



Original Article

The impact of successful intelligence on students' critical thinking and tolerance of ambiguity

Ali Babaei¹; *Gholamhosen Maktabi²; Naser Behrozi³; Askar Atashafroz²

¹Ph.D. student in Educational Psychology, Chamran University, Ahvaz, Iran

²Assistant professor of Educational Psychology, Faculty of Psychology, Chamran University, Ahvaz, Iran.

³Associate professor of Educational Psychology, Faculty of Psychology, Chamran University, Ahvaz, Iran.

Abstract

Introduction: Successful intelligence is the combination of analytical, creative and practical capabilities. This helps individuals to adapt, select and change the environment, in order to achieve their goals in life, regarding to the socio-cultural context. The aim of this study was to determine the effectiveness of successful intelligence on university student, Imam Ja'far Sadeq in Behbahan city.

Materials and Methods: In this descriptive study, using simple random sampling method, 50 students were selected and randomly divided into two groups of 25 patients. They were divided into experimental group and control group. Experimental group were taught by successful intelligence package. Both were measured by Watson-Glaser Critical Thinking and tolerance of ambiguity McLean questionnaires in pre-test and post-test. Multivariate analysis of covariance was used to analyze the data.

Results: Results showed that teaching components of successful intelligence has been able to increase students' critical thinking and tolerance of ambiguity.

Conclusion: Teaching successful intelligence components and teaching based on this approach in the universities of the country, gives new trends in teaching students and students' learning. It also can open new look in issues around.

Keywords: Critical thinking, Intelligence, Students, Tolerance of ambiguity

Please cite this paper as:

Babaei A, Maktabi G, Behrozi N, Atashafroz A. The impact of successful intelligence on students' critical thinking and tolerance of ambiguity. *Journal of Fundamentals of Mental Health* 2016; 18(Special Issue): 379-386.

Introduction

Today, people live in a very complex and dynamic world. A world where technology, economy and job needs are continuously changing. In this situation, in order for people to succeed in their lives, they need to perform well

in their skills. Successful people are those who can use analytical, creative and practical thinking abilities to achieve success (1). Sternberg's theory of successful intelligence is completely different from traditional theories that introduce intelligence as a single construct, sometimes the g factor or general intelligence, and sometimes

*Corresponding Author: Faculty of Psychology, Shahid Chamran University, Ahvaz, Iran.

ghmaktabi@gmail.com

Received: Aug. 22, 2016

Accepted: Sep. 29, 2016

with the term IQ; is Successful intelligence is a combination of analytical, creative and practical abilities that helps people to adapt, choose and change the environment in order to achieve their goals in life, according to the socio-cultural context. Success is defined only in the social-cultural context of the individual. In our social culture, according to the values accepted by the society, success also finds its own meaning and concept. This means that success is formed according to a set of values, criteria or expectations of the individual and others. The socio-cultural context of Eastern societies, especially our society, is different from Western societies in terms of collectivism and emphasis on specific religious values.

The combination of three types of analytical, creative and practical abilities and the simultaneous balance between them can determine the success of people in their lives. Analytical ability is used when a person has the ability to analyze, evaluate and compare. Also, creative ability, which is one of the higher cognitive levels in Bloom's theory, is used when a person creates, invents or discovers, and finally practical ability appears when a person takes action. He either uses what he knows or uses what he has learned. People with successful intelligence show a balance of these three types of thinking ability in dealing with situations. Unfortunately, in many educational programs, they emphasize only on analytical intelligence, and that too on its low levels. While the other two aspects of intelligence, i.e. creative and practical intelligence, which are vital and necessary for success in life, are given less attention or not at all. Creative and innovative thinking, along with problem solving and research, are among the basic skills needed for learners in the 21st century. The main focus in creative and new thinking includes generating original ideas and responding to special issues or situations, which can be taught to learners through teaching creative thinking. Unfortunately, in schools, the most thinking that is expected from students is analytical thinking, but outside of school and in the real world, the importance of creative thinking and especially practical thinking is much more expected (1). Thinking as the highest action of a human being is formed and evolves throughout life, but perhaps it can be said that

critical thinking is one of the aspects of thinking that anyone can learn during education and through education, because it is a kind of solution. It is a problem that has elements of the ability to analyze and evaluate things. Critical thinking is the ability to make logical decisions about what we should do or believe (2). One of the valuable intellectual abilities that learners should acquire in educational centers is to examine and evaluate what they have heard and read, thoughts and beliefs that they encounter in life and make rational decisions about them. In the field of critical thinking, which is one of the basic components for solving problems, learning, and making precise and strategic decisions in today's world, traditional educational systems face limitations because traditional educational methods, capacity do not accept such approaches (3). Teaching the components of successful intelligence is an effective and efficient way to strengthen critical thinking in learners (4) because improving analytical and creative thinking is one of the factors that form the basis for the formation of critical thinking, which can be effective in this regard. Creative thinking as one of the abilities of successful intelligence and critical thinking are related to each other (5). Improving the analytical and creative ability of student teachers can give them a new perspective and the power of reasoning, inventing a solution to solve a new problem, making correct judgments, avoiding one-dimensionality, examining the problem from different angles, respect for different points of view, avoid determinism, and finally improve critical thinking, which is considered one of the high levels of thinking, in student teachers.

In addition, the ability to tolerate ambiguity is one of the important characteristics that play a fundamental role in the initiation and continuation of risk-taking that leads to success. The ability to tolerate ambiguity is accepting uncertainty and as a part of life, the ability to continue living with incomplete knowledge about the environment and the desire to start an independent activity, without knowing whether a person will succeed or not, is proposed. A person who has a high tolerance for ambiguity does not feel threatened or troubled in adapting to a new and fresh environment, because he has accepted the existence of a degree of ambiguity as one of

the principles of life and knows that our information is never complete for making decisions. In other words, tolerating ambiguity means that if a person finds himself in an unknown situation and faces a problem, his mental and emotional balance will not be disturbed and he will patiently understand the ambiguous situation and find a solution. Tolerating ambiguity depends a lot on having a spirit of inquiry. A person who has the spirit of research is aware that in the process of acquiring knowledge, it is natural to have various questions and to have vague intellectual horizons. This awareness strengthens the tolerance of ambiguity. The ability to tolerate ambiguity is one of the personality traits that play a role in creativity (6). Sternberg (7) emphasizes five personality traits of creative people, which are: ambiguity tolerance, persistent persistence, determination, risk-taking, and individual independence. Tawighi, Kakavand and Hakemi (8) concluded in their research that tolerance of ambiguity is one of the most important substructures of personality, which increases a person's ability to face ambiguous and unpredictable situations by training problem-solving skills. In this regard, Zenouzian, Gharai and Yekhezandoost (9) concluded in their research that problem solving training, one of the most important techniques of successful intelligence, causes a change in coping strategies and ultimately improves ambiguity tolerance. It will have a positive effect on the person. There is a positive relationship between the ability to tolerate ambiguity and each of the components of creativity (initiative, fluidity, flexibility and expansion) (10). The more ambiguous a person is, the more complex situations he will like. Usually, people with low tolerance like simple and orderly situations, and simpler situations involve less mental aspects of a person. Therefore, the individual's creativity is less manifested. Stichova (11) showed in her research that there is a positive relationship between ambiguity tolerance, motivation and creative performance. In this regard, Kornilova and Kornilou (12) acknowledge that both intelligence and ambiguity tolerance can increase creativity. So creating a creative work requires tolerating uncertainty throughout the creative process.

The components of successful intelligence can probably guide students to analyze the problem

and choose the best solution, provide creative and innovative solutions, as well as transfer learning, especially in practical and practical fields. Also, education based on successful intelligence can help learners by creating a balance between analytical, creative and practical ability through adaptation, change and choice, to change the nature of the job according to the speed of environmental changes, new learning methods. The changing needs of these jobs and rapid changes in the social structure, develop flexibility in themselves. According to the fact that getting higher grades is one of the main goals of all educational centers, this educational model helps educational centers create higher levels of performance in their students, so the present research is aimed at the effects Study the components of successful intelligence on students' critical thinking and ambiguity tolerance.

The general purpose of this research is to determine the effectiveness of successful intelligence training on critical thinking and ambiguity tolerance of male student teachers of Farhangian University, Imam Jafar Sadiq (AS) Behbahan Higher Education Center.

Materials and Methods

The community of this research is student teachers of Farhangian University, Imam Jafar Sadiq (AS) Higher Education Center, Behbahan city. From this number of students, 50 students were selected using a simple random sampling method and divided into two groups of 25 people as a test group and a control group, and the experimental group was trained as an independent variable.

The educational intervention includes the training of successful intelligence skills based on the model of Sternberg and Grigorenko (17) that this educational package, with the aim of teaching successful intelligence skills, for high school students and university students, has three general topics about skills. Analytical, creative and practical. In this training package, each topic includes a number of lessons (training sessions), which are summarized below.

Session 1 to 7: Analytical ability training, including identifying problems, recognizing sources, organizing information, choosing solutions, monitoring and evaluation.

8th to 14th sessions: teaching creative ability, including reframing the problem, questioning methods, presenting creative work and the ability to defend it, stimulating ideas, multi-dimensional viewing, organizing ideas and questioning the situation.

The 15th to 22nd session: practical ability training including self-motivation skills, controlling impulses, persevering - not persevering, using the right abilities, acting on a plan, focusing on the end result, managing personal problems. Determining responsibility and controlling compassion for yourself.

Research instruments

A) *Critical Thinking Questionnaire*: Watson-Glasser's standard critical thinking questionnaire (13) has 80 items in five sections to determine the ability of people in analytical and logical thinking, and the five components are inference, identification of assumptions, inference, interpretation, and evaluation. They measure logical arguments. Scores in different sections are obtained by correctness and incorrectness of statements. The reliability of this questionnaire has been reported as 0.85 using the test-retest method (13). The validity of the questionnaire was checked by Watson and Glaser (13) on a sample of 2440 men and women, and the correlation matrix and eigenvalue were reported to be favorable. Also, they reported favorable convergent and divergent validity between this test and tests with a similar structure. The reliability of this test was evaluated by Javidi, Jafarabadi and Abdoli (14) as 0.78 and its validity according to the desired indicators. In the present study, the reliability of the test was obtained through the Coder-Richardson formula of 0.82, and the validity of the questionnaire was

confirmed through confirmatory factor analysis. It should be noted that the evaluation subscale of logical arguments was not confirmed in this statistical sample due to the low standard factor loading (0.018).

B) *Ambiguity Tolerance Questionnaire*: McLean (15) created the Ambiguity Tolerance Questionnaire in 13 items and confirmed the validity of the test. He has checked the correlation of this questionnaire with other convergent questionnaires (in Bodner's 16-item scale, it was 0.6, in Story and Aldog's 8-item scale, it was 0.71, and in McDonald's 20-item scale, it was 0.58). Also, he reported a suitable internal reliability of 0.82 for the 13-item questionnaire. Faizi, Mahboubi, Zare and Mustafaei (16) obtained the content validity of this questionnaire through construct validity of 0.48, and the reliability of this questionnaire through Cronbach's alpha of 0.85. In the present study, the reliability of the questionnaire was obtained from the Cronbach's alpha method of 0.818 and from the half method of 0.782. Also, the validity of the questionnaire is verified through confirmatory factor analysis. Items 10 and 13 of the questionnaire were not confirmed in this statistical sample due to the low standard factor loading and were removed.

Results

Multivariate covariance analysis was used to check the research hypotheses. In order to ensure that the data of this research meet the basic assumptions of MANCOVA analysis, they were examined. For this purpose, the assumption of homogeneity of variances was investigated. To observe the assumption of equality of variance of the research variables, Lon's test was used, the result of which is presented in Table 1.

Table 1. The results of Levene's test regarding the assumption of equality of variances

REMSEA	CFI	TLI	IFI	GFI	CIMIN/DF
0.0001	1.12	1.05	0.796	0.993	0.704

Box index was also not significant at the level of 0.229 through Box test. Therefore, there was an assumption of homogeneity of variance-covariance matrices for the implementation of MANCOVA; Also, the assumption of homogeneity of the regression slope was

observed. In table number 4, the findings related to the main hypotheses of the research (effectiveness of successful intelligence education on students' critical thinking and ambiguity tolerance) are presented.

Table 2. Results of multivariate covariance analysis of critical thinking and ambiguity tolerance

REMSEA	CFI	TLI	IFI	GFI	CIMIN/DF
0.05	0.953	0.935	0.955	0.936	1.52

As it is clear in Table 2, the significance levels of all the tests indicate that there is a significant difference (0.02) between the control and test groups, at least in terms of one of the dependent variables (critical thinking and ambiguity

tolerance). There are $P < 0.002$ and $F = 7.40$. To find out this difference, a one-way analysis of covariance was performed on the studied variables in MANCOVA text, and the results are presented in Table 3.

Table 3. The results of one-way covariance analysis in the text of MANCOVA on the variables of critical thinking and ambiguity tolerance

Dependent Variable	F	DF1	DF2	Sig
Critical thinking	0.166	1	45	0.686
Tolerance of ambiguity	0.029	1	45	0.865

As can be seen in Table 5, there is a significant difference ($P < 0.022$ and $F = 5.614$) between the control group and the test group in terms of critical thinking variable. Also, there is a significant difference ($P < 0.007$ and $F = 8.075$) between the control group and the test group in terms of ambiguity tolerance.

Multivariate covariance analysis was used to test the hypotheses under the critical thinking scale. After checking and confirming the assumptions of multivariate covariance analysis, the results of covariance analysis are shown in Tables 4 and 5.

Table 4. Results of multivariate covariance analysis of critical thinking subscales

Effect	Value	Hypothesis df	Error df	F	Sig	Partial Eta Squared
Pillai's Trace	0.261	2	42	7.40	0.002	0.261
Wilks' Lambda	0.739	2	42	7.40	0.002	0.261
Hotelling's Trace	0.353	2	42	7.40	0.002	0.261
Roy's Largest Root	0.353	2	42	7.40	0.002	0.261

As it is clear in Table 6, the significance levels of all tests indicate that there is a significant difference between the control and test groups, at least in terms of one of the subscales of critical thinking ($P < 0.007$ and $F = 4.155$) exist. To find

out this difference, a one-way covariance analysis was performed on the critical thinking subscales in the MANCOVA text, the results of which are presented in Table 5.

Table 5. Results of one-way covariance analysis in MANCOVA text on critical thinking subscales

Dependent Variable	Type III Sum of Squares	df	Mean Square	f	Sig	Partial Eta Squared
Critical thinking	80.84	1	80.84	5.614	0.022	0.115
Tolerance of ambiguity	326.51	1	326.51	8.075	0.007	0.158

As can be seen in Table 7, there is no significant difference between the control and test groups in terms of the inference subscale ($P < 0.744$ and $F = 0.108$). Also, there is a significant difference between the control group and the test group in terms of sub-scale of identifying assumptions ($P < 0.001$ and $F = 12.93$). According to Table 7, there is no significant difference ($P < 0.802$ and $F = 0.064$) between the control and test groups in terms of the inference subscale. In addition, there is a significant difference between the test group and the control group in terms of interpretation and interpretation subscale ($P < 0.004$ and $F = 9.079$).

Discussion

Education and training systems tend to pay more and more attention to memory abilities and to a lesser extent analytical abilities and ignore the creative and practical abilities of learners to a large extent and as a result they cannot take advantage of students' maximum ability. The best way to achieve this important and fundamental goal is to create a wide range of skills; so that students have the possibility to compete with other students with different patterns of ability, discover their important and prominent abilities and master them. In fact, this possibility can be created through teaching the components of successful intelligence and cultivating three analytical, creative and practical abilities in learners (18).

According to the hypotheses of this research, successful intelligence education can develop critical thinking and ambiguity tolerance in students, which is consistent with the results of various researches (4,5,8,10). In this research, successful intelligence training was able to have positive effects on the sub-scales of hypothesis identification and interpretation. Critical thinking is one aspect of thinking. From the point of view of Sternberg (19), critical thinking includes mental processes, strategies, and imaginations of people, which are used to solve problems, make decisions and learn new concepts. Teaching analytical ability and development of critical thinking fosters the possibility of analysis, comparison, and evaluation in students for different situations and causes the development of critical thinking, which is a requirement of professional competence in many jobs and even

social life. It can be Traditional educational systems face limitations in the field of developing critical thinking, which is one of the basic components for problem solving, because traditional educational methods do not have the capacity to accept such approaches (3). It seems that teaching the components of successful intelligence is an effective and efficient way to strengthen critical thinking in learners. Because the improvement of analytical and creative thinking is one of the factors that create the basis for the formation of critical thinking, which can be effective in this regard.

In explaining this finding, it can be said that improving the analytical and creative ability of students can give them a new perspective and the power of reasoning, inventing a solution to solve a new problem, making correct judgments, avoiding To improve students' one-dimensionality, examining problems from different angles, respecting different points of view, avoiding determinism, and finally critical thinking, which is considered one of the high levels of thinking. From Halpern's point of view (20), critical thinking is the use of cognitive skills that increase the probability of favorable results, and it is used to describe thinking that is purposeful and reasoned. Critical thinking is a process that refers to clear and logical thinking, thinking about the skills and strategies necessary to reach an ideal result, analysis, using reasoning to calculate probabilities and making decisions to solve problems (20).

It seems that there is a relationship between problem solving, which is one of the techniques of analytical ability of successful intelligence, and the ability to tolerate ambiguity. In the current study, teaching the components of successful intelligence has been able to increase the tolerance of ambiguity in students. Teaching problem solving skills can increase people's ability to tolerate ambiguity (8). One of the important stages of problem solving is the stage of identifying and expressing the problem. At this stage, the issue should be examined from different angles. Each person defining the problem should write down all the information, facts, feelings, assumptions, opinions, and questions related to the problem situation. The correct definition of the problem from different angles helps us to provide the answer. There are

four decision-making styles: command, analytical, perceptual and behavioral; People who use the analytical decision-making style have a higher tolerance for ambiguity than the prescriptive style. They want a lot of information before making a decision; Analytical decision makers are best characterized as accurate decision-makers with the ability to adapt to unique successes (20).

Often times, a superficial look at a problem fails us to reach a successful answer. So you have to look deeply. Those who have more ambiguity tolerance are better able to put together information, facts, feelings, assumptions, opinions, and questions that are related to the problem situation and solve the problem. Research also shows that creativity and ambiguity tolerance are closely related (10). Therefore, the more people tolerate ambiguity, the more they tend to create.

References

1. Sternberg RJ, Grigorenko EL. Teaching for successful intelligence: To increase student learning and achievement. USA: Sage; 2007: 28-32.
2. Seyed Mohammadi Y. [Educational psychology]. Tehran: Doran; 2008: 126-7. (Persian)
3. Sternberg RJ. Raising the achievement of all student: Teaching for successful intelligence. *Educ Psychol Rev* 2002; 14: 383-93.
4. Negahban Salami M. [The impact of successful intelligence training on critical thinking, self-efficacy and academic performance of students]. Dissertation. Kharazmi University, 2013. (Persian)
5. Ching Y, Chan L. The relationship among creative, critical thinking and thinking style in Taiwan high school student. *J Instruct Psychol* 2004; 14: 123-34.
6. Zenasni F, Besancon M, Lubart T. Creativity and Tolerance Ambiguity: An Empirical Study. *Journal of creative behavior* 2006. Available from: <http://www.psych.univ-paris5.fr>.
7. Amirhoseni Z. Creativity and innovation. Tehran: Aref; 2005: 24-5. (Persian)
8. Taviqhi M, Kakavand A, Hakami M. [Problem-solving skills training on increasing tolerance of ambiguity in teens]. *Journal of behavioral sciences* 2013; 7(4): 363-71. (Persian)
9. Zenozyan S, Gharai B, Yekeyzandost R. [The effectiveness of teaching students problem-solving coping strategies]. *Journal of psychology* 2010; 5: 124-36. (Persian)
10. Gholami A, Kakavand A. [The relationship between tolerance of ambiguity and creativity]. *Journal of new thoughts on education* 2010; 6(4): 153-68. (Persian)
11. Stoycheva K. *Tolerance for ambiguity, creativity and personality*. *Bulg J Psychol* 2010; 1(4): 178-88.
12. Kornilova TV, Kornilov AS. Intelligence and tolerance/intolerance for uncertainty as predictors of creativity. *Lomonosov Moscow State University* 2010; 4: 150-62.
13. Watson-Glaser. Critical thinking appraisal user-guide and technical manual UK supervised and unsupervised versions 2012. Available from: <http://www.thinkwatson.com/assessments/watson-glaser>
14. Javidi K, Jafarabadi T, Abdoli A. Critical thinking in student of university. *Journal of psychology studies of Ferdosi University* 2010; 11(2): 103-20. (Persian)
15. McLain DL. The MSTAT-I: A new measure of an individual's tolerance for ambiguity. *Educ Psychol Meas* 1993; 53: 183-9.
16. Fezi A, Mahbobi T, Zare H, Mostafaei A. [The relationship among cognitive intelligence and tolerance for ambiguity whit critical job of Payam-e-Noor University students. *Journal of Behavioral science researches* 2012; 10(4): 276-84. (Persian)

Therefore, teaching creative ability can raise the platform of developing ambiguity tolerance in students. Usually, people with low tolerance like simple and orderly situations, and simpler situations involve less mental aspects of a person. In the present study, it seems that adding critical thinking skills to the educational textbook of successful intelligence can have a positive effect on improving other subscales of critical thinking, which unfortunately did not happen in this study.

Conclusion

The results of this research lead the university officials to the fact that by teaching the components of successful intelligence in students and teaching based on this approach in the country's universities, a new trend in the field of teaching and learning of students will begin and opens a new way of looking at the surrounding issues for students.

17. Sternberg RJ, Grigorenko EL. Teaching for successful intelligence. Cheraghi F, Abidi Zakani A, Foladvand Kh. (translators). Tehran: Jahad daneshgahi;2011: 28-52. (Persian)
18. Sternberg RJ, Jarvin L, Grigorenko EL. Teaching for wisdom, intelligence, creativity and success. USA: Sage; 2009: 85-6.
19. Irannejad Parizi M. [Management of the third millennium]. Neyshabur: Islamic Azad University, 2014: 46-7. (Persian)
20. Halpern DF. Is intelligence critical thinking? Why we need a new definition for intelligence. In: Kyllonen P, Stankov I, Roberts RD. (editors). Extending intelligence: enhancement and new constructs. Mahwah, NJ: Erlbaum Associates; 2007: 349-70.