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The relationship between personality characteristics and the psycho-social climate of the classroom in the engagement of high school students studying mathematics

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Abstract

Introduction: This research investigates the relationship between personality characteristics and the psycho-social climate of the classroom (PSCC) in the academic engagement of high school students in mathematics.

Materials and method: The statistical population consisted of all second grade and junior high school students studying a mathematical and science course during the academic year of 2011-2012 in the city of Dameghan, Iran. Participants were randomly selected with a multi-stage method. Finally 513 students (310 girls and 203 boys) were completed 3 questionnaires: MSLQ (Pintrich and DeGroot, 1990), Psycho-social climate of classroom (Michaud, Comeau and Goupil, 1990) and Personality questionnaire - short form (NEO-FFI). The multiple regression method was used to analysis data.

Results: The results showed that openness, consciousness, extroversion and PSCC could be positively predicted, while neuroticism could negatively predict academic engagement.

Conclusion: It seems that a favorable psycho-social climate, along with respect and friendship between learner-teacher, and learner-learner, can be effective in academic engagement. In addition to, personality characteristics play an important role in academic engagement.

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1. Introduction

This article attempts to understand personality characteristics and the psycho-social climate of the classroom to predict the engagement of high school students studying mathematics in the city of Dameghan. At all academic levels, teachers and educational authorities seek to engage students in academic and learning activities, and encourage students in their homework for the development of high level cognitive skills and learning (Abolmaali, Hashemian & Anari, 2012). In this study, engagement in mathematics has been studied, because of the importance of mathematics in everyday life and results of the TIMMS study in 2003 showed that Iran ranked 24th among the 25 countries that participated in an assessment of fourth grade elementary mathematics (Mohammad-Ismail, 2006).

Generally, students' academic engagement indicates psychological investment and direct effort for learning and understanding dominate knowledge, skills and arts that academic activities are done to improve them (Newmann, Wehlage & Lamborn, 1992). In this regard research carried out by Linnenbrink and Pintrich (2003) shows that academic engagement is a multidimensional structure made up of three components: behavioral, cognitive and emotional.

Behavioral engagement refers to visible behaviors in dealing with school, effort and stability while doing homework, seeking help from others while doing homework, and contribution in classroom activities (Finn & Rock, 1997). Elliot, McGregor and Gable (1999) showed that effort has a direct effect on students' academic performance.

Cognitive engagement refers to types of information processing such as deep processing, and elaborating and organizing information used by students for learning. Recent studies show that deep cognitive engagement has a positive correlation with the academic performance of students, while there is no relationship between surface cognitive engagement and academic performance (Elliot et al., 1999). Wolters (2004) showed that when high school students do mathematics homework they use more cognitive and metacognitive strategies. Foulad-Chang (1997) and Ekhtiyari-Ardakani (1999) also showed that learning cognitive strategies has a positive impact on motivation and the problem-solving performance of students of mathematics. Some researchers highlight a number of factors that affect academic engagement. These include cognitive factors such as intelligence (Biabangard, 2006; Besharat, Shalchi & Shamsipoor, 2007; Karimi, 2012), information processing, such as using cognitive strategies (Caraway, Tucker, Reinke, & Hall, 2003; Abdollahpoor, 2004; Wolters, 2004; Dupeyrat & Marian, 2005; Harackiewicz & Linnenbrink, 2005), motivational factors, such as goal orientation (Kajbaf & Khalili, 2004; Hejazi, Rastgar, Karamdost & Ghorban-Jahromi, 2008), internal and external motivation, a sense of belonging to the school (Jordan, Lara & McPartland. 1994); general interest to the school (Ekstrom, Goertz, Pollack & Rock, 1986); and being involved in extracurricular activities, such as sports and camps (Ingels, Curtin, Kaufman, Alt & Chen, 2002). Although these predictions vary, educational psychologists are interested in presenting appropriate strategies to improve the academic level of learners.

The effective dimension of academic engagement refers to individual variables (internal and related to him/her), contextual variables (external) such as communication with peers, classroom climate and family support, as well as excitement and emotions such as anxiety, exhaustion, enthusiasm and the value of homework. Effective engagement is a motivation to get learners involved in learning. Giving value to homework shows the interest and internal enthusiasm a learner gives to their homework, and indicates their beliefs about the subjects and skills they learn. It is important that students are convinced that the presented contents are important and useful to them (Slavin, 2006). Pintrich and Garcia (1991) found that different beliefs in the value of homework (importance and usefulness) have positive and meaningful relationships with students' academic performance (Bong, 2001).

Personality characteristics can be considered as an intrinsic factor that can affect students' academic engagement. Personality can affect a person's

motivation, learning and academic performance. Feist and Feist (2002) introduced personality as a relatively stable pattern of traits, tendencies or characteristics that give durability to the behavior of individuals. In Costa and McCrae's (1992) model, five important personal factors or mega-traits are described: neuroticism, extraversion, openness, agreeableness and consciousness. The physical consequences of neuroticism, such as increased heartbeat, muscle tension and an upset stomach, associated with concepts of self-inferiority and weak self-assessment and weak intelligence leads to a decline in the academic performance of students (Chamorro-Premuzic & Furnham, 2003; De Raad, & Schouwenburg, 1996; Duff, Boyle, Dunleavy & Ferguson, 2004; Atashroz, Rastgar & Askari, 2009). Lounsbury, Tatum, Gibson, Park, Sundstorm, Hamrick and Wilburn (2003) showed that emotional consistency has a negative relationship with an intention to withdraw from school.

Individuals with low extraversion tend to have a greater ability for learning, acquiring better study habits and are less distracted. Research has shown that people with high extraversion at a young age have better academic performance, while at higher levels of education they are faced with educational failure, possibly because they spend less time learning and spend more time in social and extracurricular activities such as sport. In fact, from high school onwards, the correlation between extraversion and academic achievement becomes negative (Dunsmore, 2005). This pattern maybe represent passing through an informal, interactive and classroom-based environment of the primary school, to a more academic environment based on studying. For example, McKenzie (1989) found that extraversion is negatively related with success in higher education, and this correlation can be explained using interpersonal skills.

Ackerman and Heggestad (1997) explained that individuals with high openness seem to have lingual skills, vocabulary skills and a high general knowledge. Furthermore, Blickle (1996) declared that individuals with an open personality have more motivation for studying and acquiring new experiences.

Agreeable people have a greater tendency to form study groups and learning. Low levels of agreeableness are related to conflict and students with weaker communication skills with teachers and classmates (Graziano, Hair & Finch, 1997; Wentzel, 1997). Hair and Graziano (2003) found that greater agreeableness and openness in students in middle schools leads to academic achievement in higher education (high school and university). Some studies showed that conscientiousness continuously has a positive relationship with academic engagement (Wagerman & Funder, 2007, Komarraju, Karau & Schmeck, 2009) and Duckworth and Seligman (2005) believed that this relationship is beyond the IQ. In this regard, Wolfe and Johnson (1995), Graziano and Ward (1992), and Busato, Prins, Elshout and Hamaker (2007) reported that conscientiousness is the strongest predictor of academic performance. This prediction also includes the examination performance of middle and high school students (Lounsbury et al., 2003), B.Sc students (McCrae, Costa, Terracciano, Parker, Mills, De Fruyt & Mervielde, 2002), and graduate students (Hirschberg & Itkin, 1978).

Contextual variables (external variables) such as communication with peers and psycho-social climate of the classroom (PSCC) are other variables that can affect students' academic engagement (Anderman & Midgley, 1997). A favorable PSCC is formed by the interaction between teachers and students. The teacher tries to attract the interest of students by using strategies such as careful programming to prevent undesirable behaviors. If a teacher provides challenging assignments based on individual differences, s/he will create an increased interest in assignments. Challenging assignments create enthusiasm, satisfaction and joy in learners, and result in a greater involvement in academic activities. Students who are more involved in academic activities use more cognitive and metacognitive strategies (Ames, 1992; Goodenow, 1993; Gentry, Gable & Rizza, 2002; Pintrich & Schunk, 2002; Larocque, 2008; Sungur & Gungoren, 2009; Leutwyler & Merki, 2009). Other factors such as classroom structure (Hejazi &

Naghsh, 2009) and perceptions of classroom environment (Abolmaali, et al., 2012) are effective in explaining differences in students' academic engagement. Most of the research has studied the effect of objective aspects of the academic environment.

According to what was discussed, the question of this research is; would it possible to predict students' academic engagement in mathematics based on personality characteristics and psycho-social climate of the classroom (PSCC)?

2. Method

The research method in the present study is descriptive and correlational method using parametric statistic.

2.1. Participants

The method of this research was correlation. The statistical population consisted of all second grade and junior high school students studying a mathematical and science course during the academic year of 2011-2012 in the city of Dameghan, Iran. Participants were randomly selected with a multi-stage method, the first 10 schools and then2 classes were randomly selected at each school and final513 students (310 girls and 203 boys) were completed 3 questionnaires.

2.2. Measurement

2.2.1. Academic engagement

This questionnaire had 32 questions to measure behavioral, emotional and cognitive aspects of academic engagement. It is one of the subscales of motivation strategies for a learning questionnaire (MSLQ) produced by Pintrich and DeGroot (1990). In Iran, Abedini (2008) reported reliability of this questionnaire with internal consistency, and Cronbach's alpha coefficients were reported for behavioral dimensions (effort), emotional (the task), cognitive strategies and metacognitive strategies as 0.69, 0.90, 0.69, and 0.75, respectively. In the present study, reliability of this questionnaire with internal consistency was obtained, in the above order, at 0.59, 0.66, 0.59 and 0.73.

2.2.2. Psycho-social climate of classroom (PSCC)

A PSCC questionnaire used to measure the psycho-social climate of the classroom was made by Michaud, Comeau and Goupil (1990). PSCC assesses two dimensions: perception and expectation. In this research only perception was assessed. The reliability of internal consistency of this test, for the dimension of perception, was about 0.68 according to in Iran (Ansari, 1996).

2.2.3. Personality questionnaire - short form (NEO-FFI)

This questionnaire assesses the personality characteristics of neuroticism, extraversion, openness, agreeableness and consciousness. Cronbach's alpha coefficient was measured by Costa and McCrae (1992) between 0.68 and 0.86 from neuroticism to openness. In Iran Garoosi-Farshi (1999) obtained Cronbach's alpha coefficient at 0.84, 0.75, 0.74, 0.75 and 0.83, respectively. In the present study, Cronbach's alpha coefficient in the above dimensions was measured at 0.678, 0.594, 0.531, 0.509, and 0.738, respectively.

3. Results

Descriptive statistics displayed in table 1.

Table1. Descriptive indexes of variables

	Mean		Standard Deviation		Skewness		Kurtosis	
Variables	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy
Academic Engagement	108.5	106.6	13.27	13.58	-0.58	-0.36	0.51	0.02
Neuroticism	17.81	16.42	5.60	5.88	-0.07	-0.18	-0.43	0.51
Extraversion	21.88	22.13	4.76	3.00	-0.44	-0.29	0.31	0.11
Openness	11.57	11.02	2.63	3.01	-0.70	-0.53	0.80	0.32
Agreeableness	11.95	12.20	4.33	3.97	-0.12	-0.13	0.01	0.08
Consciousness	33.88	33.89	6.84	7.03	-0.50	-0.36	0.09	0.48
PSCC	15.40	14.95	2.37	3.00	-0.31	-0.63	-0.24	0.28

With regard to table 1, the standard deviation of academic engagement scores more than other variables and almost distribution of all studying variables tend to normal trend (skewness and kurtosis are in the range of -1 and +1). Multiple regressions were used to predict the academic engagement and its components based on personality characteristics and classroom climate in boys and girls.

Table2. Prediction of emotional dimension of academic engagement of boys and girls, based on personality characteristics and PSCC.

Academic engagement dimensions	Predictor variables	Boys				Girls			
		B	β	t	Sig.	B	β	t	Sig.
Emotional dimension	Neuroticism	-0.07	-0.94	-1.35	0.19	-0.58	-0.76	-1.32	0.19
	Extraversion	0.08	0.10	1.32	0.19	0.11	0.12	2.04	0.04
	Openness	0.16	0.18	2.68	0.01	0.03	0.03	0.46	0.65
	Agreeableness	0.13	0.15	1.89	0.16	-0.01	-0.01	-0.17	0.87
	Consciousness	0.04	0.05	0.68	0.50	0.15	0.21	3.52	0.01
	PSCC	0.31	0.19	2.77	0.01	0.32	0.15	2.79	0.01

According to the above table, openness and PSCC can predict the emotional dimension in boys. Also, extroversion, conscientiousness and classroom climate can predict the emotional dimension in both the girls' and total samples. Neuroticism can predict emotional dimension negatively, while extroversion, openness and conscientiousness can predict this factor positively, and just agreeableness cannot predict emotional dimension of academic engagement in total group sample.

The multivariate correlation coefficient (R) between the emotional dimension of academic engagement and predictor variables in the total sample is equal to R=0.358, R=0.427 in boys, and R=0.355 in girls. R square in the total sample, and the boys' and girls' groups is R^2=0.128, 0.182 and 0.112, respectively. In the other words, the variance of emotional academic engagement could be explained by personality characteristics and PSCC, which equals 12.8 % in the total sample, 18.2% in the boys' sample, and 11.2 % in the girls' sample. Also, based on ANOVA test results (with regard to the ratio of the average regression variance to the average residual variance (F value) and the level of significance (sig.), there is a meaningful relationship between a weighted linear combination of independent variables, which are specified by the model, and the dependent variable in the total, and the samples of both girls and boys.

Table3. Prediction of behavioural dimensions of academic engagement based on personality characteristics and social climate of classroom in the total, boys' and girls' groups.

Academic engagement dimensions	Predictors	Boys				Girls			
		B	β	t	Sig.	B	β	t	Sig.
Behavioural dimension	Neuroticism	-0.01	-0.02	-0.22	0.83	-0.02	-0.04	-0.79	0.43
	Extraversion	0.05	0.11	1.34	0.18	-0.01	-0.15	-0.27	0.79
	Openness	0.002	0.04	0.05	0.96	-0.01	-0.02	-0.40	0.69
	Agreeableness	0.07	0.13	1.67	0.03	-0.01	-0.02	-0.40	0.6
	Consciousness	0.08	0.19	2.34	0.02	0.18	0.46	8.48	0.0
	PSCC	0.10	0.11	1.57	0.12	0.12	0.11	2.07	0.0

According to the boys' sample in table 3, conscientiousness can predict the behavioural dimension of academic engagement, while other predictor variables do not have a significant

contribution in the prediction of behavioural dimensions on academic engagement. In the girls' sample, as well as in total group, personality characteristics (consciousness) and PSCC can predict behavioural dimensions of academic engagement. R, between the behavioural dimension of academic engagement and predictor variables in the total, boys' and girls' groups is R=0.424, 0.383 and 0.479, while R square in the total, boys' and girls' groups is R^2=0.180, 0.146 and 0.23, respectively. In other words, the amount of variance in the behavioural dimension of academic engagement, which is explained by personality characteristics and PSCC in the total, boys' and girls' groups are 18%, 14.6% and 23%, respectively.

Based on analysis of variance test results (with regard to F value and sig.), there is a meaningful relationship between a weighted linear combination of independent variables, which are specified by the model, and the dependent variable in each of the total, girls' and boys' samples.

Table4. Prediction of cognitive dimension of academic engagement based on personality characteristics and PSCC in the total, boys' and girls' groups.

Academic engagement dimensions	Predictor variables	Boys				Girls			
		B	β	T	sig	B	β	T	sig
Cognitive dimension	Neuroticism	-0.03	-0.03	-0.43	0.67	0.02	0.03	0.50	0.62
	Extraversion	-0.01	-0.01	-0.13	0.89	0.04	0.05	0.75	0.43
	Openness	0.06	0.06	0.73	0.43	0.19	0.10	1.81	0.07
	Agreeableness	0.10	0.09	1.17	0.24	0.04	0.04	0.60	0.55
	Consciousness	0.21	0.24	3.03	0.03	0.28	0.35	6.11	0.001
	PSCC	0.27	0.14	1.96	0.05	0.08	0.04	0.69	0.51

According to table 4, in the boys' and girls' groups, cognitive dimension of academic engagement is predicted only based on conscientiousness of personality characteristics. In the total group, conscientiousness and PSCC can predict academic engagement in the cognitive dimension.

The multivariate correlation between the cognitive dimension of academic engagement and predictor variables in the total, boys' and girls' groups is R=0.367, 0.364 and 0.383. The square of the correlation coefficient in the total, boys' and girls' groups is R^2=0.135, 0.147 and 0.147, respectively. In the other words, the amount of variance in behavioural dimensions of academic engagement, which is explained by personality characteristics and PSCC in the total, boys' and girls' groups is 13.5%, 14.7% and 14.7%, respectively.

Based on ANOVA test results (with regard to F value and sig.), there is a meaningful relationship between a weighted linear combination of independent variables, which are specified by the model and the dependent variable, in each of the total, girls' and boys' groups.

Table5. Prediction of metacognitive dimension of academic engagement based on personality characteristics and PSCC in the total, boys' and girls' groups.

Academic engagement dimensions	Predictor variables	Boys				Girls			
		B	β	T	sig	B	β	T	sig
Metacognitive dimension	Neuroticism	-0.14	-0.23	-0.31	0.75	-0.14	-0.24	-4.15	0.0005
	Extraversion	0.47	0.07	0.84	0.41	0.06	0.09	1.61	0.11
	Openness	0.16	0.02	0.31	0.76	-0.03	-0.24	-0.65	0.51
	Agreeableness	-0.04	-0.05	-0.61	0.55	0.03	0.24	0.61	0.54
	Consciousness	0.17	0.28	3.49	0.01	0.15	0.27	4.63	0.0005
	PSCC	0.14	0.10	1.37	0.17	0.18	0.11	2.12	0.04

According to table 5, in the boys' group, metacognitive dimensions of academic engagement are predicted on conscientiousness of personality characteristics. In the total and girls' groups, neuroticism can negatively predict academic engagement in the metacognitive dimension, while conscientiousness and PSCC can positively predict metacognitive dimension of academic engagement.

Multivariate correlation between the cognitive dimension of academic engagement and predictor variables in the total, boys' and girls' groups is R=0.343, 0.341 and 0.367. R square in the total, boys' and girls' groups is R^2=0.181, 0.116 and 0.135, respectively. In other words, the amount of the variance in the behavioural dimension of academic engagement, which is explained by personality characteristics and PSCC in the total, boys' and girls' groups are 18%, 11.6% and 13.5%, respectively.

Based on ANOVA test results (with regard to F value and sig.), there is a meaningful relationship between a weighted linear combination of independent variables, which are specified by the model and the dependent variable in each of the total sample and girls' and boys' groups.

4. Discussion

The creation of the best scientific, social, economic and ethical performances of students depend on instructions that have proper content, appropriate methods, and noble and achievable goals. Proper instructions of scientific and social implications with content are very important that should be adjusted with the students' needs. Therefore, to achieve the desired result these instructions should be carried out in an environment that respects their needs. If today's students cannot communicate with each other, show their feelings logically, listen to the opinions of others, alongside them live peacefully with the consent, and not to be trained about these subjects, their future interpersonal relationship will be dominated by the society. In recent years, Iran has given much importance to teaching concepts such as friendship, mutual respect, obeying rules, cooperation and agreeableness (Ansari, 1996; Abolmaali et al., 2012).

In the present study, PSCC can predict dimensions of academic engagement. It seems that a favorable psycho-social climate, along with respect and friendship between learner-teacher, and learner-learner, can be effective in motivating learners.

In this study, openness could predict emotional engagement in boys, while openness could predict academic engagement in girls. It seems that the different results stem from various cultural characteristics that deal with seeking curiosity in girls and boys. Open people seek diversity; they are sometimes moody and have independent judgment. Also, they do not enjoy repetitive contexts and instructional methods. As a result, they soon become tired and perhaps achieving a high score is not important to them (Wagerman, 2007).

A positive relationship between conscientiousness and academic engagement is expected based on consciousness's structure. In the present study, conscientiousness in girls and boys predicted dimensions of academic engagement. It seems that conscientiousness leads to increased interest in lessons. Conscientious people usually do their homework carefully and try to improve their performance. They have high sense of responsibility, are development-oriented, prefer structured learning environments, and are determined to achieve (Komarraju, et al., 2009). Agreeableness people are positive, warm and have friendly relationships with classmates and teachers (Feist and Feist, 2002), so a clear explanation can be offered about a positive relationship between agreeableness and academic engagement. Therefore, agreeableness increases students' tolerance when encountering difficult conditions and leads to constructive interactions with study groups, teachers and other students.

In this study, the correlation between neuroticism and academic engagement is negative. Neurotic people display anxiety, fears, doubts and other

problems that affect academic and non-academic performances (Komarraju, et al., 2009). These unpleasant consequences can cause to decrease in academic talent and perseverance which are necessary for academic achievement. With regard to the findings of this research, it is suggested that teachers place emphasis on educating conscientiousness and creating different experiences when students enter an instructional environment. In this way, learners are involved in instructional activities that provide a favorable context for academic achievement. To reduce the neurotic traits of anxiety and worry in students it is suggested educators create a secure climate in schools to enhance academic performance.

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