

Explanation of Academic Achievement Based on Personality Characteristics Psycho-Social Climate of the Classroom and Students' Academic Engagement in Mathematics

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Abstract

This research explains academic achievement based on the personality characteristics, the psycho-social climate of the classroom in terms of academic engagement in mathematics. The population was high schoolboys and girls in Damghan city in Iran. Participants were randomly selected using a multi-stage cluster method (513 boys and girls) and they simultaneously completed three questionnaires: academic engagement, the psycho-social climate of the classroom and personality characteristics. Path analysis was used to analyze data. The results showed that the direct effects of personality characteristics and psycho-social climate of the classroom on academic achievement were not significant. The direct effects of openness, conscientiousness and psycho-social climate of classroom on academic engagement were significant. The indirect effects (with mediation of academic engagement) and overall effects of openness, conscientiousness and psycho-social climate of classroom on academic achievement were significant, also the effect of academic engagement on academic achievement was significant.

Keywords

Academic Achievement, Personality Characteristics, Psychosocial Climate of Classroom (PSCC),

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Student's Mathematical Academic Engagement

1. Introduction

Academic achievement is considered as a criterion by which to decide on the effectiveness of educational programmes. Researchers evaluating an education system often take notice of academic achievement and look for factors that affect academic achievement. They have identified various factors including: 1) Cognitive factors such as intelligence [1], the way of information processing, and the use of cognitive and meta cognitive strategies [2], styles of thinking and learning [2] [3] and creativity [4]; 2) Motivational factors such as goal orientation and motivational beliefs [5]-[7], and internal and external motivation [8]; 3) Factors related to the quality of instruction in schools such as teaching methods and the psycho-social climate of the classroom [9] [10], the structure of the classroom [11], the feeling of belonging to the school [12] and perceptions of classroom environment [13] [14]; 4) Family factors such as family environment perception [12], family support perception [15]; 5) Socio-economic status such as parent's education and their occupation [16]; 6) Non-cognitive factors such as personality traits [17] [18], identity styles [16], self-concept and self-esteem [19]; and 7) A combination of different factors (cognitive, emotional, behavioral) such as academic engagement [20]-[22], and resiliency [10].

Although, the results of the above-mentioned research are different in some areas, these variables have been taken note of by educators. In this research the relationship between the psycho-social climate of classroom (PSCC), personality characteristics and academic engagement with academic achievement has been studied.

In general, academic engagement leads to more effort and participation in academic activities and the promotion of educational outcomes. Linnenbrink and Pintrich [23] showed that academic engagement is a multidimensional structure that has three components: behavioral, cognitive and emotional. Some of specialists suggest that when homework has value for students, they become involved in it [20]. In this study considering the importance of engagement in mathematics has been studied. Based on results of the TIMMS study in 2003, Iran ranked 24th among the 25 countries that participated in an assessment of fourth grade elementary mathematics [24].

Behavioral engagement is considered as a variety of observable behavior in terms of exposure to homework and of maintaining student's efforts with regard to academic activity, and because they seek help from others when doing homework and participating in class [25]. Researchers suggest that behavioral engagement has a positive impact on academic achievement [26].

Cognitive involvement consists of a variety of information processing approaches that students use for learning. The degree of cognitive engagement has been investigated as a mediator variable that impacts on learning strategies (meta cognitive and cognitive strategies such as deep processing, meaning elaboration and the organization of information). The relationship between learning and academic achievement in high school students is mediated by cognitive engagement [27] [28]. Elliott, McGregor and Gable [29] explained that deep cognitive engagement is positively related to academic performance, but there is no relationship between academic performance and surface cognitive engagement. The results of Wolters' research [30] showed when successful high school students do math homework, they use more cognitive strategies. Some researchers have reported a positive relationship between learning strategies (cognitive and Meta cognitive) and academic achievement [2] [6] [7].

The affective dimension of academic engagement consists of individual variables (internal variables that are related to the self) and contextual variables (such as peer relationships, classroom climate and family support). These variables could explain academic achievement [31]-[34].

The psycho-social climate of the classroom (PSCC) is considered as a contextual variable that impacts on affective outcomes and the academic behavior of students, and reflects on the interpersonal relationships between student/teacher and student/student, and explains students' expectations and perceptions. PSCC has two dimensions: perception and expectation. It is recognized there is a significant positive relationship between PSCC and academic progress [35] [36]. Hojat-Ansari stated that optimal PSCC could lead to positive and purposeful relationships between teachers and students [37]. Bianfar concluded that the perception and expectation of a positive PSCC leads to academic progress [38].

Personality is also an important factor that motivates learning and has an influence on the academic perfor-

mance of students. Personality is a relatively continuous trait and has tendencies or characteristics that ensure the stability of behavior in individuals [39]. The so-called Big Five personality traits are neuroticism, extroversion, openness, agreeableness and conscientiousness. Neurotic people are described as having traits such as shyness, high levels of anxiety and an unstable temperament. Extroverts are social and self-assertive individuals who are optimistic in terms of life experience. Open people are described as being open-minded, with an active imagination and independent judgment. They seek variety in their lives. They are very curious about their surroundings and constantly seeking to gain new experiences. Agreeable people tend to emphasize the need for trust and patience, and respect laws and the beliefs of others. Conscientious people have a high sense of responsibility and accountability and tend to progress and focus on the task and their work [40]. Recent studies have shown that conscientiousness could be a strong predictor of academic achievement [17] [41] [42] and this prediction also includes performance in tests [43]. According to what has been said above, it is necessary for creating a bridge between the individual and social areas. Individual areas include personality characteristics, engagement in school activities and homework and so on, while social areas include the environment of the classroom such as PSCC.

So, in this study, we have tried to answer the question as to whether or not the academic achievement of students could be predicted based on personality characteristics and PSCC, with the mediation of academic engagement in mathematics. To answer this question, the conceptual model used in this study was fitted with data collected from a statistical sample. Theoretical model is given in Figure 1.

2. Method

2.1. Procedure

The method adopted by this research was quantitative in nature. The research population included both boys and girls who were educated in the high schools of Damghan city in Iran. Following Schumacker and Lomax’s suggestion, the participant ratio to the estimated parameters was considered to be 1:20 and the total number was estimated at 420, which increased to 550 with we considered pre-estimation [44]. Due to the failure to complete 37 questionnaires (the measuring tool), the sample volume was reduced to 513 participants (i.e. 310 girls and 203 boys).

Objective: Identification of the effects of personality characteristics and PSCC on academic achievement with the mediation of academic engagement.

Research assumptions:

- 1) PSCC and personality characteristics have direct effects on academic achievement.
- 2) PSCC and personality characteristics have indirect effects on academic achievement that are mediated by academic engagement.
- 3) PSCC and personality characteristics have direct effects on academic engagement.

For data collection, three questionnaires are used:

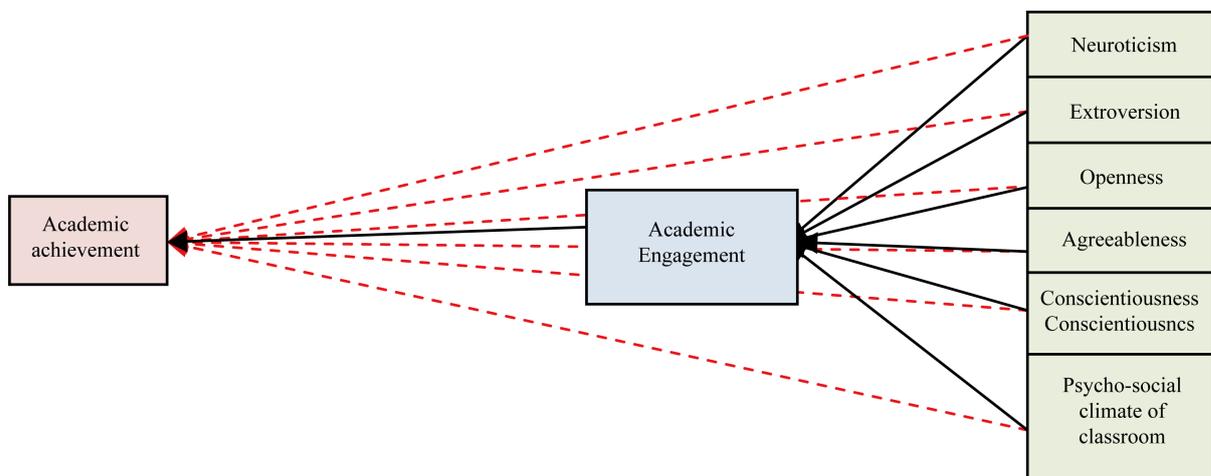


Figure 1. Theoretical model.

2.2. Instruments

2.2.1. Academic Engagement Questionnaire

This questionnaire has 32 questions that measure the behavioral, emotional and cognitive aspects of academic engagement. It is one of the subscales of the motivation strategies for learning questionnaire (MSLQ), which was produced by Pintrich in 1994 [45]. In Iran, Abedini reported on the reliability of this test in terms of internal consistency and Chronbach alpha coefficients [21]. These were reported for behavioral dimensions (effort), emotional (the task), cognitive strategies and Meta cognitive strategies as 0.69, 0.90, 0.69 and 0.75 respectively. In the present study, the reliability of this test in terms of internal consistency was obtained in line with the above order as 0.59, 0.66, 0.59 and 0.73 respectively.

2.2.2. Psychosocial Climate of the Classroom

The PSCC questionnaire is used for measuring the Psycho-Social Climate of Classroom as proposed in 1990 by Michaud, Comeau and Goupil [46]. PSCC assesses 2 dimensions: perception and expectation. In this research, only the dimension of perception was assessed. The internal consistency reliability of this test in Iran in terms of the dimension of perception was about 0.68 [37], and specialists have emphasized its content validity.

2.2.3. Personality Questionnaire-Short Form (NEO-FFI)

This questionnaire assesses the personality characteristics of neuroticism, extraversion, openness, agreeableness and conscientiousness. Cronbach's alpha coefficient in terms of neuroticism to openness was measured by Costa & McCrae in 1992 at between 0.68 and 0.86 [47]. In Iran, GaroosiFarshi obtained Cronbach's alpha coefficients of 0.84, 0.75, 0.74, 0.75 and 0.83 respectively [48]. In the present study, Cronbach's alpha coefficients in terms of the above dimensions were measured at 0.678, 0.594, 0.531, 0.509, and 0.738, respectively.

In order to comply with ethical standards, the following points were considered:

Obtaining permission from the educational organizations in Domghan city, and school administrators; obtaining informed consent of participants; and Reassure participants that the information collected will remain confidential.

3. Results

According to the **Table 1**, the standard deviation of PSSS is more than the standard deviation of the other variables. Kurtosis and skewness show that the distribution of the data is almost normal. Fifty three percent of the participants were female and 47% were male, and 54% in math field and 46% in science field studied and their mean age was 17 years.

To test the hypothesis, path analysis was used. The direct, indirect and overall effects of the path coefficients are reported in **Table 2**. The St.d., t and R^2 , with and without indirect effects, were reported.

Table 2 showed that:

Table 1. Descriptive indices of under-study variables.

Descriptive indices							
selbairav	naem	standard deviation	ecnairav	ssenweks	St.d of skewness	sisotruk	St.d of skewness
academic achievement	17.51	1.79	3.21	-1.00	0.108	0.654	0.215
academic engagement	107.88	13.46	181.18	-0.48	0.108	0.270	0.215
neuroticism	17.25	5.82	33.90	-0.13	0.108	-0.422	0.216
extraversion	22.04	4.86	23.45	-0.36	0.108	0.105	0.215
openness	11.35	2.83	7.99	-0.655	0.108	0.553	0.215
agreeableness	12.06	4.22	17.80	-0.135	0.108	0.059	0.216
conscientiousness	33.84	6.99	48.80	-0.466	0.108	-0.163	0.215
CCSP	15.22	2.64	6.98	-0.544	0.108	0.359	0.215

Table 2. The finding of path analysis.

Direct, Indirect and Overall path coefficients, St.d, t, R ² with and without direct effect												
	Nonstandardized path coefficients (direct effect)	St.d of direct effect	t	Nonstandardized path coefficients (direct effect)	Indirect effects	St.d of indirect effect	t	overall effects	St.d of overall effect	t	R ²	R ² with and without indirect effects
The effect of engagement on achievement	0.03	0.01	5.04	0.24	-	-	-	0.03	0.01	5.04	0.20	
The effect of neuroticism on engagement	0.000	0.10	-0.03	0.000	-	-	-	0.000	0.10	-0.03		
The effect of extroversion on engagement	0.09	0.12	0.76	0.03	-	-	-	0.09	0.12	0.76		
The effect of openness on engagement	0.57	0.20	2.87	0.12	-	-	-	0.57	0.20	2.87		
The effect of agreeableness on engagement	0.21	0.14	1.49	0.06	-	-	-	0.21	0.14	1.49		
The effect of conscientiousness on engagement	0.64	0.08	7.61	0.33	-	-	-	0.64	0.08	7.61		
The effect of PSCC on engagement	0.70	0.21	3.38	0.14	-	-	-	0.70	0.21	3.38		
The effect of neuroticism on achievement	-0.03	0.01	-1.85	-0.09	0.000	0.000	-0.03	-0.03	0.01	-1.85	-0.06	0.01
The effect of extroversion on achievement	-0.02	0.02	-0.96	-0.04	0.000	0.000	0.76	-0.01	0.02	-0.77		
The effect of openness on achievement	0.01	0.03	0.48	0.02	0.02	0.01	2.49	0.03	0.03	1.10		
The effect of agreeableness on achievement	0.000	0.02	-0.22	-0.01	0.01	0.000	1.43	0.000	0.02	0.11		
The effect of conscientiousness on achievement	-0.01	0.01	-0.93	-0.05	0.02	0.000	4.20	0.01	0.01	0.71		
The effect of PSCC on achievement	0.04	0.03	1.18	-0.05	0.02	0.01	2.81	0.07	0.03	2		

- 1) The direct effects of personality characteristics and PSCC on academic achievement are not significant.
- 2) The direct effect of academic engagement with regard to mathematics on academic achievement is significant.
- 3) The direct effect of PSCC and openness and conscientiousness on academic engagement in mathematics is significant.
- 4) The overall and indirect effects of openness, conscientiousness and PSCC on academic achievement with mediation of academic engagement are significant. Therefore the role of mediator in terms of academic engagement is confirmed.
- 5) The direct effect of PSCC on academic engagement is significant.

In this model, 20% of the total variance of academic engagement and 6.7% of the variance of academic achievement is explained. The fitted model is given in **Figure 2**.

4. Discussion

In this study, the results show that the direct effect of academic engagement in mathematics on academic achievement is significant. These results are in good agreement with those of other researchers [5] [49]-[52].

In this research, the direct effect of PSCC on academic engagement was found to be significant and positive. These results are consistent with the findings of Atofi-Salmani *et al.* and Keramati [36] [53]. Also, according to the results obtained in this research, the overall effect of PSCC on academic achievement was significant, findings that are confirmed by the results of many researches [7] [53]-[55]. It seems that a good PSCC could create an optimal community in terms of friendship between the teacher/learner and learner/learner, and leads to students demonstrating an increased amount of academic engagement.

In this study, the direct effects of openness and conscientiousness on mathematics academic engagement were significant. These results are consistent with the findings of Duff, Boyle, Dunleavy and Ferguson [56], Dunsmore [57], Komarraju *et al.* [42] and Atashrouze *et al.* [17]. But in this study, neuroticism, extraversion and agreeableness could not directly predict mathematics academic engagement. Such findings were also obtained in Furnham, Zhang and Chamorro’s research in 2006, and that of Duff *et al.* [56] [58]. Based on the findings of the present study, openness, conscientiousness and agreeableness have significant indirect effects on academic achievement. The findings were confirmed by the results obtained by Duff *et al.*, Dunsmore; Furnham *et al.*; Furnham, Chamorro-Premuzic and McDougall; and Hakimi [18] [56]-[59]. It seems that conscientiousness leads to an interest in the course. Individuals with conscientiousness tend to carry out their duties carefully, and try to raise their own performance and ensure progress. High persistence and high achievement guarantee academic success. People that are open to new assignments also enjoy experiencing more academic engagement.

5. Conclusion

It seems that for building a positive psychosocial climate of the classroom needs to social-emotional learning (SES). SES is built upon caring relationship and warm but challenging classroom and school environment. These classrooms are places where students feel cared about, welcomed, valued and seen as more than just learners—they are seen as resources (Elias, 2003). As a result a classroom with positive psychosocial climate could be challenging for students and can foster cognitive, affective and behavioral engagement in academic tasks and leads to academic achievement. The findings with regard to the importance of students’ involvement and a safe PSCC classroom suggest teachers to build a safe environment for involving learners in learning activities, allowing them to increase their opportunities with regard to academic achievement. Furthermore, given the significant

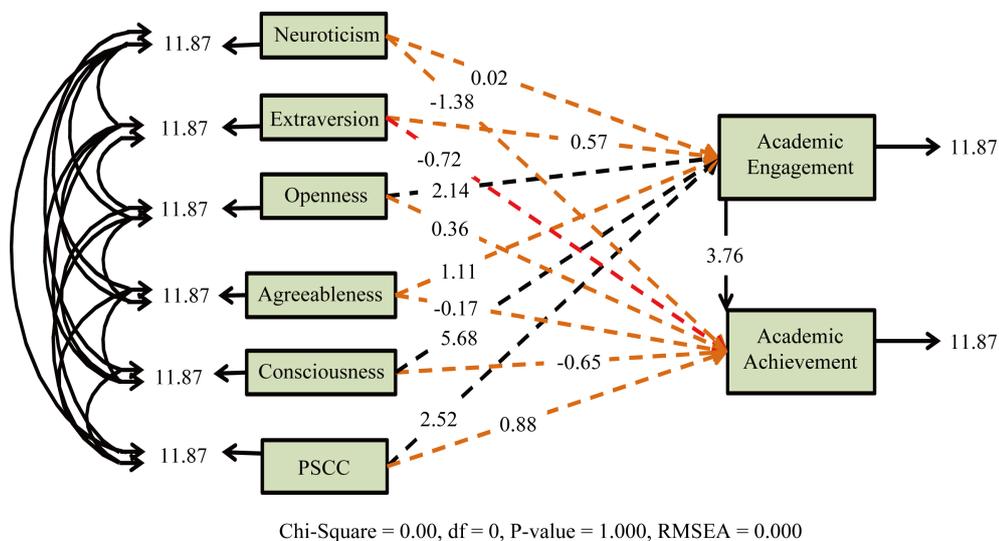


Figure 2. The fitted model, using path analysis.

and positive contribution of conscientiousness and openness in explaining academic engagement, it is recommended that teachers use teaching methods based on experience action and use cooperative learning strategies to motivate and engage learners in academic task and strengthen sense of student's responsibility. In this research, importance of academic engagement in mathematics, as an intermediate variable, is emphasized. That academic engagement can role-play as a mediator that mediates the effects of personality traits on academic achievement. Therefore, it is recommended that teacher of mathematical lessons use strategies to engage their students in math.

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