

The relationship between cognitive styles (in)dependent and creativity Among high school students in Ghorveh city

Abstract

This research aims to investigate the relationship between the (in)dependent field cognitive styles and the creativity of boy students in junior high school in Qorveh city. The current study is applied research in terms of the goal and the correlation with a modeling method of structural equations in terms of research. The statistical population of this research includes all the boy students of a junior high school in Qorveh city during 2014-2015, and based on the announcement of its educational management, there were 830 people. Using Cochran's formula, the volume of data obtained was 220 people. To gather data, Eltman, Raskin, and Witkin's test (1971) and Abedi's creativity test are used to evaluate the (in)dependent cognitive styles. To analyze the data, the structural equation model is utilized using the SmartPLS software. The reliability coefficient of variables based on Cronbach's alpha was 0.715 for the cognitive styles, and 0.946 for the creativity that indicated acceptable reliability. The average variance extracted for the cognitive styles was 0.559 and for the creativity 0.641, which indicated the acceptable validity values. The results show that cognitive styles have a significant and direct effect on the students' creativity.

Keywords: *Cognitive Styles, Creativity, Boy Student, Qorveh City*

Dr. Reza Rahimi

Department of Psychology, Payame Noor University, Tehran, Iran.

r_rahimi@pnu.ac.ir

Introduction

As a science, today, more than before, psychology, which studies human behaviour and mental processes, has been in educational service to improve learning and educational processes. Some students have slightly fixed properties in the field of their studies which is known as their learning style (Woolfolk, 1995). The learning styles refer to how a learner learns (Saif, 2020). The term cognitive styles show the degree of differentiation of people from others and their external environment and explain how much people rely on symbols and external drivers (Witkin et al., 1977). Generally, the learning styles can be divided into 3 groups, such as cognitive, emotional, and physiological, and the ones (in)depending on the field are considered the most important cognitive ones (Saif, 2020). First, the styles (in)depend on the field indicated and studied by Witkin in 1940 (Woolfolk, 1995). These styles state that the individual judges of some learners are affected by the field of the learning subject, while for other people, they are less affected or they never exist (Witkin, Morre, Goodenough, and Cox, 1977). Based on Witkin, these differences have important uses in job and educational situations. People dependent on the field, do not separate one detail from the visual context setting and they also have problems with separating the visual details, patterns, and designs (Woolfolk, 1995). These people choose curriculum subjects such as social sciences and jobs such as teaching (Dembo, 1994). While the people do not depend on the field, they perceive the parts of a pattern set separately and have many abilities to perceive complicated designs and pictures (Woolfolk, 1995) and show their property in the process of problem-solving and creativity (Witkin and Goodenough,

1981). These people select curriculum subjects such as mathematics and prefer jobs such as engineering to other professions (Dembo, 1994). Cassidy (2021) knows cognitive styles as regular mental behaviours that design mental maps and solve problems.

(In)dependent field cognitive style (FD-I) has been considered a sustainable personal and predictive feature that includes the constraints of individual differences in most cognitive fields, such as personal.social relationships, learning, defensive controls, and concept acquisition (Goodenough, 1977). People dependent on the field have little differentiation mentally from others and the external environment and rely more on environmental.external symbols in their cognitive activities. In contrast, people who are independent on the field have differentiated from the environment and others mentally and they respond more to the symbols created by themselves and depend less on the external drivers. In other words, the people who are dependent on the field are affected more by their surrounding area, while the ones who are independent on the field are affected less by environmental changes (Woolfolk, 1995).

Currently, students should improve their creative skills to decide properly and solve the complicated problems of their society (Ganji, Mirhashei, and Pasha Sharifi, 2005). Undoubtedly, creativity has a special position in the personal and social life of humans, so that, all achievements and civilizations from the beginning to now, as well as in the future, are the results of creativity. In the current era, the considerable importance and the critical essence of creativity are increasing and accelerating and cover all dimensions and aspects of human life (Golestan Hashemi, 1993). There are different

definitions of creativity. For example, Eysenck, Arnold, and Mili believe that creativity is a mental process that results in problem-solving, ideation, conceptualization, creation of artistic forms, theorizing, and making them innovative and unique. In Weber's psychological culture, creativity means the capability of seeing new relationships and creating unusual thoughts and distance from the traditional pattern of thinking. Also, Guilford has known creativity as a kind of thinking ability. The research done on creativity education has almost reported that creativity can be educated. During the research, Fryer and Collings (1991) concluded that 90% of teachers believe that creativity can be extended. Torrance (1993) states that after 15-year experience in study and education, creativity can be educated. Psychologists have presented various techniques for educating creativity and among them, the "brainstorming" method has been much used (Thomas, 2005).

Ates & Cataloglu (2007) and Antoniti & Maria (1995) have indicated in their studies that people who are independent of the field have more capability to solve the problem than the ones dependent on that. Angeli, Valanides, and Kirschner (2021) showed that there is a relationship between the independent field cognitive style and mathematical performance. The results of Hodges et al. (2008) and Kratzig & Arbuthnott (2006) indicated that there is a relationship between the independent field cognitive style and educational progress. Cassidy (2021) and Jackson & Williams (2003) indicated that there is a relationship between the independent field cognitive style and the descriptive tests (2003). The research findings show higher focus and precision (Guisande et al., 2007) and autism (Edgin & Pennington, 2005) in people with an independent field cognitive style than the ones with a dependent field cognitive style.

In the current era, students should improve their creative skills to decide properly and solve the complicated problems faced with the amazing evolution of the third millennium AD. They should increase their skills in research and problem-solving as well as their spirit for surfing (Ganji et al., 2005). This subject in each period of history has been a main power for the human mind, the main goal for schools and educational centers. Today, broad cultural, social, and economic changes and evolution lead to new problems and, in the following, new expectations for schools and educational and training systems worldwide. The rapid development of technology in different fields, the knowledge density, extended communication, and the presence of various types of information processing, prevent the economic structure of societies relying on primary resources and have replaced the training of expert human sources, availability of information, and wide use of scientific findings with it in practice (Ganji et al., 2005).

Regarding another essence of this study, it can be referred to that the research and study are useful in the field of cognitive

styles and creativity as well as for practitioners, managers, and teachers to solve visual and special problems.

The school officials that identify and know the cognitive styles and creativity and their influence on academic and educational activities, including problem-solving, which is one of the defined applied and fundamental goals in the educational field, are aware of the necessity of the auxiliary measures in this area and, increase the other actions of students' educational experiences such as educational consultation and educational programs for all them. According to the mentioned concepts, the goal of the current study is to examine the relationship between independent and dependent cognitive styles with creativity in the boy students of the junior high school of Qorveh city.

Research Methodology

The current study is an applied method in terms of the goal and correlation one in terms of the research method in a structural equation modeling way. The statistical population in this research includes all students of junior high school in Qorveh city in the academic year of 2014-2015. Based on the announcement of the education management in Qorveh city, there were 830 people. Using Cochran's formula, the volume of the sample was 220 people. In this study, using the multiple cluster sampling methods, the samples were chosen from the statistical population, such that among the boys high school of Qorveh city, 4 high schools were selected accidentally, and in these schools, 2 classes were randomly selected as well and these tests were performed on these classes (5 classes with 25 people, 2 classes with 27 people, and one class with 26 people).

Measurement Tools

The Group Embedded Figures Test (GEFT)

Oltman, Raskin, and Witkin (1971) have produced this test to evaluate the (in)dependent field cognitive styles. This test involves 25 complicated images. In each picture, the subject is asked to find one of the simple geometrical forms of the sample that is embedded in a complicated design. This test involves 3 parts: the first part includes 7 relatively complicated pictures and is only performed for practice and lasts 2 minutes. The second and third parts, with more complicated forms, are the main parts of the test. Each of them involves 9 pictures and the necessary time for responding to them is 10 minutes. When performing, it prevented seeing the sample form and testing simultaneously. So, the sample form of shapes has been printed on the back of the notebook. The capability of the subject to find the simple geometrical shapes of the sample form without diverting due to the complicated design shows the amount of (in)dependent field. A score is given to the subject per each response. In this way, the range of scores from 0 to 18 is scattered. A score of 0 indicates the dependent field cognitive style and 18 indicates the completely independent one. Eltman et al. (1971) have reported this test with a retesting method in

both men (N = 80) and women (N = 97) that matches with the retesting validity of the Embedded Figures Test (EFT) for men (0.82; N = 51) and women (0.79; N = 51). Also, in this study, the criterion validity coefficient was 0.82 (N = 73) for men and 0.63 (N = 63) for women (Bosaki et al., 1997). Also, Witkin et al. (1971) reported the validity coefficient between the second and third parts of testing as 0.82 using the Spearman-Brown formula (Raviv and Nabel, 1998). This test was used by Safaripour (2001) to investigate gender interaction and cognitive style in the educational progress of mathematical and social lessons. In his research, the validity coefficient with a retesting method was 0.85 and with Cronbach's alpha, 0.75.

Abedi Creativity Test

This test, which is based on the Torrance theory, was built in 1984 by Abedi (1993) and performed on a group of 650 people from a senior secondary school in Tehran. In 1986, Abedi and Schumacher remade the testing materials due to accessing the main version in the US. The new version of this test was reviewed multiple times and for the first time, was described by O'Neil et al. (1994). This test has 60 questions with 3 options including 4 subtests: fluency, expansion, innovation, and flexibility. The options show that the amount of creativity is low, medium, and high, and that score 1 is for low creativity,

Table 1: Description of research variables.

Variable	Sample Volume	Mean	Std.	Minimum	Maximum	The range of classes	Variance	Std.	Tilt	Std.	Tension	Std.
Cognitive Styles	220	7	0.204	2	17	15	9.173	3.029	1.377	0.164	1.976	0.327
Creativity	220	84.33	1.191	66	150	84	311.967	17.663	2.199	0.164	4.514	0.327

The data in the table indicate that in cognitive styles, the mean is equal to 7 and the standard deviation is 3.03. In creativity, the mean is equal to 84.33 and the standard deviation is 17.66.

Table 2: Measurement model Indices of cognitive styles.

Object	b	t	p
1	0.362	5.032	p < 0.01
2	0.432	5.954	p < 0.01
3	0.396	5.358	p < 0.01
4	0.360	5.010	p < 0.01
5	0.449	6.422	p < 0.01
6	0.459	6.620	p < 0.01
7	0.486	6.849	p < 0.01
8	0.529	7.201	p < 0.01
9	0.365	5.131	p < 0.01
10	0.459	6.909	p < 0.01
11	0.425	5.834	p < 0.01
12	0.392	5.244	p < 0.01

score 2 for medium, and 3 for high. The total scores acquired from each subtest represent the subject score of that part and the total subject scores of each subtest show the total score of his/her creativity. The range of the total score of each subject is between 60 and 180. Questions 1-22 are related to fluency, 23-33 to expansion, 34-49 to innovation, and 50-60 to flexibility. The reliability of Abedi's creativity test was obtained by retesting the students of secondary schools in Tehran in 1984 with 4 test parts, respectively as follows:

The reliability coefficient of the fluency part is 0.85, innovation is 0.82, flexibility is 0.84, and expansion is 0.8 (Abedi, 1993).

The internal consistency coefficient was acquired using Cronbach's alpha for subtests of fluency, flexibility, innovation, and expansion, 0.75, 0.66, 0.61, and 0.61, respectively, on 2270 students (Azmandi et al., 1996).

Regardless of using proper central and scattering indices for measuring the level of variables, the structural equation model was utilized using the SmartPLS software.

Findings

The descriptive results of research variables have been mentioned in Table (1).

13	0.368	5.050	p < 0.01
14	0.647	14.736	p < 0.01
15	0.484	6.622	p < 0.01
16	0.466	5.814	p < 0.01
17	0.624	10.897	p < 0.01
18	0.667	11.812	p < 0.01

The data in Table 2 show that all objects on the questionnaire have a meaningful impact coefficient for measuring cognitive style.

Table 3: Measurement model Indices of the creativity.

Object	b	t	p
1	0.407	6.113	p < 0.01
2	0.491	8.141	p < 0.01
3	0.544	9.945	p < 0.01
4	0.463	7.367	p < 0.01
5	0.535	7.749	p < 0.01
6	0.471	6.337	p < 0.01
7	0.541	7.601	p < 0.01
8	0.493	6.964	p < 0.01
9	0.554	8.963	p < 0.01
10	0.467	7.352	p < 0.01
11	0.440	5.463	p < 0.01
12	0.524	7.475	p < 0.01
13	0.561	7.708	p < 0.01
14	0.531	7.772	p < 0.01
15	0.526	7.723	p < 0.01
16	0.440	5.865	p < 0.01
17	0.524	7.269	p < 0.01
18	0.559	9.102	p < 0.01
19	0.595	7.486	p < 0.01
20	0.530	7.677	p < 0.01
21	0.444	6.080	p < 0.01
22	0.462	5.781	p < 0.01
23	0.488	6.885	p < 0.01
24	0.506	7.963	p < 0.01
25	0.484	6.755	p < 0.01
26	0.405	4.809	p < 0.01
27	0.432	5.439	p < 0.01
28	0.372	5.070	p < 0.01
29	0.519	7.944	p < 0.01
30	0.464	6.082	p < 0.01
31	0.362	4.715	p < 0.01
32	0.408	6.748	p < 0.01
33	0.461	7.493	p < 0.01
34	0.454	6.435	p < 0.01
35	0.480	6.987	p < 0.01
36	0.585	9.095	p < 0.01

37	0.475	6.239	p < 0.01
38	0.429	6.961	p < 0.01
39	0.485	6.655	p < 0.01
40	0.441	5.986	p < 0.01
41	0.569	8.470	p < 0.01
42	0.432	6.218	p < 0.01
43	0.422	6.731	p < 0.01
44	0.440	6.535	p < 0.01
45	0.555	10.366	p < 0.01
46	0.517	7.282	p < 0.01
47	0.510	6.897	p < 0.01
48	0.488	6.354	p < 0.01
49	0.542	7.826	p < 0.01
50	0.440	5.339	p < 0.01
51	0.426	5.843	p < 0.01
52	0.472	6.615	p < 0.01
53	0.498	6.412	p < 0.01
54	0.561	8.375	p < 0.01
55	0.582	9.756	p < 0.01
56	0.559	8.919	p < 0.01
57	0.548	7.485	p < 0.01
58	0.440	5.657	p < 0.01
59	0.447	5.857	p < 0.01
60	0.473	7.449	p < 0.01

Table 4: The reliability of research variables

Variable	Cronbach's alpha	Composite reliability
Cognitive styles	0.715	0.729
Creativity	0.946	0.949

The reliability coefficient of variables based on Cronbach's alpha was 0.715 for cognitive styles, and 0.946 for creativity, which indicated acceptable reliability. The reliability

coefficient of variables based on the composite reliability achieved 0.729 for the cognitive styles and 0.949 for the creativity, which indicated acceptable reliability.

Table 5: The mean values of the extracted variance.

Variable	AVE	Common coefficient	R^2
Cognitive styles	0.559	0.559	0.339
Creativity	0.641	0.641	0.651

Based on Table 5, the average variance extracted for the cognitive styles acquired was 0.559, and for the creativity 0.641, which indicated acceptable validity values. The values of common coefficients computed for the cognitive styles are

0.56 and for creativity, 0.64, which indicates an acceptable validity. The determination coefficient for the cognitive styles was 0.339 and for creativity, 0.651. This indicated that the mentioned values are at the extent of average and acceptable.

Table 6: The effect of research variables on solving the problem.

Variable	Direct effect			Total effect		
	b	t	p	b	t	p
The cognitive style on the creativity	0.526	5.795	p < 0.01	0.526	5.795	p < 0.01

The results of Table 6 show that the cognitive styles have a meaningful direct effect on the students' creativity ($p < 0.01$, $t = 5.79$, and $b = 0.53$).

Discussion

The results show that cognitive styles have a direct meaningful impact on the attitude to students' creativity. The current research findings in this regard are consistent with the findings of Bal (1988), Chaddha (1985), Cohen, Swerdlik, and Philips (2022), Hisaker (1981), and McKinnon (1994). Various research has emphasized the relationship between (in)dependent field cognitive styles and creativity. For example, Bal (1988) performed Torrance's creativity test and EFT on 150 Indian student girls and found that there is a significant relationship between independent field cognitive style and fluency scores, between flexibility and originality in Torrance's creativity test. Chaddha (1985) concluded in his research that people with creativity lower than the ones with high creativity are more dependent on the field. Cohen et al. (1996) investigated creativity in people (in)dependent fields and the results showed that dependent-field people have less creativity than independent-field people. Also, Hisaker (1981) showed in his research that dependent field people are more obedient and receptive and have less creativity than independent field people. Also, McKinnon found out in his research that there is a significant correlation between people with perceptual complexity and those with creativity (Anastasi, 2019). So, to describe this finding, it can be explained that in people with high creativity there is not a field with rare impact or without it (Witkin, Morre, Goodenough, and Cox, 1977). People with dependent fields do not separate one detail from the visual field setting; also, these people have a problem separating visual details from the patterns and designs (Woolfolk, 1995). While people in a dependent field perceive the parts of a pattern setting separately and have a very high ability to perceive complicated designs and pictures (Woolfolk, 1995), these properties show themselves in the problem-solving process and creativity (Witkin and Goodenough, 1981).

Conclusion

According to the results obtained in this research, it can be concluded that cognitive styles have a significant direct impact on the attitude to creativity. Based on the Gaschwind-Bahan-Galaburda theory (the GBG pattern) and Witkin's theory and, based on this point, if the personal cognitive style and attitude to creativity are proportional, universities and special centers for consulting and psychology and education, which can use practically, of this model; meanwhile the formulated model can provide the science incentives for more research in this area.

One of the other constraints of this research is that in this study, only (in)dependent styles have been considered and others have not been considered.

According to the results, it is recommended that the teachers and professors familiarize themselves with the students' cognitive styles to match their programs and methods with the cognitive styles of learners.

References

- Abedi, J. (1993). Creativity and The modern method in its measurement. *Psychological Research*, Vol. 2, Issue 1-2, pp. 55-46.
- Anastasi, Anne. (2019). Individual Differences, translated by Javad Tahorian, Mashhad, Astan Qods Razavi.
- Angeli, C., Valanides, N., & Kirschner, P. (2009). Field dependence–independence and instructional design effects on learners' performance with a computer-modeling tool. *Computers in Human Behavior*, 25 (6), 1355 -1366
- Antoniti, G., & Maria, A. (1995). Individual differ differences in analogical problem-solving. *Personality and Individual Differences*, 18, 611- 619.
- Ates, S., & Cataloglu, E. (2007). The effects of students cognitive styles on conceptual understandings and problem-solving skills in introductory mechanics. *Research in Science & Technological Education*, 2, 167–178.
- Auzmendi, E., Villa, A., & Abedi, J. (1996). Reliability and validity of a newly constructed multiple-choice creativity instrument. *Creativity Research Journal*, 9 (1), 89-95.
- Bal, Sudesh. (1988). Creativity, cognitive style and academic achievement amongst university students. *Psychological studies*, 33, 10-13.
- Bosaki, s., Innerd, w., & Towson, s. (1997). Field independence-dependence and self-esteem in preadolescents. Does Gender make a difference? *Journal of Youth and Adolescence*, 26(6), 691-703.
- Cassidy, S. (2021). Learning style and student self-assessment skill. *Education Training*, 2(48), 170-177.
- Chaddha, N.K. (1985). Creativity and cognitive styles. *Psycholinguia*, 15, 81-88
- Cohen, R. J., Swerdlik, M. E., & Philips, S. M. (2022). *Psychological testing Assessment*. (7th ed). California: Myfield.
- Dembo, M.H. (1994). *Applying Educational Psychology*. (5th ed). New York: Longman
- Edgin, J. O., & Pennington, B. F. (2005). Spatial cognition in autism spectrum disorders: Superior, impaired, or just intact? *Journal of Autism Development Disorder*, 35, 729-745.
- Ganji, H., Mirhashei, M., Pasha Sharifi, H. (2005). The Effect of Brainstorming On Students' Creativity, *Journal of Education*, Vol. 21, Issue 1, pp. 89-112.
- Golestan Hashemi, S.M. (1993), *Creativity Technology*, The Islamic Revolution Approach, Vol. 112, Issue 26, pp. 85-98.
- Goodenough, D.R. (1977). the role of individual differences in FD as a factor in learning and memory. *Psychological Bulletin*, 83, 675-694
- Guisande, M. A., Paramo, M. F., Tinajero, C., & Almeida, L. S. (2007). Field dependence independence (FDI) cognitive style analysis of attentional functioning. *Psicothema*, 4, 572-577.
- Henseler, J., Ringleand, C. M., & Sinkovics, R. R. (2009). The Use of Partial Least Squares Path Modeling in International Marketing. *New Challenges to International Marketing Advances in International Marketing*, 20, 277–319.
- Hodges, C. B., Stackpole-Hodges, C. L., & Cox, K. M. (2008). Self-efficacy, self-regulation and cognitive style as predictors of

achievement with podcast instruction. *Journal of Educational Computing Research*, **2**, 139-153.

- Johnson, M. H. (2005). *Developmental Cognitive Neuroscience*. (5th ed Blackwell Publishment
- Kirveskari , E., Salmelin , R., & Hari , R.(2021).Neuromagnetic responses to vowels vs.tones reveals hemispheric lateralization .*Clin Neurophysiol* , **117**, **3** , 643-8.
- O'Neil, H., Abedi, J., & Spielberger, C. (1994). The measurement and teaching of creativity. In H. O'Neil & M. Drillings (Eds.). *Motivation: Theory and research*, (pp. 245- 263). Hillsdale, NJ: Erlbaum.
- Raviv, S., & Nabel, N. (1988). Dependence – Independence and concentration as psychological characteristics of basketball players. *Perceptual and motor skills*, **66**, **831**-836.
- Safaripour, F. 2001, Investigating the interaction between the gender and the cognitive styles in the academic achievement in two courses of Mathematical and Social of the secondary school of the Shiraz City in 2001, Master Thesis, Shiraz University.
- Saif, A.A. (2020), Modern educational psychology, 6th edition, Tehran, Agah publication.
- Thomas, J. (2005) . Facilitation of critical thinking and Deep cognitive processing by structured discussion Board Activities. *Journal of Science Education and Technology*, **8**,**2** 32544-334.
- Torrance, E. P. (1998). An interview with E. Paul Torrance: About creativity *Educational Psychology Review*, **15**, 441-452.
- Witkin, H.A., Morre, C., Goodenough, D.R., & Cox, P. (1977). *Field-dependent a field-independent cognitive style and Their Educational Implications*. Review of Educational research Woolfolk, A.E. (1995). *Educational psychology*. (6th ed). Boston: Allyn and Bacon.