, and math anxiety and math achievement are endogenous variables to it. The results showed that this model is a good fitness in the population studied. Also in the models were found to surface approach significantly negative indirect effect on the mathematical achievement. Given that many math exams in human groups such accounting or management as surface question, this finding is important. Students with a surface approach to studying, Are externally motivated to keep contents tends to be repeated for grade school. Note that the continuous mathematics curriculum and basic math skills are important, his/her anxiety employing these skills is an important problem that the processing of data will increase the level of anxiety.

As an overall result of the theoretical model used in this study can be claimed that the studying approaches can be explain of achievement in mathematics through math anxiety. Among the studying approaches surface approach is an indirect effect on student math achievement. The results of this study can be used in educational counseling, to increase students' math achievement. Mathematics teachers can help as well as to improve their own education with the results of this study.

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**Corresponding Author:**

Bahare Soleymani  
 Department of Mathematics  
 Islamic Azad University  
 Abadan, Iran  
 E-mail: [soleymani\\_bahare@yahoo.com](mailto:soleymani_bahare@yahoo.com)

**References**

1. Bessant, K. C (1995), Factors associated with types of mathematics anxiety in college students, *Journal of Research in Mathematics Education*, 26, 327- 345.
2. Biggs, J. (2003). *Teaching for quality learning at university* (2nd ed.). Berkshire, UK: Open University Press.

3. Diseth, A., & Martinsen, O (2003), Approaches to learning, cognitive styles, and motives as predictors of academic achievement, *Educational Psychology*, 23, 195-207.
4. Eggen, P., & Kauchak, D. (2010). *Educational psychology: window on classroom*. Upper Saddle River, NJ: Merrill, Prentice-Hall.
5. Entwistle, N (2008), Taking stock: teaching and learning research in higher education, *Teaching and Learning Research in Higher Education*, Review prepared for an international symposium on "Teaching and Learning Research in Higher Education", Guelph, Ontario, April, 25-26, 2008.
6. Fennema, E. & Sherman, J.A (1976), Fennema-Sherman Mathematics Attitude Scales: Instruments designed to measure attitudes toward the learning of mathematics by females and males, *Catalog of selected Documents in Psychology*, 6(2), 31.
7. Green, L.T (1990), Test anxiety, mathematics anxiety and teacher comments: relationships to achievement in remedial mathematics classes, *Journal of Negro Education*, 56(3), 320 – 335 .
8. Ma, X (1999), A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics, *Journal for research in mathematics education*, 30(5), 520 – 540.
9. McLeod, D. B (1992), Research on Affect in Mathematics Education a Reconceptualization; *Handbook of research on mathematics teaching and learning*, A project of the National Council of Teachers of Mathematics, New York Macmillan, 575-596.
10. Richardson, F.C., and Suinn, R.M (1972), The Mathematics Anxiety Rating Scale: Psychometric data, *Journal of Counseling Psychology*, 19, 551– 554 .
11. TIMSS (2003). *Timss 2003 International Mathematics Reports*. Retrieved March 21, 2009, from [http://timss.bc.edu/pdf/t03\\_m\\_front.pdf](http://timss.bc.edu/pdf/t03_m_front.pdf).

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