The Relationship among Self-efficacy, Metacognitive Ability and Academic Motivation with Math Performance of High School Students in Parsian

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Abstract

The purpose of this study was to determine the relationship among self-efficacy, meta-cognitive ability and academic motivation with math performance of high school students in Parsian. This research has been applied in a purposeful and descriptive way and has been correlated with research type. The statistical population of this study was all high school students in Parsian. Sample size: 150 people were selected by cluster sampling method. Measurement tools were self-efficacy questionnaire, meta-cognitive ability questionnaire and academic motivation questionnaire. The results of this research have shown that there is a significant and positive relationship between self-efficacy, metacognitive ability, academic motivation and mathematical function. Also, student's math performance is predictable through the components of self-efficacy, metacognitive ability, and academic motivation. In total, approximately 30.3% of variance predicts students' mathematical performance variables.

Key words: self-efficacy, metacognitive ability, academic motivation, math performance, students.

1. Introduction

In today's societies, all nations with any political and social system, advanced and progressing, are paying attention to the education issue, and pay more attention to it than other social activities (Khayer, 2006).

This is not an unnecessary consideration, and a strong moral authority has been established. Because today, the education of children is one of the most important needs of social life. Progressive motivation is a psychological issue that has focused on the attention of many psychologists and educators. In this regard, identifying the important and effective factors in motivating academic achievement in relation to the educational and social characteristics of individuals helps to pay attention to improving the students' academic status. Motivation is in fact the main stimulant and the energy that generates behavior (Gich & Berliner, 1994, quoted from Saif, 2005). And if effective factors in creating academic motivation are recognized and used desirable, successes in education and learning process and, most importantly, learning continuity will be created.

The motivation for progress is the ability to do good work toward high standards (McClelland and Atkhneon, 1968 quoted from Saif, 2005). By exploring the nature of the motivation for progress, in the last forty years, the person who has the need for progress defines the following: Success in competing with its supportive standards requires strong progress to succeed in some challenging assignments (Seif, 2005).

Many studies have pointed to a significant relationship between the motivation for progress and academic achievement and the existence of motivation for progress

has been introduced into the motor of academic achievement. Hawth and others (2006), in their research, have pointed to the impact of motivation on the performance and academic achievement of learners.

Those who are motivated are progressing well in terms of what they say, in terms of moderate difficulty, better than those who are motivated by little progress. Students with high motivations do not perform easy or difficult tasks better than students with low motivation. Rather, performance in relatively difficult assignments with high motivation gives a positive encouragement to the student with low motivation. The student is motivated by a lot of progress towards an average challenge because this kind of challenge challenges his skill and ability better. Achieving success through self-person-to-person skills makes a lot of progress that he's doing well, a feeling that's of particular importance to these people (Seif, 2005).

A student who has a low level self-efficacy may not even prepare for an exam because he thinks it will not be worth any effort. On the other hand, a person with high level self-efficacy is more hopeful and successful in doing things (Bayernengrand, 2007).

2. Theoretical Basics of Research

In the present era, with the ever-growing technological advancement of tremendous changes in human life and simplicity of life, complex mathematics has opened its place to all social and industrial fields, and man is inevitable for getting help from math to answer the complexities of his life. Hence, today, higher education systems around the world are working to incorporate mathematical topics into their curricula to develop mental abilities and the power of rational reasoning in their learners, and to help them keep pace with scientific

developments and technological advancements. Obviously, achieving such goals requires identifying the problems that students face in math lessons. On the other hand, it seems that some of the learning problems in the learning of math have an inward root and are due to cognitive-motivational variables and student attitudes.

In recent years, many studies have been done on metacognition, and recently, people's beliefs about the nature of knowledge and learning or epistemological beliefs have been studied, assuming that they are part of the meta-cognitive underlying mechanism (Spiro, Fletowicz and Coulson, 1996). ; Shomer, 1990).

Educational psychologists typically consider epistemological beliefs as a system of implicit and absolute assumptions and beliefs that students have about the nature of knowledge and acquisition (Brunning, Shrow and Roning, 1999; Paulson and Feldman, 2005). These beliefs have different dimensions and include categories such as the source of knowledge, the certainty of knowledge, the organization of knowledge, the speed of knowledge acquisition, and the control of the learning process (Schummer et al., 1997). These categories are enclosed along a continuum with raw and naive beliefs on the other, and on the other side, sophisticated and wise beliefs (Paulson and Feldman, 2005). Individuals with naive beliefs believe that knowledge is simple and definitive, and that they receive authority, besides, they do not have control over learning, and only intelligent people are able to learn. On the other hand, people with well-educated beliefs believe that knowledge has a complex structure and its information is less stable, the individual is constructive of meaning and controls his learning (Schumer, 1990).

Also, in recent years, the goals of progress have been considered as one of the most important theoretical frameworks for the conceptualization and study of educational outcomes (Eliot, 1999, and Pintrich, 1994). The goals of progress

actually represent a comprehensive semantic system of situations or tissues that have cognitive, emotional and behavioral implications, and learners use them to interpret their actions (Ames, 1992; Duques and Leggett, 1988, Kaplan and Schaer, 1999).

The concept of the goals of progress is essentially based on the learner's reasons for doing the assignments (Braaten & Stamsowo, 2004). In other words, the overwhelming response to this component answers the question "Why do I do this assignment?" This theory takes into account both personal factors (perceptions, values and emotions) and situational factors beyond the other theories that motivate learners on cognition or factual factors. The goals of progress are different in terms of the skill and ability of the various types, including the goals of mastery (homework objectives and learning goals) that are used to demonstrate competence development, learning and mastery of the assignment, and the performance goals that serve to demonstrate competency with others. Recently, by dividing the performance objectives into two dimensions, the approach-performance and avoidance-performance goals expanded the Duce theory's theories and focused on research goals, achievement goals, approach-performance goals, and avoidance-performance goals (Eliot and Church, 1997; Eliot and Harkvich, 1996; Dupirat and Marin, 2005). According to this view, those who choose the approach-performance goals act as a form of struggle for others to promote themselves and show themselves, and this kind of perception of activity produces emotions that cause them to go into action and struggle and focus more on homework and homework is appealing to them. Also, people who choose the approach-performance goals emphasize their skills in comparison with others. On the other hand, learners with AEs focus on avoiding lack of skills compared to peers and classmates, and their focus is on avoiding failure. Eventually, the

consequence of such an alternative is to feel ineffective. Finally, those who choose the goals of excellence emphasize the development of their own skills and learning, and mastery.

Students' motivation for learning is usually considered as the main determinant of the success and quality of learning outcomes. Research has shown that student perception of merit decreases with increasing educational levels. This decline has been attributed to a variety of factors, including greater competition, less teacher attention to individual students' progress and school-related stress (quoted by Camarodin et al., 2009). Some studies have also shown that problem solving, creativity, and deep understanding of learning require high levels of positive excitement and intrinsic motivation (Moore, 2005).

In addition to the above, self-efficacy also plays an important role in academic performance. Self-efficacy refers to people's beliefs about their abilities, in performing homework successfully at a specified level (Bandura, 1997). Studies show that students' self-efficacy is a positive predictor of academic performance in various subjects, including mathematics, science, and reading (Leam et al., 2008; Hoodjes, 2008; Rivers, 2008).

According to the mentioned cases and the results of the researches mentioned, it is clear that the mentioned variables - academic motivation, metacognitive ability and self-efficacy - are somehow related to academic performance, but the review of the research shows that comprehensive research on the role of this Factors have not been conducted on academic performance, or existing research has scattered this issue.

Since learners have different levels of self-efficacy and these differences affect learning, academic achievement, motivation, thinking, problem solving, response

to situations, etc., it is necessary for instructors to be aware of how it is to educate their learners in Optimal use help (Saif, 2007).

Since the self-efficacy and motivation of student progress are among the psychological structures that play an effective role in the academic achievement of students in different fields and can guide the future in determining the field of study at the university and the choice of occupation, such research is essential.

Self-efficacy judgments are important because of the important role they play in the growth of intrinsic motivation. Because self-efficacy has shown that overcoming and endurance against barriers (Bandura, 1986) can be a major cause of performance relative to complex interpersonal duties (Gist et al., 1991 quoted from Mirzai, 2007). For this reason, it is essential to carry out research that can help educators in identifying the motivation and self-efficacy of students in terms of depriving the region.

Research has also shown that self-efficacy is effective in academic performance (Dorman & Adams, 2004). They said that academic self-efficacy was positively related to academic motivation. Therefore, one of the other variables to be taught in relation to academic performance is student self-efficacy.

As already mentioned, one of the educational system's requirements is to succeed in developing and develop the necessary educational skills among students, and given that student, this massive teenager plays an important role in future cultural, social and economic development, this research will be useful in evaluating the factors affecting academic performance in math. In the past decades, individual differences were considered to be the main factor in the difference in educational level between students. Hence, intelligence and talent tests have been expanded, but in recent years, especially with the presentation of cognitive and newspoints,

new ideas have been presented on student learning problems and failures that partly reflect the importance of learning and how to apply learning strategies.

In fact, the difference between students is not only on intrinsic capabilities but also in the way information is processed, hence, using appropriate educational methods, the field of problem solving and improvement of the level of students' learning and education is provided. Regarding the necessity and importance of motivation, meta-cognition and self-efficacy in academic performance, the importance of addressing such research is twofold. This research and the same research try to expand the knowledge of the field by demonstrating the relationship between mathematical self-efficacy, mathematical metacognitive ability and academic motivation with the performance of math of high school students, and on the other hand, solving problems for solicitors and teachers. The aim of this study was to investigate the relationship between self-efficacy, meta-cognitive ability and academic motivation with math performance in high school students in Parsian.

3. Research hypotheses

3.1 Main hypothesis

There is a significant relationship between self-efficacy, meta-cognitive ability and academic motivation with the math performance of high school students in Parsian.

3.2 Sub-hypotheses

- There is a significant relationship between self-efficacy and math performance of high school students in Parsian.

- There is a significant relationship between the metacognitive ability and the mathematical performance of high school students in Parsian.

- There is a significant relationship between the educational motivation and the math performance of high school students in Parsian.

- The variables of academic motivation, metacognitive ability and self-efficacy are predictors of math performance among high school students in Parsian.

4. Research method

The purpose of this study was to determine the relationship between self-efficacy, meta-cognitive ability and academic motivation with math performance of high school students in Parsian and determine the empirical relationships between self-efficacy, metacognitive ability and academic motivation with student's math function and add to applied knowledge in this regard; Accordingly, the current research is applied in terms of target and in terms of data collection method, descriptive research is a correlation type. The statistical population of this study was all high school students in Parsian. Sample size: 150 people were selected by cluster sampling method. Measurement tools were self-efficacy questionnaire, meta-cognitive ability questionnaire, and academic motivation questionnaire.

5. Research results

To analyze all hypotheses, Pearson correlation coefficient test was used.

5.1. First Special Hypothesis Test: There is a significant relationship between self-efficacy and math performance in high school students in Parsian.

Table 1. Results of the first hypothesis test. Correlation between self-efficacy and academic performance

variable		Academic Performance
Efficacy	Pearson correlation	.545
	Significance level	.000

	Number	150

In this section, Pearson correlation coefficient between self-efficacy variables and students' academic performance is calculated. The significance level of the test also shows that there is a significant relationship between self-efficacy variables with student's academic performance (95% confidence level) ($P < 0/05$). Also, the correlation coefficient is equal to (0.545). These numbers are positive and represent a direct correlation between the variables. In other words, self-efficacy has affected students' academic performance. In this way, the more self-efficacy of students increases, their academic performance will increase and vice versa. Based on the results of the above test, the main hypothesis of the research is confirmed.

5.2 Special hypothesis test

2. There is a significant relationship between the metacognitive ability and the mathematical function of high school students in Parsian.

Table 2. Results of the second sub-hypothesis test. Correlation between metacognitive ability and academic performance

variable		Academic Performance
metacognitive ability	Pearson correlation	.603
	Significance level	.000
	Number	150

In this section, Pearson correlation coefficient between metacognitive ability variables and students' academic performance is calculated. The significance level of the test also shows that there is a significant relationship between metacognitive ability and students' academic performance (95% confidence) ($P < 0.05$). Also, the correlation coefficient is equal to (0/603). These numbers are positive and

represent a direct correlation between the variables. In other words, metacognitive ability has an effect on academic performance of students. As the metacognitive ability of students increases, their academic performance will increase and vice versa. Based on the results of the above test, the main hypothesis of the research is confirmed.

5.3 Special-hypothesis test Third:

There is a significant relationship between academic motivation and math performance in high school students in Parsian.

Table 3. Results of the third hypothesis test. The correlation between academic motivation and academic performance

variable		Academic Performance
academic motivation	Pearson correlation	.587
	Significance level	.000
	Number	150

In this section, Pearson correlation coefficient is calculated between the variables of academic motivation and academic performance of students. The significance level of the test also shows that there is a significant relationship between the two variables of academic motivation with students' academic performance (95% confidence level) (P <0.05). Also, the correlation coefficient is equal to (0.558). These numbers are positive and represent a direct correlation between the variables. In other words, it can be said that academic motivation has affected students' academic performance. In this way, the higher the student's academic motivation, their academic performance will increase, and vice versa. According to the results of the above test, the main hypothesis of the research is confirmed.

5.4. Special Fourth Specific Examination:

Variables of academic motivation, metacognitive ability and self-efficacy are the predictions of math performance among high school students of Parsian.

A stepwise regression equation was used to determine which of the variables of academic motivation variables, metacognitive ability and self-efficacy predicted academic performance more than expected.

Table 4. Test results of the fourth hypothesis of the variables entered in the regression model in different steps

model	The correlation coefficient	The coefficient of determination	Adjusted coefficient of determination	Estimated criterion error
1	٠/a484	٠/244	٠/ 489	١
2	٠/b533	٠/274	٠/ 413	٢
3	٠/c467	٠/303	٠/ 449	٣
a-Predictors: (constant), academic motivation				
b-Predictive: (fixed), metacognitive ability				
c- Predictor: (fixed), self-efficacy				
Dependent variable: academic performance				

The results show that the predictive regression model of academic performance has been done in three steps. In the first step, the academic motivation is entered into the equation and the coefficient of determination (R2) is equal to 0.244. In other words, academic motivation alone determines 24.4% of the variance in academic performance. In the second step, along with the variable of academic motivation, the metacognitive ability variable is introduced into the equation. By entering this variable, the coefficient of determination (R2) has increased to 274/0. In other words, the two variables of academic motivation and meta-cognitive ability alone

determine 27.4% of the variance in academic performance. In step three, along with the variable of academic motivation and variable metacognitive ability, the self-efficacy variable entered into the equation. By entering this variable, the coefficient of determination (R2) has increased to 303/0. In other words, three variables of academic motivation, metacognitive ability and self-efficacy, together, determine 30.3% of variance in academic performance.

Table 5: Analysis of variance analysis

model	Source of change	Sum of squares	Degree of freedom	Average squares	the amount of F	Significance level
1	regression	6.511	1	6.511	28.01	a.000
	remaining	26.846	118	.229		
	all	33.357	119			
2	regression	7.827	2	4.213	16.74	b.000
	remaining	25.977	117	.241		
	all	33.804	119			
3	regression	8.546	3	4.102	16.45	
	remaining	24.645	116	.223		c.000
	all	33.191	119			
a-Predictors: (constant), academic motivation						
b-Predictive: (fixed), metacognitive ability						
c- Predictor: (fixed), self-efficacy						
Dependent variable: academic performance						

The results of table (4-6) show that the calculated F value for the regression analysis steps is significant ($p < 0.05$). Therefore, the regression equation is statistically significant.

Table 6: Regression coefficients of the entered variables

model	variable	Standardized coefficients	Not standardized coefficients		T value	Significance level
		Beta	The standard deviation	B		
1	Fixed		.160	3.257	18.632	.000
	educational motivation	.454	.062	.278	6.012	.000
2	Fixed		.215	3.221	14.087	.000
	educational motivation	.326	.055	.246	3.678	.000
	Metacognitive ability	.247	.059	.169	2.246	.000
3	fixed		.245	3.349	13.985	.000
	educational motivation	.312	.047	.241	3.648	.000
	Metacognitive ability	.212	.041	.158	2.072	.000
	Self-efficacy	.202	.036	.156	2.006	.000
Dependent variable: academic performance						

Table (6) shows the stepwise regression coefficients. Regression coefficient (B) The first step for the motivation variable is equal to .278 and the "constant" regression is 257.3.

In the second step, the metacognitive ability variable enters the equation and the coefficients of the academic motivation variable and the meta-cognitive ability variables are 0.246 and 0.169 respectively, and the regression constant is 3.221. In step 3, the variable of self-efficacy capability is entered into the equation. The coefficients of the variables of academic motivation, metacognitive ability variables, and autoimmunity variables are respectively 0.241 and 0.158 and 0.156 respectively, and the constant value of regression is 349/3.

In this way, the final regression equation with three predictors of academic motivation, metacognitive ability and self-efficacy will be as follows:

(Meta-cognitive ability - 0.158) + Autoimped - 0.156) + 349/3 = Academic Achievement (Educational motivation - 0.241)

6. Discussion and Conclusion

Anyone involved in a learning assignment should be self-aware, that is, aware of his abilities and limitations, and control his behavior on the basis of this knowledge and consciousness. Successful students are students who are aware of and learn about their learning. Many learning difficulties are due to the lack of metacognitive skills and strategies. The skills and strategies mentioned give individuals the opportunity to select, control, monitor, manage and, as a result, improve cognitive processes. Therefore, it is necessary for learners in the field of skills such as regulation, self-monitoring, planning, and goal setting, the necessary training to master the decision-making cognitive strategies and create the basis for new learning. In the third place, it is difficult for them to solve new tasks that they have

not already faced. Self-efficacy and motivation can also play an important role in dealing with the goals, challenges and tasks of the person.

Based on the findings of the present study, the following suggestions are offered to the authorities:

-Given that the results indicated that academic motivation and self-efficacy and metacognitive ability predict math performance, it is therefore recommended to teach some things to increase the students.

- Families can also help students increase their academic performance by creating an atmosphere that is comfortable and relaxed.

- On the other hand, given that increasing academic performance depends to a great extent on the students' motivation and willingness, students are encouraged to use techniques that are attractive to them in the study of mathematical concepts and can increase their performance in this way.

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