

# The Correlation between Gardner's Multiple Intelligences and the Problem-solving Styles and their Role in the Academic Performance Achievement of High School Students

**Yaghoob Raissi Ahvan\*, Hossein Zainalipour, Mahin Jamri, Fatemh Mahmoodi**

Department of Psychology and Education, University of Hormozgan, Bandar Abbas, Islam Republic of Iran

\*E-mail: yrahvan1343@gmail.com

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## Abstract

The present study attempts to investigate the correlation between Gardner's multiple intelligences and problem-solving styles and their role in the academic performance achievement levels of high school students of Bandar Abbas. This was a descriptive correlation study. To accomplish this purpose, 270 students of high school of Bandar Abbas were selected by clustering random sampling, and all of them filled the Gardner's multiple intelligences, the Cassidy and Long's questionnaires. For analysis of collected data, descriptive statistics including mean, standard deviation, Pearson coefficients of correlation, regression, spss19 and statistical soft were used. Findings of this study revealed that the helplessness and the control styles have a significant positive relationship with the intrapersonal intelligence. The logical-mathematical intelligence, visual-spatial, verbal-linguistic, musical and naturalist intelligence have a significant relationship with the creative and confidence styles. The verbal-linguistic, musical, bodily-kinesthetic showed a significant correlation-weighted with the avoidance style. The approach style showed a significant correlation with the verbal-linguistic intelligence.

The results showed that all multiple intelligences including visual-spatial, verbal-linguistic, interpersonal, bodily-kinesthetic, musical, natural, interpersonal have a positive correlation with academic performance achievement. The regression of analysis showed that the multiple intelligences such as visual-spatial intelligence, interpersonal and verbal-linguistic intelligence were statistically significant and could positively predict academic performance achievement ( $p < 0.05$ ), whereas the musical intelligence was a tunable negative predictor for academic achievement of students.

**Keywords:** Gardner's multiple intelligences, problem solving styles, academic performance achievement.

## Introduction

In today's world, rapid and wide developments in science, technology, communication and emergence of new views about social, political, economic, and cultural issues bring about fundamental changes in educational systems and teaching methods (Taheri Otaghsara, 2014).

Allah has given man intelligence, which is the cause of superiority among all other creatures. Intelligence is of paramount importance in a person's life. Therefore the topic of intelligence is of substantial curiosity and interest to researchers and lay people (Mackintosh, 1998). General, interpersonal, fluid, and crystalized as well as many other types of intelligence have been discovered.

Gardner asserted that individual differences reflect multiple intelligences of human beings; and through these intelligences an individual tries to understand the world, these are personal strengths through which a person comprehends the world (Arnold & Fonseca, 2004). What the Multiple intelligences theory offers is not only significant from a theoretical perspective, but also has important practical implications for teaching practice. Teachers should consider various multiple intelligences of the students during their teaching; and should encourage the students to use their different intelligences in their learning (Gen, 2000), as Larsen-Freeman (2000) suggested improving quality of teaching and learning, both teacher and learner should take into account their own different multiple intelligences. Regarding their career, learners' multidimensionality should be celebrated and all intellectual abilities may be enhanced (Cohen, 2003).

Gardner (2006) argued that due to the multiple intelligences individuals are truly human beings. Each has a unique profile of intelligences of varying strengths. Although no one intelligence is considered to be superior to other types, according to Gardner (2003) all intelligences are required for an individual, in order to participate, act purposefully and creatively in the society.

In order to be successful in educating all students, teachers should be aware of the students' individual differences; individual learning styles and multiple intelligence profiles. In schools logical and linguistic intelligences tend to be emphasized in teaching. Students who are more developed in other intelligence dimensions are often ignored. Identifying and knowing students' intelligence profile is important and has implications for instruction (Shalk, 2002). For example, if a student has limited success with verbal and mathematical intelligences, more success may be achieved by using some of the other intelligences (Oddleifson, 1994). A Multiple intelligences approach offers useful suggestions for providing a more reasonable and practical approach to schooling (Eisner, 1994). Furthermore, since intelligence strengths and weaknesses are not static, they may be improved with different educational experiences. For this reason, multiple intelligences theory approach supports continuous assessment of intelligences starting at an early age (Shalk, 2002).

Some researchers have found intelligence as a cause of academic performance (Habibollah, et al., 2008). A close connection by some of the psychologists between intelligence and academic achievement was discovered. Some say that there is cause and effect relationship between the two variables. According to Laidra, Pullmann & Allik (2007) academic achievement of the students is reliant on their cognitive abilities through all grade levels.

Multiple intelligence theory is assuming an important place in the recognition of the diversity of ways that learners approach the curriculum; it helps teachers and learners to successfully plan for individualized instruction. Consequently, many researchers stress the importance of identifying the profiles of the learners and empowering them with recognition of their intelligences, in order to enhance and develop learning (Gurbuz & Gurbuz 2010; Natasa 2010; Netoa, Ruiza & Furnham 2008; Wu & Alrabah 2009). Thus, it seems necessary to recognize the students' intelligences in order to consider them, when designing for the teaching and learning process to enhance the students' learning performance.

Numerous research studies have explored the effects of different variables on students' academic performance achievement. Little attention was paid in Iran especially in an under-developing city like Bandar Abbas to the interrelationship of multiple intelligences and with academic performance achievement. This current study explored this relationship using public high school students as participants from Bandar Abbas, the southern city of Iran.

Today, the psychological and behavioral science experts pay attention to the problem-solving skill as a basic skill . A major goal in education is to develop capability of problem solving, creativity, and innovation in students. Students can adapt to different and new situations in life using

these abilities (sheikhpour, S. 2012). On the other hand, the transient conditions of society has made children and teens face particular problems and complexities. In these circumstances, one of the most important skills which can strengthens their mental health and development to encounter future problems is problem solving skills in general terms and social problem solving in specific terms, such that those who are unable to solve inventible problems may exacerbate their problems by applying ineffective solutions (Refaghat Khajeh A. 2011). Problems do occur in life but their proper solution is a skill, which many people are devoid of. Problem solving is the process of eliminating the discrepancy between the actual and desired situation (Archer, 1980). Success in any endeavour depends on making the right decision at the right time. But decision making is just one component of the problem solving process. Unless a problem has been accurately defined and its root causes identified we are unlikely to make an appropriate decision about how to solve it. Effective problem solvers know how to gather and evaluate information to define and clarify a problem. They know the value of generating more than one action alternative and weighing all the implications of a plan before deciding to implement it. They acknowledge the importance of following through to make sure that changes are effective (Archer, 1980).

From the cognitive perspective, problem-solving is a personal -cognitive and innovative process that helps a person to develop effective and useful strategies to solve their everyday problems by using them. Four activities are related to this component: Problem definition, developing alternative solutions, decision making and implementation of the work, as cited in( Ahangi 2010 ). Each of four steps has a great role in developing an effective response to the problematic situations. Cassidy and Long introduced six styles of problem-solving including: creative problem solving, confidence, approach, helplessness, control and avoidance styles. The first three styles of problem-solving are called constructive and the last three styles of problem-solving are called counterproductive. Creative problem-solving constructive and the last three styles of problem-solving are called counterproductive. Creative problem-solving constructive and the last three styles of problem-solving are called counterproductive. Creative problem-solving styles involving planning and considering various solutions depending on the problematic situation. Confidence problem-solving style represents one's belief in oneself ability to solve problems. Approach problem-solving style shows a positive attitude toward and desire to tackle problems. Helplessness problem-solving style shows being an alone person facing the problem. Control problem-solving style refers to external and internal controller in dealing with problematic situations. And avoidance problem-solving style refers to avoid of problems instead of solving them. Long and Cassidy defined problem-solving styles as a cognitive process that people suggest their own strategies to deal with problematic situations.

The problem of poor performance of students in public secondary schools in the examination continues unabated despite numerous efforts and resources put into education development. The study sought to determine the relationship between problem solving approach and academic performance and to establish gender differences in the problem solving approaches among secondary school students in Bandar Abbas.

To sum up researchers came to the conclusion that problem-solving process vary in different levels of experience and different levels of expertise( Sternberg 1995 ). And that, problem-solving process varies in various fields and by different people and thus the results obtained in the laboratory cannot necessarily generalized to problem-solving situations outside the Labs. This issue over the past two decades has led to an emphasis on problem-solving styles.

Few studies have been done about problem-solving styles relationship with learners' academic performance achievement ( Poshtiban, 2007, Morton, 2001 ). In the review of mentioned research we can say that problem-solving styles of students have a positive role in their academic

achievement and success. But no research specifically has conducted about the role of problem-solving styles of secondary school students on academic achievement in Bandar Abbas. This can help managers, planners and educators of higher education system for developing new strategies and methods to achieve more successes. In this regard, the main purpose of this study is to examine effect of problem-solving styles on academic achievement of high school students in Bandar Abbas.

### **Materials and methods**

This was a descriptive correlation study. Participants of this study were 270 students randomly selected from among public and private high schools students in Bandar Abbas. 1-Douglas and Harm's questionnaire of multiple intelligences consisting of 80 statements was used as the data collection instrument. This inventory is a standardized inventory, describing Gardner's eight multiple intelligences. Each intelligence was measured through ten statements. The composite inventory was translated into Persian with the help of a research language expert in order to make it understandable for students. In order to find out the reliability, the inventory was distributed among 182 public high school students of Tehran, as a pilot test. The Cronbach's Alpha Value found out for different intelligences, verbal-linguistic .76, logical-mathematical .71, visual-spatial .74, bodily-kinesthetic .63, musical .76, intrapersonal .60, interpersonal .70, naturalistic .84 respectively, the Cronbach's Alfa Value for the whole inventory was .81.

2-This questionnaire that was made by Cassidy and Long (1996) in two stages assesses helplessness, problem-solving control, creativity, confidence, avoidance, and approach styles. The questionnaire used as a scale is composed of 24 questions that measure each style by four questions. The questions are scored by the answers yes, no, and I do not know. The results show that each item, which gained the highest score, is used by the respondent as a technique of solving problems when facing problems. Mohammadi and Sahebi(2001) standardized the scale of problem-solving styles in a research. The alpha coefficient of all styles is higher than 0.50, except that of approach style. Reliability and validity of problem solving tests: In research of Mohammadi and Sahebi (2001) alpha coefficients were, respectively, for helplessness(69%), inhibitor of solution or control (66%), style of creativity (63%), confidence in problem solving (72%), avoidance (53%), style trends (37%), and the total average was ( 60%) and the average internal consistency coefficient of correlation for the above cases have been reported ( -12%, 34%, 15%,30%, -23%, 29% ) , respectively. Note that the alpha coefficients is higher than 0.50 (except style trends) and alpha 0.60 as well as the average internal consistency of the tests, the scale is valid. In Babapour's research (2002), Cronbach's alpha reliability coefficient has been reported (77% to 87%) . The research of Saber (2011) the validity and reliability were ( 90% to 79% ), respectively. The Cronbach's Alfa Value for the whole inventory was ( 86%).

### **Results**

The research hypotheses of this study are :

1-There is a statistically significant relationship between the Gardner's multiple intelligences and the problem-solving styles of high school students of Bandar Abbas.

2-There are statistically significant correlations between the Gardner's multiple intelligences and the problem-solving styles with the academic performance achievement of high school students of Bandar Abbas.

Analysis and interpretation of data were done in this section. The statistical values were calculated carefully. Mean, standard deviation, Pearson coefficient correlation and regression were used as statistical tests. The data were arranged in 2 tables.

**Table 1: The coefficient correlation between the Gardner's multiple intelligences and the problem-solving styles**

Problem-solving styles	Bodily-kinesthetic	inter personal	intra personal	naturalistic	Verbal-linguistic	Visual-spatial	Logical-mathematical	musical
helplessness	./40	./11	./20	.12	./33	./28	./44	./32
control	./19	-/03	./17	./18	./41	./27	./45	./34
creative	./10	./04	./10	./14	./16	./27	./21	./31
confidence	./15*	-/08	./08	./04	./29	./29	./25	./18
avoidance	-/13	./06	./11	./08	-/23	./08	./09	./12
approach	./05	-/06	-/04	-/02	./22	./11	./11	./05

P&lt; \*\*/ 01.\*./P&lt;05

Different levels of correlation between the multiple intelligences and the problem-solving styles were found. The Coefficient Correlation between the helplessness , control styles and all multiple intelligences (except interpersonal intelligence) are statistically significant ( $p<01$ ).The creative style has a positive correlation with the logical-mathematical, visual-spatial and verbal-linguistic ( $p<01$ ) aswell as the naturalistic intelligence ( $p<05$ ).The confidence style has a significant correlation with logical-mathematical,visual-spatial,verbal-linguistic and music ( $p<01$ ) as well as bodily-kinesthetic intelligence ( $p<05$ ). The avoidance style has a positive significant correlation with verbal-linguistic ( $P<01$ ) as well as bodil-kinesthethic and musical ( $p<05$ ).The approach style has a positiv significant correlation with the verbal-lingustic  $P<01$ ).

**Table 2: Multiple regression predicting the relationship between multiple intelligences and problem-solving styles with the academic performance achievement of students**

Model	t	Standardized $\beta$	Unstandardized coefficient		significance
			STD Error	B	
constant	3/71		1/17	./83	./001
helplessness	4/68	./32	./06	./28	./001
control	-/37	-/02	./05	-/02	./71
creative	1/74	./12	./03	./05	./08
confidence	-/75	-/05	./05	./04	./45
avoidance	-/93	-/05	./09	-/09	./35
approach	6/36	./45	./08	./52	./001
Logical-mathematical	./56	./05	./03	./02	./57
Visual-spatial	2/14	./14	./05	./12	./01
Verbal-linguistic	1/82	./13	./03	./05	./05
naturalistic	./01	./001	./01	./001	./99
intrapersonal	./17	./02	./01	./005	./78
interpersonal	1/28	./10	./01	./01	./20
Bodily-kinesthetic	1.27	./10	./02	./03	./20
musical	9-1/96	-/23	./05	-/10	./05

The standardized beta coefficient gives a measure of the contribution of each variable to the model. A large value indicates that a unit change in this predicator ( independent ) variable has a large effect on the criterion ( dependent ) variable . The T \_value and P \_value give a rough indication of the impact of each predicator variable a big absolute T\_ value and a small P\_value suggest that a predicator variable is having a large impact on the criterion variable.

Based on the data presented in the Table-2, it can be concluded that verbal-linguistic and visual-spatial intelligences were the predictors of multiple intelligences and academic performance achievement(  $p<01$  ) among Bandar Abbas high school students which yielded multiple regression coefficient ( beta ) of .29 and .27 , respectively. Other intelligences did not predict multiple intelligences and academic performance achievement among the students of Bandar Abbas ( $p>/05$ ), especially musical intelligence was a tunable negative predictor for academic performance achievement of students which yielded multiple regression coefficient ( beta ) of -.25 .

The multiple regression techniques was used in order to determine the effect of problem solving styles on the academic achievement.The styles of control and confidence problem-solving that had significant correlation with the dependent variable entered in regression.The value of multiple correlation coefficients (R) is 0.340 and the R<sup>2</sup> value is 0.115. It means that 11.5 percent of changes of dependent variable can be explained by control style table (2).

According to the data presented in the Table-2, it can be concluded that the contoral and confidence styles were the highest predators of problem-solving styles and academic performance achievement (  $p<01$  ) among Bandar Abbas high school students which yielded multiple regression coefficient ( beta ) of( .34 and .30 ) , respectively. Other problem-solving styles predicate moderately the academic performance achievement of the students of Bandar Abbas ( $p>/05$ ), especially the helplessness and avoidance styles were a tunable negative predictor for academic performance achievement of students which yielded multiple regression coefficient ( beta ) of ( -.12 ,-.23 ).

### **Conclusion**

The study provided evidence that the verbal-linguistic intelligence is the student's most frequent intelligence and the musical intelligence is the students' least frequent intelligence. This could be due to the opportunities, environment available for the nourishment of an intelligence; it is quite possible that verbal-linguistic intelligence might have developed due to the environment available to it, and musical and other intelligences might have remained underdeveloped or moderately developed because encouraging environment was not available to them. The southern cities of Iran are underdeveloped and the students have limited opportunity to enhance their multiple intelligences. The researcher also found a moderate association between verbal-linguistic, visual-spatial intelligence and academic achievement. Result of the study is in consonance with, Haji Hosseini Nejad, Gh.etal (2004), he found in his study a significant positive correlation between perceived verbal-linguistic,visual-spatial intelligences and academic achievement of the students. Overall, there is a significant positive correlation between perceived verbal- linguistic, bodily-kinesthetic, logical-mathematical, musical intelligence and academic achievement of the students and it shows moderate correlation. This result is also aligned with the results of Deary,et al., (2007), who discovered a positive relationship between verbal-linguistic intelligence and academic achievement. Furnham, Hosoe, & Tang (2002), found in their research, that the respondents considered that verbal, spatial and logical intelligences exemplify true intelligence. The hypothesis no 2 developed by the above researchers in their study, which states that verbal, spatial and logical intelligences are the best predictors of academic performance achievement also supported by the results of this study. It can be also said that results of the study is reflection of our traditional teaching, in the schools of southern city of Iran, Bandar Abbas which focus on verbal-linguistic and visual-spatial dimensions only.

This study also investigated the effect of problem-solving Styles on academic achievement of high school students in Bandar Abbas of Iran. The research findings showed that relationship between control and confidence Problem-solving styles and academic achievement of students was

statistically significant. This study also showed a significant relationship between creativity problem-solving style and academic achievement. The relationships can be explained by studies of creativity. According to the threshold theory, there is a certain level of intelligence which is necessary for creativity. Since most of undergraduate students have such a level of intelligence, thus it seems that intelligence factor as major factors in academic achievement and simultaneously creativity, causes positive relationship between academic achievement and creative style. With respect to confidence problem-solving style, it has been recognized that individual differences in the academic achievement is not only depend on intelligence and memory, and other factors that have low correlation with the mental abilities affect the academic achievement. Hence confidence problem-solving style can be considered as second factor affected academic achievement. The idea of self-efficacy that means assessment of the individual confidence or his ability to accomplish a specific task. More confidence means more probability of starting a task and more readiness for facing its barriers. Thus it seems confidence factor as one of the factors has relationship with academic achievement simultaneously lead to more can probability of one's effort for academic achievement. The result of the study is in consonance with (Poshtiban, 2007, Morton, 2001). They found in their study a significant positive correlation between perceived control, confidence, approach, creativity styles of problem-solving and academic achievement of the students. Finally the regression of results showed that among styles of problem-solving affecting on academic achievement, only style of control problem solving had a high positive and significant effect on it. It could explain eleven percent of variance of the dependent variable.

**Application :**The multiple intelligences and the problem-solving styles need to be incorporated in teaching, learning process, formally in Iran, especially in schools of southern city like Bandar Abbas; so the students may have the opportunities to develop all intelligences and styles. Teacher should create such an environment, which is favorable for the development of all intelligences and styles, keeping in view individual differences of the students.

**Recommendation:** Additional research is needed. For example, experimental studies may be conducted on students of different ages in different localities in order to compare the results and find out the actual correlation between multiple intelligences and problem-solving styles with academic performance achievement.

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