

Research Article

Cite this article: Movahedzadeh, B. & Mortazavizadeh, S.H. (2024). The Effect of Critical Thinking Skills Training on Academic Achievement and Test Anxiety of Pre-University Students. *Üniversitepark Bülten*, 13(1): 134-142.
<https://doi.org/10.22521/unibulletin.2024.131.9>

Received March 15, 2024

Accepted May 22, 2024

Keywords:

critical thinking, academic achievement, test anxiety

Author for correspondence:

✉ Bahram Movahedzadeh

✉ Assistant Professor, Department of Educational Psychology, Payam Noor University, Tehran, Iran

**OPEN ACCESS**

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0), where it is permissible to download and share the work provided it is properly cited.

The Effect of Critical Thinking Skills Training on Academic Achievement and Test Anxiety of Pre-University Students

Bahram Movahedzadeh , **Seyyed Heshmatollah Mortazavizadeh**

Abstract

Background/purpose. This study aimed to determine the effect of critical thinking education on academic achievement and test anxiety of pre-university students attending Yasuj City High School, which is located in the Kohgiluyeh and Boyer-Ahmad province of Iran. Critical thinking education was recognized as an independent variable and academic achievement and test anxiety as the study's dependent variables.

Materials/methods. The study was conducted as a field experiment with a pretest and posttest applied to one experimental group and a control group. The instruments employed in the study were Halpern's Critical Thinking Questionnaire and Sarason's Test Anxiety Questionnaire, in addition to checking the students' academic high school achievement scores. The research sample consisted of 48 pre-university students, split equally between male and female, during the 2016-2017 academic year. The participants were selected according to multistage random sampling and divided into an experimental group and a control group. Before applying critical thinking education, a pretest was conducted to both groups of students to test their prior critical thinking and test anxiety levels, as well as checking their mean high school academic grades. The experimental group were then instructed on critical thinking, whilst no critical thinking training was provided to the control group. After completion of the training, the same tests were reapplied to both groups as a posttest, in order to assess changes to the participants' critical thinking, test anxiety, and academic achievement.

Conclusion. Multivariable Analysis of Covariance (MANCOVA) revealed that the applied critical thinking education significantly increased the participant students' academic achievement and decreased their test anxiety. Additionally, comparison of the two groups mean scores showed a significant difference.

1. Introduction

As the complexity of the modern world grows at an accelerating pace, there is a strong tendency to become passive information recipients and to accept what is seen and heard without criticism, since many of us do not actively make personal choices about what we have to accept and what we must reject.

Kendall and Marzano (2000) analyzed K-12 national standards in the United States for 12 disciplines and found that general critical-thinking skills exist in all areas. However, although high school teachers face significant challenges, most identified the topics that are tested by their national standards. The researchers' revealed that most compulsory standards' testing forces teachers to focus on lower-level thinking skills. However, critical thinking is a very important structure in the process of student growth and education, as first raised by philosophers in around 350 BCE, such as in the theories of Socrates, Plato, and Aristotle (Natale & Ricci, 2006). Outside of the formal learning context, the need for critical thinking is increasingly on the rise in modern everyday life, in human relationships, and in the maintenance and development of participatory democracies.

Halpern (2002) argued that high school students outside of the classroom are exposed to strong messages that may confound their attempts at thought-provoking deliberation. Critical thinking education is aimed at developing and improving the cognitive skills or strategies that increase our chances of an optimal outcome through targeting, reasoning, guiding, problem solving, deducing outcomes, as well as predicting and deciding on academic achievement and success in educational programs. Critical thinking education leads to its deliberate use without cause to hypothesize or invoke prejudicial thinking in different domains. According to Ennis (1991), critical thinking involves deciding what action to take and what to believe, which is achieved through deep thinking and reasoning.

In education, students' academic achievement is an important assessment indicator, hence considerable effort across the educational system is focused in this area. There are various factors that can have impact upon student academic achievement (Zhang, 2002). Academic achievement can be described as the extent to which a student achieves a set of predetermined goals based on their learning efforts. In education, teachers' critical spirit should be strengthened by providing students with the necessary learning background and environment. However, due to the inability of many high school students in transferring to their educational studies that which they have learnt from outside school and in other real-world contexts, it is considered necessary to design the means to train students in critical thinking (Orfield et al., 2004). Critical thinking is seen to provide the ground for students' academic achievement, hence both are said to be interrelated.

In a study by Redding (2001), the relationship between critical thinking tendency and scientific success was examined in the training of nursing experts, and a positive relationship was revealed between the mean scores of nursing education and critical thinking tendencies. In another research case, Karami et al. (2011) identified a relationship between cognitive beliefs, test anxiety, and academic achievement. Earlier, Jackson and Lawty-Jones (1996) investigated the role of critical thinking in academic achievement, and revealed a positive and significant correlation between critical thinking and academic success, and Azar (2003) concluded that critical thinking is a good predictor of academic performance. In the study by Khalkhali and Sadooghi (2001) titled "The Effect of Critical Thinking on Students' Academic Achievement," the authors concluded that critical thinking leads to improved student academic achievement.

However, with regards to issues of public health, students should naturally have certain abilities to interpret, analyze, and evaluate issues related to performing normal social, psychological, and physical roles, as well as the ability to work effectively in certain conditions and to maintain a good

standard of general personal health; all of which would not be possible without the ability to think critically. Educational programs should ensure that students are able to identify and understand the various components of critical thinking, including the ability to evaluate, analyze, deduce, and to reason both deductively and inductively, else their mental health may be put at risk.

Test anxiety is a general term that refers to anxiety related to exams and tests, and is a specific social phobia that can cause discomfort and suffering to a person regarding their ability to handle academic or other tests in life, and the consequence of any reduced ability in this area. In these situations, an individual may be subject to formal evaluation and required to solve problems to a set standard. Test anxiety is a common and important educational phenomenon and has a close relationship with performance and educational achievement for both young and adolescent learners. According to McDonald (2001), test anxiety also correlates with the personality and self-esteem of students, which is more common in those who are introspective or have low self-esteem.

The use of learning strategies is another factor that can affect academic achievement (Zimmerman & Martinez-Ponz, 1992). One of the strategies employed in cognitive and meta-cognitive learning is critical thinking, since deep learning actually refers to the strategies employed in learning consistently. In this respect, critical thinking is a significantly influential skill (Dweck & Leggett, 1998; Liem et al., 2008; Middleton & Midgley, 2007). Sulayman and Halally (2007) researched the relationship between critical thinking self-esteem and anxiety in high school students. Their findings showed that critical thinking was found to be negligible in the sample, indicating a serious defect in their critical thinking abilities. The participants' average self-esteem and situational anxiety levels were found to be relatively high, and a positive, high, and meaningful correlation was revealed between the high school students' critical thinking and self-esteem, with a negative and meaningful correlation between their critical thinking and situational anxiety.

Regarding these issues, as well as the lack of any comprehensive approach to critical-thinking skills training and the lack of experimental research in this field, the current study aims to investigate the effect of critical-thinking skills training on the academic achievement and test anxiety levels of high school students in the city of Yasuj, Iran.

2. Methodology

The study was designed as a field experiment with a pretest and posttest applied to both an experimental group and a control group. Prior to teaching critical-thinking skills to the experimental group, both student groups were applied critical thinking and test anxiety assessments. Then, the experimental group were taught critical-thinking skills in 13 sessions, but no additional training was provided to those in the control group. Immediately after completion of the training application, both the experimental and control groups were retested for their critical thinking and test anxiety, and the students' grades from both before and after the intervention were considered as criteria for academic achievement.

The statistical population of the study was all students attending the Yasuj high school, which is located in the Kohgiluyeh and Boyer-Ahmad province of Iran, during the 2016-2017 academic year. The study's sample consisted of 48 students, with an equal gender split (24 male, 24 female), who formed two mixed-gender groups (24 students in the experimental group, and 24 in the control groups) selected through multistage random sampling.

In this research, three measurements were used for both pretest and posttest: Halpern's Critical Thinking Skills Questionnaire (2010), which consists of 25 scenarios and a total of 98 articles; Sarason's Test Anxiety Questionnaire (1957), and the mean score of the test curriculum (referred to as "educational achievement").

Halpern's Critical Thinking Skills Questionnaire consists of five subscales (verbal reasoning, thinking skills in hypothesis testing, assessment skills, analysis skills, decision-making skills, and problem-solving skills), with each subscale consisting of five scenarios. Items were answered based on a two-dimensional spectra of 0 = *false* or 1 = *true*, a 5-point Likert-type measurement (0 = *not at all important*, 1 = *very low importance*, 2 = *low importance*, 3 = *moderately important*, 4 = *very important*, 5 = *extremely important*), or one of two different 7-point Likert-type calibrations graded from 0 to 6 (0 = *completely weak*, 1 = *very weak*, 2 = *weak*, 3 = *average*, 4 = *good*, 5 = *very good*, 6 = *excellent*; and 0 = *not at all important*, 1 = *very low importance*, 2 = *low importance*, 3 = *moderate importance*, 4 = *important*, 5 = *very important*, 6 = *extremely important*). The reliability coefficients of the Critical Thinking Skills Questionnaire were found to be .83 according to both Cronbach's alpha and Spearman-Brown and Gutman's harmonic methods. To determine the instrument's validity, the questionnaire's scores and prior research were used to evaluate the critical-thinking scores using a correlation matrix of the subscales, and the results were found to be satisfactory.

Sarason's Test Anxiety Questionnaire consists of 37 articles. This scale is designed as a short questionnaire in which subjects respond through self-monitoring according to their psychological state and physiological experience during the exam, and can therefore be applied both as a pretest and posttest. Tryon (1980) reported the reliability coefficients of Sarason's Test Anxiety Questionnaire as .80 as a single test and .91 as a two-way application. According to Vakili et al. (2010), the questionnaire has a reliability coefficient of .88 and an internal consistency of .95.

3. Findings

Table 1. Mean scores and standard deviation of pretest and posttest based on experimental and control group type

Scale/Test	Stage	Mean		Standard Deviation	
		Experiment	Control	Experiment	Control
Critical Thinking	Pretest	58/05	55/10	3/35	3/92
	Posttest	72/57	43/04	3/64	5/30
Educational Achievement	Pretest	15/22	14/96	1/21	1/33
	Posttest	16/19	14/52	1/25	0/78
Test Anxiety	Pretest	14/86	12/50	3/13	3/02
	Posttest	10/66	16/62	2/47	2/58

As shown in Table 1, the mean and standard deviation of the pretest and posttest for critical thinking, academic achievement, and test anxiety in the experimental group were $M = 58.05$ ($SD = 3.35$) and $M = 72.57$ ($SD = 3/64$), $M = 15/22$ ($SD = 1/21$) and $M = 16/19$ ($SD = 1/25$), and $M = 14/86$ ($SD = 13/13$) and $M = 10/22$ ($SD = 20/47$), respectively, whilst for the control group they were $M = 10/55$ ($SD = 3.92$) and $M = 04.04$ ($SD = 5.30$), $M = 14.94$ ($SD = 1.33$) and $M = 14.52$ ($SD = 0.78$), and $M = 12.5$ ($SD = 02/3$) and $M = 62/11$ ($SD = 58/2$), respectively.

Table 2. Mean scores and standard deviation of pretest and posttest based on gender

Scale/Test	Male		Female	
	Mean	Standard Deviation	Mean	Standard Deviation
Critical Thinking	56/78	15/63	58/78	15/76
Educational Achievement	15/34	1/49	15/37	1/18
Test Anxiety	11/16	2/20	11/12	2/90

As shown in Table 2, the mean scores and standard deviation for the pretest–posttest applied for the critical thinking, academic achievement, and test anxiety variables were $M = 56.68$ ($SD = 15.63$), $M = 15.34$ ($SD = 49.1\%$), and $M = 11.16$ ($SD = 2.20$), respectively for the male students, and $M = 58.78$ ($SD = 15.76$), $M = 15.77$ ($SD = 18.1$), and $M = 11.12$ ($SD = 2.90$), respectively for the female students.

Table 3. Multivariate covariance analysis of pretest/posttest mean scores

Source	Test	Value	F	DF Hyp.	DF Error	Sig. Level	Effect Size
Group	Pillai's Effect	0/918	240/670	2	43	.0001	.918
	Wilks Lambda	0/082	240/670	2	43	.0001	.918
	Hotelling's Effect	11/194	240/670	2	43	.0001	.918
	Roy's largest Root	11/194	240/670	2	43	.0001	.918

Note: Hyp = Hypothesis

Table 3 shows that a meaningful difference was found between the experimental and control groups for at least one dependent variable (critical thinking, academic achievement, or test anxiety). To investigate this difference, a one-way MANCOVA covariance analysis was performed on the dependent variables. The results of this analysis are presented in Table 3, which compares the pretest and posttest mean scores for critical thinking, academic achievement, and test anxiety for the experimental and control groups.

Table 4. One-way covariance MANCOVA test of pretest/posttest mean scores

Effect	Dependent Variable	Sum Square	DF	Sum Square	F	Sig. Level	Effect Size
Group	Critical Thinking	8811/629	1	8811/629	416/451	.0001	.902
	Educational Achievement	30/409	1	8652/304	29/940	.0001	.400
	Test Anxiety	2/528	1	2/528	0/863	.358	.019

The results presented in Table 4 show that one-way covariance analysis of the critical thinking ($F = 0.41645145$, $p = .0001$), academic achievement ($F = 0.9890$, $p = .0001$), and test anxiety (63.6 $0 = F$ and $p = .358$) variables were found to be meaningful. In order to better understand these differences, it is sufficient to compare the average posttest results of the experimental and control groups in terms of how the variables are associated with each other. According to the results of Table 4, the mean posttest score for critical thinking of the experimental group was 72/57 and 04/43 for the control group, which indicates that the critical thinking of the experimental group's students in the posttest was at a higher level than those in the control group. With regards to the posttest based on the participant students' academic achievement grades, the mean of the experimental group and the control group were 16.19 and 14.52, respectively, indicating that the academic achievement of the subjects in the experimental group was higher than that of the control group. On the posttest for test anxiety, the mean score of the experimental group and the control group were 10.66 and 11.46, respectively, indicating that the test anxiety of the subjects in the experimental group was less than that of the control group.

Table 5. Comparison of academic achievement and test anxiety mean based on group type

Scale/Test	Variable	Mean		Standard Deviation		F	F	Sig. Level	DF
		Exp.	Contr.	Exp.	Contr.				
Educ. Achieve.	Group	16/19	14/52	1/25	0/789	9/17	5/51	.0001	46
Test Anxiety	Group	10/66	11/62	2/47	2/58		.001	.031	0/979

According to Table 5, the mean scores for the academic achievement of the experimental group ($M = 16.19$, $SD = 25.1$) ($p = .001$, $df = 46$, $t = 5.51$) were meaningfully higher than the control group ($M = 14/52$, $SD = 0/979$). The mean scores of test anxiety in the experimental group ($M = 10.66$, $SD = 2.47$) ($p = .979$, $p = 46$) were meaningfully lower than the control group ($M = 11/62$, $SD = 2/58$).

Table 6. Comparison of academic achievement and test anxiety mean based on gender

Scale/Test	Variable	Mean		Standard Deviation		F	T	Sig. Level	DF
		Male	Female	Male	Female				
Educ. Achieve.	Gender	15/34	15/37	1/49	1/18	2/47	.089	.122	46
Test Anxiety	Gender	11/16	11/12	2/20	0/186	1/801	-.056	.186	46

From Table 6, it can be seen that the mean scores for the academic achievement of the male students ($M = 15.44$, $SD = 1.49$) ($p = .22$, $df = 46$, $t = .089$) were significantly lower than for the female students ($M = 15/37$, $SD = 1/18$). The mean scores for test anxiety for the male students ($M = 11.16$, $SD = 20.22$) ($p = .186$, $df = 46$, $t = .056$) were not found to be significantly different from the female students ($M = 11/12$, $SD = 2/90$).

4. Discussion and Conclusion

The results of multivariate and one-way covariance analysis revealed a significant difference between the posttest scores on academic achievement of the experimental and control groups. The posttest mean of the experimental group for academic achievement was shown to be higher than that of the control group. Consequently, Hypothesis 1 of the research on the effect of critical thinking education on increasing academic achievement in pre-university students in Yasuj city, Iran, was confirmed.

Comparison of the mean academic achievement scores based on gender and group (experimental group and control group) revealed the effect of critical thinking education having been administered to the experimental group on the participants' academic achievement scores, with differences seen between male and female students. The findings of this hypothesis test were matched with the results studies by Dweck and Leggett (1988), Halpern (2002), Orfield et al. (2004), Pak Mehr and Sharifi (2007, 2011), Redding (2001), Sadooghi (2001), and Zimmerman and Martinez-Ponz (1992). Moseley et al. (2010) and Paul and Elder (2008) argued that critical thinking provides the conditions and means necessary to educate the mind, but it should be acknowledged that such training alone is not sufficient during the 4 years of high school education, since students face a variety of factors during the training. Whilst individuals may also think differently, they can be educated on how to think better and more productively.

The authors posit that high schools and pre-university centers are well-positioned to prepare learners to think critically. Research using qualitative analysis has shown that cognitive thinking can increase when teachers rely on verbal encouragement and positive reinforcement rather than punishment. In addition, as the data suggests in the current study, learning environments that are void of anxiety can facilitate critical thinking skills development. By facilitating the necessary process for critical thinking skills development, learners' academic achievement can also benefit. Scheau (2012) reported critical thinking as having an impact on the development and advancement of students and their instructive activities, and that the use of cognitive thinking techniques based on the principles of active learning in the classroom can help advance students in terms of their academic work and their public communication. The results from Scheau' (2012) study revealed that critical thinking techniques can stimulate students to develop better communication capability, group work, and teamwork. It can also help increase self-confidence in their abilities, help them to engage actively in completing informative assignments, to politely listen to the ideas and opinions of others, and to improve their academic achievement.

Given the transformation of modern-day society and the constant advancement of technological progress, educational communities across many nations have felt the need to adopt critical thinking as a means to progressing the advancement of national goals. Today, critical thinking skills training has been implemented in the education systems of various countries, with this type of thinking now taught in many schools and universities. In other words, in the past, it was less imagined that all people had the potential to be critical in their thought patterns and to be creative. The general belief was that creativity and this kind of thinking have certain intrinsic qualities and that they are mostly inherited and are unable to be harnessed, controlled, or manipulated. The development of critical-thinking skills is paramount to academic success in the contemporary lives we live and in which the new rate of knowledge is accelerating.

Most educational trainers agree that critical thinking skills form an essential element of educational processes. On the other hand, the results of the current study's multivariate and one-way covariance analysis showed a meaningful difference in the posttest test anxiety scores between the experimental and control groups. The text anxiety mean scores of the experimental group's posttest was shown to be lower than that of the control group. As a result, Hypothesis 2

confirmed that critical thinking education can positively affect the reduction of test anxiety in pre-university students. In the comparison of test anxiety posttest mean scores based on gender (male and female) and group (experimental group and control group), the effect of critical thinking education on the participants' test anxiety differed according to gender. The findings related to Hypothesis 2 are presented in Table 5, and broadly match with the results of research conducted by Chamorro-Premuzic et al. (2008), Lashgaripour et al. (2006), McDonald (2001), Onyeizugbo (2010), Suleiman and Halally (xxxx, as cited in Milanifar, 2005), and Zimmerman and Martinez-Ponz (1992).

Fear and anxiety are considered inseparable components of childhood life, and form a natural part of the human growth process. Generally, anxiety and fear are seen as commonplace during the early years of life. As such, school anxiety, especially test anxiety, develops naturally during the schooling years, before stabilizing and continuing until and maybe into adulthood, and, if such anxiety intensifies or is left untreated, can result in poor academic and/or work-related performance. The results point to an inverse relationship between increases in critical thinking and test anxiety, and that test anxiety decreases with increased critical thinking.

In conclusion, since there is less attention aimed toward critical thinking in the educational process of Iran's schooling system, the authors consider it imperative to pay greater attention to critical thinking education. This change would help reduce fear and anxiety levels experienced by today's students, and thus create the necessary grounds for more people to succeed in terms of academic achievement.

References

- American Diploma Project. (2004). *Do graduation tests measure up? A closer look at state high school exit exams*. Achieve.
- Azar, F. A. (2003). *Teaching Methods and Techniques*. Tabriz University Press.
- Bigdeli, H. (2005). *The Relationship between Critical Thinking and Self-Esteem and Academic Achievement in Bachelor Students in the Humanities and Engineering Sciences of Tehran University* [Master's thesis]. University of Tehran, Iran.
- Boor, M. (1987). Test anxiety and classroom examination performance: a reply to Daniels and Hewitt (1978). *Journal of Clinical Psychology*, 36(1), 177-179. [https://doi.org/10.1002/1097-4679\(198001\)36:1%3C177::AID-JCLP2270360120%3E3.0.CO;2-I](https://doi.org/10.1002/1097-4679(198001)36:1%3C177::AID-JCLP2270360120%3E3.0.CO;2-I)
- Chamorro-Premuzic, T., Ahmetoglu, G., & Furnham, A. (2008). Little more than personality: Dispositional determinants of test anxiety (the Big Five, core Self-evaluations and self-assessed intelligence). *Learning and Individual Differences*, 18(2), 258-263. <https://doi.org/10.1016/j.lindif.2007.09.002>
- Dweck, C. S., & Leggett, E. L. (1988). A social cognitive approach to motivation and personality. *Psychological Review*, 95(2), 256-273. <https://psycnet.apa.org/doi/10.1037/0033-295X.95.2.256>
- Ennis, R. (1991). Critical thinking: A streamlined conception. In M. Davies & R. Barnett (Eds.), *The Palgrave Handbook of Critical Thinking in Higher Education* (pp. 31-47). Palgrave Macmillan. https://doi.org/10.1057/9781137378057_2
- Halpern, D. (2002). *Thought and knowledge: An introduction to critical thinking* (4th ed.). Erlbaum.
- Jackson, C., & Lawty-Jones, M. (1996). Explaining the overlap between personality and learning style. *Personality and Individual Differences*, 20(3), 293-300. [https://doi.org/10.1016/0191-8869\(95\)00174-3](https://doi.org/10.1016/0191-8869(95)00174-3)
- Karami, J. Zaki Yi, A., Rahmanzadeh, S., & Khani, A. M. (2011). *The role of meta-cognitive beliefs and self-efficacy beliefs in test anxiety and academic achievement in students* [Conference Presentation]. First National Conference on Cognitive Science Findings in Education, Ferdowsi University of Mashhad, Iran.

- Kendall, J. S., & Marzano, R. J. (2000). *Content knowledge: A compendium of standards and benchmarks for K-12 education* (3rd ed.). Association for Supervision & Curriculum.
- Lashgaripour, K., Bonyani, N. M., & Soleimani, M. J. (2006). The relationship between test anxiety and academic achievement in students of guidance schools in Zahedan in 2006. *Zahedan Journal of Research in Medical Sciences*, 8(4), Article e94880. <https://brieflands.com/articles/zjrms-94880>
- Liem, A. D., Lau, S., & Nie, Y. (2008). The role of self-efficacy, task value, and achievement goals in predicting learning strategies, task disengagement, peer relationship, and achievement outcome. *Journal of Contemporary Educational Psychology*, 33(4), 486-512. <https://doi.org/10.1016/j.cedpsych.2007.08.001>
- McDonald, A. S. (2001). The prevalence and effects of test anxiety in school children. *Educational Psychology*, 21(1), 89-101. <https://doi.org/10.1080/01443410020019867>
- Middleton, M., & Midgley, C. (2007). Avoiding the demonstration of lack of ability: An underexplored aspect of goal theory. *Journal of Educational Psychology*, 89(4), 710-718. <https://psycnet.apa.org/buy/1997-43826-012>
- MilaniFar, B. (2005). *Mental Health*. Quds Publications.
- Moseley, D., Baumfield, V., Elliot, J., Gregson, M., Higgins, S., Miller, J., & Newton, D. P. (2010). *Frameworks for thinking. A handbook for teaching and learning*. Cambridge University Press.
- Natale, S., & Ricci, F. (2006). Critical thinking in organizations. *Team Performance Management*, 12(7/8), 272-277. <https://doi.org/10.1108/13527590610711822>
- Onyeizugbo, E. U. (2010). Self-Efficacy and test anxiety as correlates of academic performance. *Educational Research*, 1(10), 477-480. <https://www.interestjournals.org/articles/selfefficacy-and-test-anxiety-as-correlates-of-academic-performance.pdf>
- Orfield, G., Losen, D., Wald, J., & Swanson, C. (2004). *Losing our future: How minority youth are being left behind by the graduation rate crisis*. The Civil Rights Project at Harvard University. Contributors: Advocates for Children of New York, The Civil Society Institute.
- Paul, R., & Elder, L. (2008). Critical thinking: The nuts and bolts of education. *Optometric Education*, 33(3), 88-91.
- Redding, D. A. (2001). Critical thinking disposition as it relates to academic achievement in baccalaureate nursing education. *Nurse Educator*, 26(3), 125-127. https://journals.lww.com/nurseeducatoronline/citation/2001/05000/critical_thinking_disposition_as_it_relates_to.13.aspx
- Scheau, I. (2012). The influence of critical thinking on public development and at the level of didactic activities. *Social and Behavioral Sciences*, 51, 752-756. <https://doi.org/10.1016/j.sbspro.2012.08.235>
- Troyn, G. G. (1980). The measurement and treatment of test anxiety. *Review of Educational Research*, 50(2), 343-327. <https://doi.org/10.3102/00346543050002343>
- Vakili, R., Gholamali Lavasani, M., Hejazi, B., Azhay. (2010). Learning strategies, goal orientations and test anxiety in blind students. *Journal of Exceptional Children*, 10(1), 29-36. <https://joec.ir/article-1-295-en.html>
- Zhang, L.-F. (2002). Thinking styles: Their relationships with modes of thinking and academic performance. *Educational Psychology*, 22(3), 331-348. <https://doi.org/10.1080/01443410220138557>
- Zimmerman, B. J., & Martinez-Pons, M. (1992). Self-regulation learning. *Journal of Educational Psychology*, 108(3), 253-289.