

A Model to Predict Academic Performance based on the Components of Emotional Intelligence, Problem Solving Skills and Achievement Motivation among Students of Smart and Ordinary School

Ismail Sadipour¹, Soghra Ebrahimi Ghavam², Noorali Farrokhi³, Hassan Assadzadeh⁴, Nahid Sameti⁵

1. Associate Professor, Department of Educational Psychology, University Allameh Tabatabaei, Tehran, Iran (Corresponding Author)

2. Associate Professor, Department of Educational Psychology, University Allameh Tabatabaei, Tehran, Iran

3. Associate Professor, Department of Assessment and Measurement, University Allameh Tabatabaei, Tehran, Iran

4. Associate Professor, Department of Educational Psychology, University Allameh Tabatabaei, Tehran, Iran

5. PhD student, Department of Educational Psychology, University Allameh Tabatabaei, Tehran, Iran

ABSTRACT

Improving the academic performance of students is one of the main concerns of authorities in education fields. The science of psychology and education experts has tried to help research and studies, to identify factors affecting the academic performance of students. Previously cognitive abilities as one of the most important determinants of academic performance is recognized, but gradually it became clear non-cognitive factors such as emotional intelligence play prominent role in the academic performance of students. Children who have high emotional intelligence, in the use of problem-solving skills show higher abilities, which results in improving the cognitive ability of these students. The aim of this study provide a model predicting academic performance based on the components of emotional intelligence, problem-solving skills and achievement motivation among students of ordinary and smart school. The study in term of method is predictive- correlational. The population in this study consisted of all high school students in Tehran using multi-stage cluster sampling 583 students were selected as sample. The results showed that the direct effect of emotional intelligence and achievement motivation on students' academic performance is significant, but direct effect of problem-solving skills on students' academic performance is not significant. The direct effect of emotional intelligence and achievement motivation on students' academic performance in smart schools is significantly higher than its impact on the academic performance of students in ordinary schools. There was any significant direct difference between problem solving skills and academic performance of students in smart and ordinary schools. So it can be concluded that the role of smart schools in important variables such as emotional intelligence, achievement motivation and academic performance makes the role of smart schools brighter and stronger.

KEYWORDS

smart schools, emotional intelligence, problem-solving skills, achievement motivation, academic performance

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CORRESPONDENCE Ismail Sadipour

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Introduction

Today, unlike in the past, the views governing educational psychology of many factors and learning aspects is changeable and achievable. One of the important points is always emphasized by cognitivists is educable many factors involved in learning. Cognitivists in their work have emphasized on learnability of creativity, problem solving, cognitive and metacognitive strategies (Baills et al., 2001, Mesrabadi, 2001). Improving the academic performance of students is one of the main concerns of authorities in education fields. The science of psychology and education experts has tried to help research and studies, to identify factors affecting the academic performance of students. Previously cognitive abilities as one of the most important determinants of academic performance is recognized, but gradually it became clear that non-cognitive factors such as emotional intelligence play prominent role in the academic performance of students. Children who have high emotional intelligence, in the use of problem-solving skills show higher abilities, which results in improving the cognitive ability of these students (Mayer, Salovey and Caruso, 2000).

One of the factors affecting the students' academic performance is their problem-solving ability. The results of the studies (Matemba, Awinja, Otieno, 2014; Barker, 2003; Ahadi, Mirzaie, Narimani and Abolghasemi, 2009) shown that there is a direct and significant correlation between problem-solving skills and academic performance of students. The child's ability to use thinking to solve problems is keys to success in his life. In studies such as these, when children repeatedly shown lack the necessary skills to cope with their problems or listening skills or focus, feel responsibility about their assignments, or lack importance of education, whatever these skills to nurture, help their academic performance. In this sense, emotional literacy teaching schools increase learning capacity.

Even in times of crisis and reduce the budget can be argued that these programs, to reverse the trend of educational decline and strengthen schools in accomplishing their main mission to contribute and thus are worthy for the investment (Goleman, 1995). Love and Nelson (2006) claimed that emotional intelligence is a crucial factor for personal health and academic success of students. They claimed that students with emotional intelligence skills are better able to deal with difficult and complex experience of college.

Smart schools are an environment that has the potential necessary to accomplish this goal. The school's first introduced by Perkins et al in collaboration with Project Zero study center at Harvard University and then in his book entitled smart schools: better thinking and learning for children (Perkins, 1992), was published. By definition, the smart school is the school where in the process of implementation of all processes, including management, monitoring, control, teaching-learning, learning resources and teaching aids, evaluation, teacher and office, communications and principles of development based on ICT (information and communication technology) and to improve the research-based educational system is designed (Ministry of Education, 2011).

In this sense, the present study based on Perkins theory (1992) in the field of smart schools, and other studies, they noted, the ability to predict the components of emotional intelligence, problem-solving skills and achievement

motivation and academic performance of students in ordinary and smart schools examined.

Theoretical Foundations

Smart School is a school in which the execution of all processes, including management, monitoring, control, teaching-learning, learning resources and teaching aids, evaluation, master and office affairs, communications and principles of development, based on information and communication technology (ICT) to improve the research-based educational system is designed (Ministry of Education, 2013).

Emotional intelligence mainly as the ability to review their own and others feelings and emotions, distinguish between emotions and use emotional information in problem-solving and ordering defined behavior (Meyer, 2014).

Sharma (2005) defined motivation as "an activity person to motivate and stimulate mode for person or other groups in proper condition to do or regulate the activities associated with the design goals; or the excited state of the people that under appropriate circumstances or behavior in relation to the goals performed and set out".

Academic performance is a set of academic behavior that progress in two dimensions of achievement or declining academic achievement in the field of achieving information. This function can be used in conjunction with other factors such as school and university classroom activities and communicate with classmates and professors (Maw, 1997 According to Shaver, Salimi and Homae, 2008).

Research background

Aghili and Fotohinia (2014) in a study examined the effect of smart technology on motivation and academic achievement of high school students in Gonbad Kavoos city. The research method was quasi-experimental with control group. The results showed that academic achievement in experimental group that used the smart board than the control group, increase 9.32 units and the academic achievement of the experimental group than the control group increased 1.019. According to equation regression coefficients, adjusted coefficient of determination showed that the variables of smart boards and motivation, explained 0.18 variance of academic achievement.

Heidari, Vaziri and Adli (2013) in a study to evaluate the smart schools based on standards and to compare its performance with their regular schools.

Population consisted of all girls high schools in Yazd city, two ordinary high schools and two smart high schools using cluster sampling was selected. The results showed that the current status of smart schools in terms of teaching-learning content, FAVA infrastructure, trained teachers and low-level computer-based communication in schools and only in components administrators use computer is desirable. Also, there was no significant difference between critical thinking and student's performance in smart and ordinary school, but there was significant difference in academic achievement and student's performance.

Jandra Jenna (2013), in the form of a pilot study with a pretest / posttest and control group design, examined the effect of smart class on academic performance.



For this purpose, using random sampling, 60 students were selected. The results showed that the learning environment with smart classrooms to teach students both weak and strong significantly is better than traditional classes.

Zarei Zavaraki and Malazadegan (2014) in a research compared the motivation of fifth-grade male students in smart schools with ordinary schools. Research design was causal-comparative and statistical population included all students in fifth-grade elementary schools in Tehran. From population 62 students from smart schools and 62 students from ordinary schools were selected and evaluated. The sampling method used in this research is purposive sampling because samples have been chosen must be considered closest to the standards.

Hermans achievement motivation questionnaire to determine the motivation of students in two smart and ordinary schools have used.

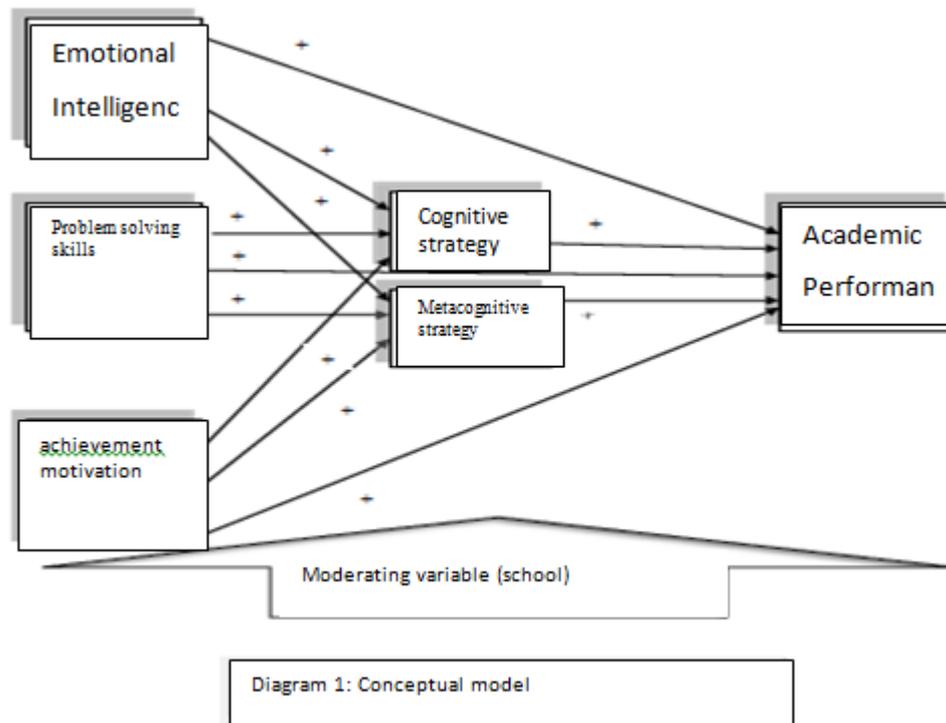
The results showed that there is no significant difference between the motivation of students in smart and ordinary and FAVA facilities has any significant effect on the motivation of students.

Timmis, Cook (2004) in a study entitled "motivate learners to online learning: organizational strategies and needs" to evaluate the motivational topics related to online learning. The paper concluded that virtual learning opportunities to motivate learners. Strategies such as external motivator, clear expectations in a virtualized environment have special tips for taking advantage of opportunities in virtual learning environments considered.

Mirzajani and Dellaviz Biklaee (2013) in a study called emotional intelligence of students in smart schools, within an experimental method using pre-test / post-test with control group showed that the smart school students than students in ordinary schools is significantly higher than emotional intelligence.

Conceptual model:

Based on what was said, the conceptual model of this study can be demonstrated as follows:



Research Methodology

With respect to the question, hypothesis and purpose of the research methodology of this study, was predictive- correlational. The study aimed to examine change one or more variable, with some changes to one or more other variables. The present study aimed to examine variables such as emotional intelligence, problem-solving skills and academic achievement in predicting academic performance of students of ordinary and smart school. The population in this study is all high school students in Tehran. According to the Education Department of Tehran Province, the total high school students (sixth, seventh and eighth grades) and the second high school (ninth, tenth and eleventh grades) are equal to 756329 people, of which 507489 on ordinary schools and 248840 students are enrolled in smart schools.

The multi-stage cluster sampling method used, selected sample accurately represents the population studied. Cochran formula was used to estimate the sample size.

The research samples are 640. However, among all the questionnaires, 611 questionnaires were collected after reviewing them, 28 questionnaires because they were not fully completed and incomplete data were excluded from analysis. Therefore, the data of 583 questionnaires were analyzed.

To collect the data, Hermans Achievement Motivation Scale (1970) Bar-On Emotional Intelligence Scale (2000), Social Problem Solving Inventory- revised: short form (SPSI-R: SF), Dortaj academic performance questionnaire (2014) is used: in this study, the descriptive data, mean, frequency, tables and graphs and to evaluate hypotheses and causal relationships between variables was used path analysis. Data analysis was performed using AMOS software.

Results

Inferential results

To analyze the research hypotheses, path analysis were used. The statistical method is in fact an extension of regression. In other words, in path analysis the role of mediator and mediation, as well as direct role of exogenous variables on the endogenous variable and the mediating role of mediating variables were examined.

In the diagram (1) structural model has been given by researchers to explore hypotheses 1 to 3 drawn and standardized coefficients as well as the variance explained by exogenous variables on endogenous and mediator's variables as schematics have been reported.

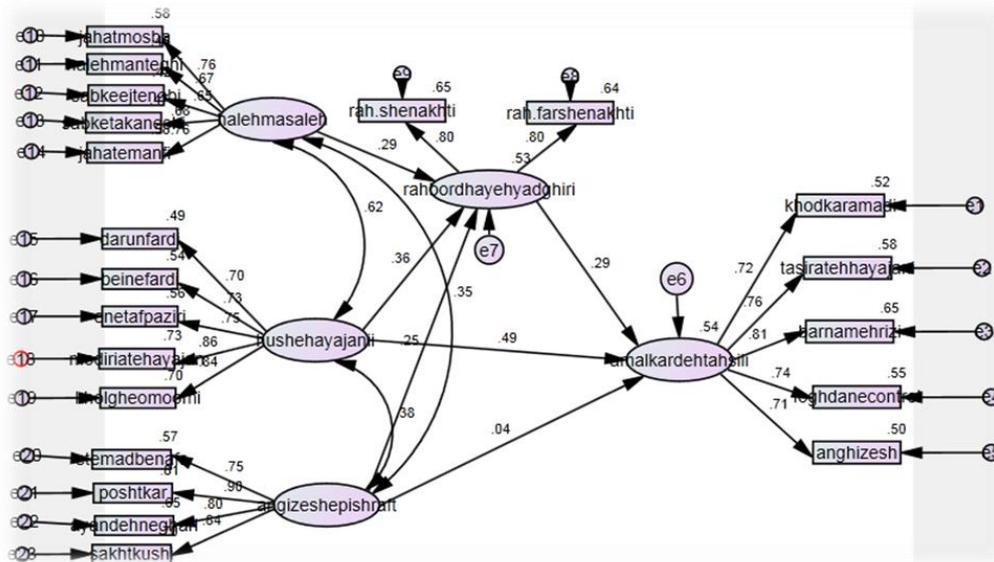


Diagram 1: The main research path analysis model to evaluate the role of learning strategies in mediating problem solving, academic motivation and emotional intelligence and academic performance

Research hypothesis

First hypothesis: emotional intelligence directly affects academic achievement. For a detailed review of the results, standard regression, and non-standard coefficients predicted in Table 1 have been reported. According to this table it is clear that all path coefficients are statistically significant ($P < .01$). According to the results reported in Table 1 it is clear that the standard coefficients of predicting academic performance through emotional intelligence is equal to 0.335 and the value of the correlation coefficient at the level of $P < .01$ was significant. The standard coefficients of predicting academic performance through learning strategies is equal to 0.362.

Table 1: standard and non-standard regression coefficients predicting academic performance and emotional intelligence and learning strategies

Dependent		predictor	Non-standardized coefficients	Standardized coefficients	Standard deviation	Critical value	significance level
Learning strategies	→	Emotional Intelligence	.636	.320	.026	12.491	0.01
Academic Performance	→	Learning strategies	.275	.362	.076	4.779	0.01
Academic Performance	→	Emotional Intelligence	.505	.335	.039	8.688	0.01

But the most important part of this hypothesis is whether emotional intelligence directly affects academic performance or not? The value of the regression coefficient has a significant amount of data is considered to be statistically powerful.

Second hypothesis: problem solving skills directly affect academic performance.

Before any interpretation of the indicators fit with path coefficients obtained data must be considered.

In Table 2 Index of the model fitness for model 3 has been reported.

Table 2: Fitness index of the data with model 3

Fitness index	obtained value	acceptable amount
Chi square	467.730 (degrees of freedom equal to 11)	Non-significant
NFI	0.94	Higher 0.90
CFI	0.93	Higher 0.90
GFI	0.94	Higher 0.90
RMSEA	0.06	Smaller 0.08

Given that all three fitness indicators are statistically in the acceptable range, so it can be concluded that 3 model with experimental data obtained in this study is an acceptable fit.

For a detailed review of the results of the regression coefficients, standard and non-standard predicted in Table 3 have been reported. This table shows that according to regression coefficient problem solving skills has not significant effects on academic performance.

Table 3: standard and non-standard regression coefficients predicting academic performance and problem-solving skills and learning strategies

Dependent		predictor	Non-standardized coefficients	Standardized coefficients	Standard deviation	Critical value	significance level
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Dependent		predictor	Non-standardized coefficients	Standardized coefficients	Standard deviation	Critical value	significance level
Learning strategies	→	problem solving skills	.625	.056	.580	11.106	0.01
Academic Performance	→	Learning strategies	.668	.083	.544	8.035	0.01
Academic Performance	→	problem solving skills	.109	.076	.082	1.428	0.01

This indicates that the second hypothesis is not confirmed.

Third hypothesis: achievement motivation directly affects the academic performance.

Before any interpretation of the path coefficients, first fitness index with data must be considered. Table (4) model fitness index of the data for model 4 reported.

Table 4: indicators fitted with version 4

Fitness index	obtained value	acceptable amount
Chi square	476.720 (degrees of freedom equal to 41)	non-significant
NFI	0.94	higher 0.90
CFI	0.92	higher 0.90
GFI	0.94	higher 0.90
RMSEA	0.08	smaller 0.08

Given that all three fitness indicators are statistically in the acceptable range, so in this study it can be concluded that 4 model with experimental data obtained has acceptable fitness.

For a detailed review of the results, standard and non-standard regression coefficients in the table (5) have been reported.

Regression coefficient in this table shows that achievement motivation has a direct and significant effect on academic performance.

Table 5: standard and non-standard regression coefficients predicting academic performance and problem-solving skills and learning strategies

Dependent		predictor	Non-standardized coefficients	Standardized coefficients	Standard deviation	Critical value	significance level
Learning strategies	→	achievement motivation	.645	.068	.486	9.441	0.01
Academic	→	Learning	.643	.076	.499	8.428	0.01

Dependent		predictor	Non-standardized coefficients	Standardized coefficients	Standard deviation	Critical value	significance level
Performance		strategies					
Academic Performance	→	achievement motivation	.320	.085	.187	3.776	0.01

In other words, the outcome of this table clearly indicates that regression coefficient directly predicting academic performance through motivation is statistically significant. The achievement motivation has direct effect on academic performance.

Fourth hypothesis: the direct effect of emotional intelligence and academic performance of students in ordinary and smart schools is different.

In hypothesis fourth to sixth type of school as a moderating variable is evaluated. The difference between the fitness values of chi-square method and CFA used to examine the role of schools in moderating the relationship between the variables.

In fact, this method is a prerequisite for a group comparison that specifies that the measurement models are unchanged between groups.

That is, they have similar regression coefficients.

According to Chen (2007) and more difference than 0.01 CFA and more than 0.015 represent there is a significant difference between the two models and two models are not similar.

Or in other words, moderating variable has significant role in moderating the relationships between variables measuring the structural model. So it can be concluded that there is a difference between the two groups in the direct path coefficient. Analysis of the structural model for each group separately indicate the path coefficient between emotional intelligence with academic performance for students in smart schools is much more than ordinary schools (see diagrams 2 and 3).

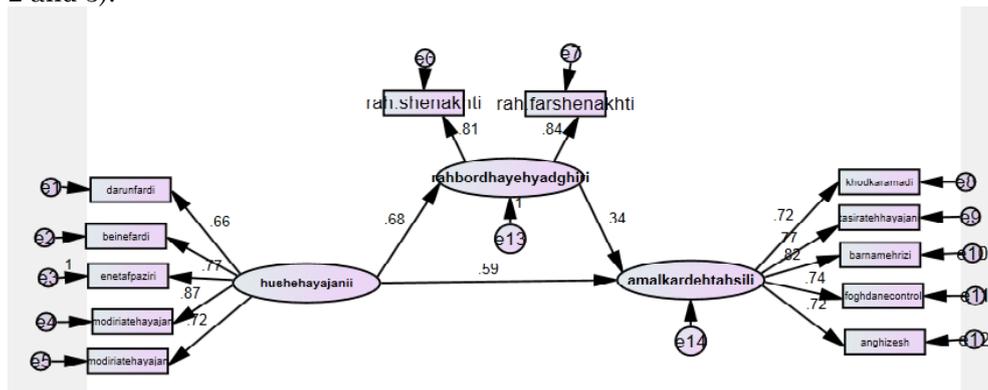


Diagram 2 Structural equations modeling to investigate the mediator role of learning strategies and emotional intelligence in academic performance (smart schools)

According to diagram 2 it is clear that the direct path coefficient between emotional intelligence and academic performance is equal to 0.59. Also according

to the diagram (2) path coefficient for the group of ordinary students is equal to 0.44.

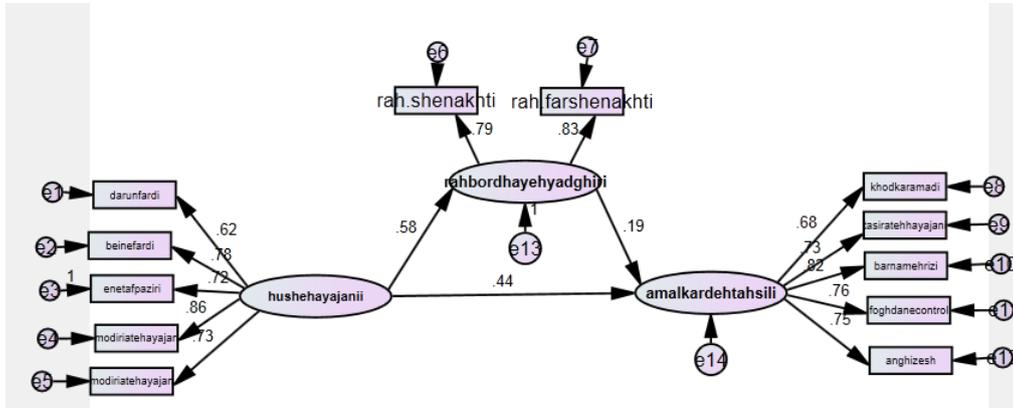


Diagram 3 Structural equations modeling to investigate the mediator role of learning strategies and emotional intelligence in academic performance (ordinary schools)

Thus, it was concluded that the direct path coefficient between emotional intelligence and academic performance for students in smart schools is more than ordinary schools.

Fifth hypothesis: the direct effect of problem-solving skills and academic performance of students in smart and ordinary schools is different.

In this hypothesis as mentioned above the multi-group structural equation method to determine moderating role of school, direct coefficients between the problem-solving skills and academic performance is bound to a fixed value. According to Chen benchmark was found that the size difference between RMSEA indices for the two groups is much smaller than the standard value. The results indicate that there is a significant difference between the two groups in the amount of direct coefficients between problem-solving skills and academic performance.

To compare the direct coefficients of the two models, in diagrams (4) and (5) models have been analyzed by the software AMOS is shown.

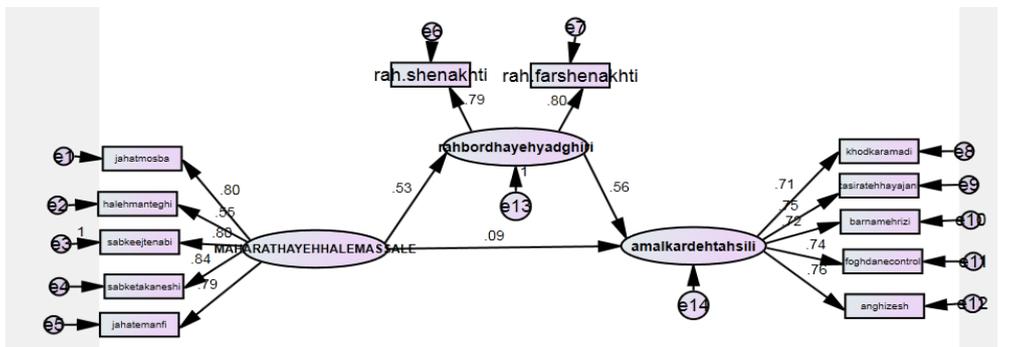


Diagram 4: Structural equation modeling to investigate the mediator role of learning strategies, problem-solving skills in academic performance (smart schools)

According to the path coefficients reported in diagrams (4) and (5) it is clear that there is very little difference between the direct coefficients of the models that confirming the previous description.

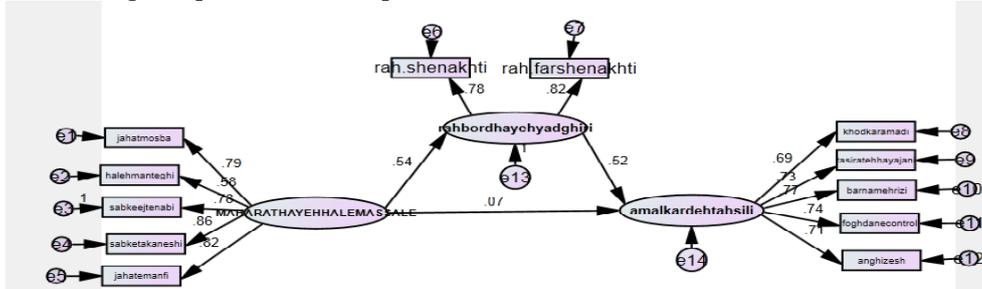


Diagram 5: Structural equation modeling to investigate the mediator role of learning strategies, problem-solving skills in academic performance (ordinary schools)

Sixth hypothesis: the direct effect of achievement motivation and academic performance of students in smart and ordinary schools is different.

The same consideration of direct path coefficient for both groups and run the AMOS software using MULTI-GROUP SEM showed that the difference RMSEA and CFA is more than enough for the two groups. So it can be concluded that there is a difference between the two groups in the direct path coefficient. Analysis of the structural model separately show the direct path coefficient between achievement motivation and academic performance for students in smart schools is more than in ordinary schools (see diagram 6 and diagram 7).

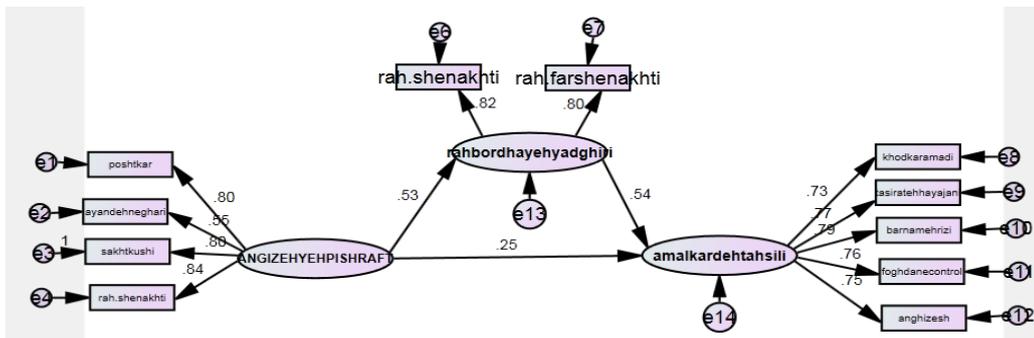


Diagram 6: Structural equation modeling to investigate the mediator role of learning strategies in the relationship between achievement motivation and academic performance (smart schools)

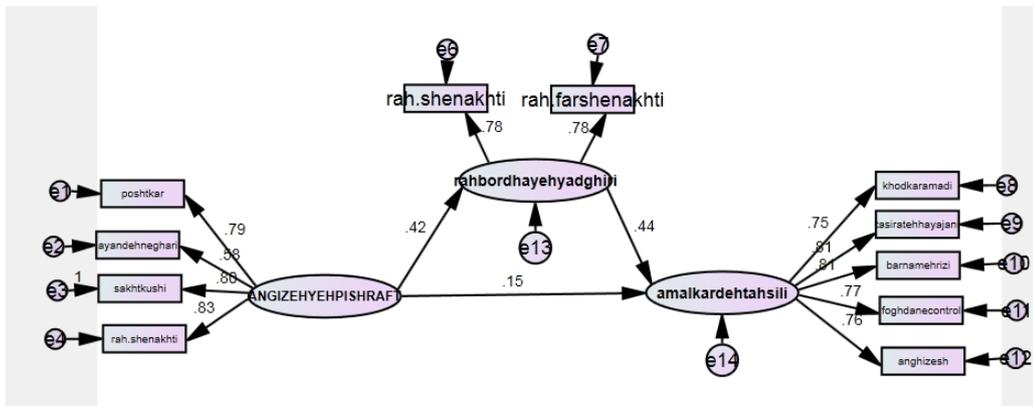


Diagram 7: Structural equation modeling to investigate the mediator role of learning strategies in the relationship between achievement motivation and academic performance (smart schools)

Testing hypothesis

First hypothesis: emotional intelligence directly affects academic performance. As you can see, the data analysis showed that emotional intelligence directly affects academic performance. In other words, it was shown that the size of the direct impact of emotional intelligence on academic performance is equal to 0.505 that the value of the regression coefficient is a significant amount of data. The findings of study is inconsistent with findings Gross, 2005, and is consistent with findings Jager 2007; Jafari and Ahadzadeh 2014; Hatami Taghizadeh and Mohebbinia 2012, Bakhshi Sureshjani 2008; Nikoogoftar 2008 and Bakhshi Sureshjani 2008. It seems academic performance by being able to set personal goals and optimistic vision and motivation, and met them facilitated (Bar-On, 2005).

Bar-On suppose the assessment of the level of emotional intelligence among students significantly in anticipation of their study can be used. He argues that such information can be guided intervention with students who need to identify and to enhance the social and emotional intelligence competencies and skills will aid in optimal academic performance (Mahzon et al., 2013).

Second hypothesis: problem solving skills directly affect academic performance.

The results of the regression coefficient showed that problem solving skills has not significant effects on academic performance. In other words, the hypothesis problem solving skills has a direct impact on academic performance rejected. The finding of this study is consistent with studies Matemba, Awinja, Otieno, 2014; Barker, 2003; Ahadi, Mirzaie, Narimani and Abolghasemi, 2009. It is said that problem solving skills increases the individual's belief than his ability. Many of human behavior influence on mechanisms motivated and controlled.

Among the mechanisms of their influence, none more important and pervasive is the belief in personal development (Ganji and Amirian, 2011). In other words, it seems the smart schools examined in this study, although computers and technology used for training students, but the content of such training is not such develop problem finding and problem-solving skills in students and hence

is able to improve a larger share of the academic performance of students in ordinary schools.

Third hypothesis: achievement motivation directly affects the academic performance.

In this hypothesis, the results of regression coefficient clearly showed that achievement motivation directly predicting academic performance that is statistically significant. The achievement motivation has direct effect on academic performance. The finding of this study is consistent with studies Amraei et al. 2011; Tella 2007 and DeLong, Winter, & Yackel 2004.

Several studies show that motivational factors are effective in cognitive engagement and learning control in the learning process (DeLong et al., 2004; Mayer, 2001).

As Wlodkowski stated "motivation just because is one of the main causes of learning is not important, but motivation is mediated transfer of learning and learning outcomes (Wlodkowski, 1985). Motivation and academic performance would influence implementation homework and show a willingness to learn (Harakoiz, Baron, Kartrz, Leto and Elliott, 1997).

Fourth hypothesis: the direct effect of emotional intelligence and academic performance of students in ordinary and smart schools is different.

As abovementioned, the hypothesis fourth to sixth, type of school as a moderating variable examined. It was shown that there is a direct difference between two groups in term of path coefficient. Analysis of the structural model for each group separately showed that the direct path coefficient between emotional intelligence and academic performance for students of smart schools is much more ordinary schools.

According to these findings, it seems compared to ordinary schools, emotional intelligence in smart schools, has a greater share in the academic success of students that finding of this study is consistent with studies Charitaki, 2015, Marzukiet al., 2015; Mirzajani and Dellaviz Biklaee, 2013; Schultz-Zehnder et al., 2002.

One of emotional intelligence strategies of students is that we find new approach to school performance. This means that it is a place to see the training of the students targeted. In other words, in the classroom, we should know thinking and feeling together (Parsa, 2001).

Fifth hypothesis: the direct effect of problem-solving skills and academic performance of students in smart and ordinary schools is different.

As shown, there is no significant difference between direct coefficients of problem-solving skills and academic performance in both groups. In other words, it is clear that there is very little difference between direct coefficients of the model. So the hypothesis was rejected.

In the smart school, student participation and group activities in use computer, makes them more adept at solving problems because such places students in shaping and defining strategies and solutions, encouraged (Wegerif & Dawes, 2008). Three principles of the seven principles that Perkins (1992) defined for smart schools, emphasis on understanding; training and skills to acquire and



transfer it to the new position and accepting to deal with complex situations, was suitable situation to improve students' problem-solving skills in the schools.

Sixth hypothesis: the direct effect of achievement motivation and academic performance of students in smart and ordinary schools is different.

There is a difference between the two groups in term of direct path coefficient. Analysis of the structural model for each group separately showed that the direct path coefficient between achievement motivation and academic performance for students in smart schools is more than in ordinary schools. Students who are internally motivated and assignment to enjoy its intrinsic continue the task more focus to strategies for efficient learning and they learn quite a pleasant experience (Merchant and Paulson, 2001).

Educational practices in smart schools is to make learning more interesting, more motivated, exciting and meaningful and makes the body, soul and mind of children in the learning process involved (project team of smart schools, 1997).

Educational practices in schools is an intelligent way to make learning more interesting, more motivated, exciting and meaningful, and makes the body, soul and mind of children in the learning process involves (a smart school project, 1997).

Skill and enthusiasm that the children used their computers is amazing (Battro, A. M., 2010). Enjoying multimedia educational content in teaching the use of active teaching methods, provides quick and clear feedback to the students, learning for students in smart schools to make a pleasant experience and leads students with their academic interest and more motivated and involved in educational issues.

Conclusion:

The present study aims at preparing a model predicting academic performance based on the components of emotional intelligence, problem solving skills and achievement motivation of students in smart and ordinary school. Today, the school education system in the country needs to use of ICT, provide the possibility of continuous learning and new opportunities for people to experience life in the information society, so that this technology not as an instrument, but also in terms of infrastructure enabling for education and professional training is considered. Smart schools are an environment that has the potential necessary to accomplish this goal. The role of smart schools in important variables such as emotional intelligence, achievement motivation and academic performance makes the role of smart schools brighter and stronger.

Using and applying smart and updated technology, on the one hand, improve the teaching-learning in teachers and students, the teachers and students to use the World Wide Web can upgrade their academic level and the development of the country.

However, the lack of infrastructure such as LAN and Internet connection, consistent lack of structure, lack of familiarity with new teachers, insufficient human resources trained, lack of physical and financial resources to equip schools, intelligent computer systems and equipment and supplies required by the school, including the problems that led to reduce benefits and positive effects of smart schools in Iran.

Thus it can be concluded that the role of smart schools in important variables such as emotional intelligence, achievement motivation and academic performance makes the role of smart schools brighter and stronger. Using and applying smart and updated technology, on the one hand, improve the teaching-learning in teachers and students, the teachers and students to use the World Wide Web can upgrade their academic level and the development of the country. The results indicate the usefulness to policymakers in the field of education.

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