Study of Relationship between Learning Styles and Creativity in Students

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Abstract: The purpose of the current study was examining the relationship between learning styles and creativity in students of Gomishan of Golestan province of I.R.Iran. To reach this purpose 255 students of Gomishan were selected by stratified random sampling. They completed Turance Creativity Test (1965) and Felder-Soloman Learning Style Questionnaire (1997). The results showed that: 1- visual-verbal learning styles of input dimension and active-reflective learning styles of process dimension had a significant relationship with creativity. 2- sensing-intuitive learning styles of perception dimension and sequential-global learning styles of understanding dimension had not a significant relationship with creativity. 3- There was not a significant differences in learning styles and creativity between male and female students. 4- Regression analysis indicated that active-reflective learning styles 25 percent of the variance and visual-verbal learning styles 20 percent and they are significant. Furthermore, sensing-intuitive learning styles explained 9 percent of the variance and sequential-global learning styles 6 percent and it was not significant. In general, there was a relationship between learning styles and creativity and creativity can be changed by changing in learning styles.

1. Introduction

One of main concerns of education is transferring knowledge to the future generation. Knowledge and information promotion, widespread cultural, social and economical developments have brought new problems and subsequently new expectations for educational system and drove it to teach the learning ways and methods and establishing creativity and innovation to the students rather than transferring a series of knowledge and information. In the present age, to confront developments, students should apply creative thinking skills and correct learning styles in order to make appropriate decisions and to solve the problems of the society. Skinner believes that an effective educational system is based on appropriate teaching and learning styles of students (Meyari, Saburi Kashani, Gharib and Biglarkhani, 2009).

One of the important cognitive abilities of students is creativity. Creativity is the power of creating new things. In Oxford dictionary, creativity has been defined as "the power of creating" and this power is depending on intelligence and the ability of imagination. In psychological dictionary, creativity has been assumed as a mental process which in that solving problems, developing ideas, making concepts, creating artistic forms, theories or unique and novel productions are made (Pirkhaefi, 2003). Stephen Robbins (1991, cited in Seif, 2009) considers creativity as an ability to combine thoughts and ideas uniquely by producing cohesiveness between them.

Creativity from the view of theorists and researchers have had different concepts and there isn't single and integrative definition about it. Therefore, the nature of creativity has been very different in various theories and schools. Psychoanalysts consider creativity as a result of solving conflicts which has been produced in subconscious while humanists emphasize that creativity is the result of mental health, self-actualization and human perfection. Medical view emphasizes on the relatoinship between creativity and the brain (Abbasi and Abedi,2010).

Guilford (1967, cited in Ghasemi and Oghlidos, 2005) believed that creativity is connected with divergent thinking (creating new ways for problem solving) and intelligence is connected to convergent thinking (reaching the correct answers). He believes that in convergent thinking there is correct and incorrect answers but in divergent thinking there is not any definitely correct answers and there is a lot of possible answers may exist which they seem logical. In Guilford's theory, divergent thinking has been established from factors such as fluency, flexibility, originality and elaboration (Ghasemi and Oghlidos, 2005).

From Turence's theory of creativity, creative thinking means the process of feeling the difficulties and problems, different views about information,

making mistakes in elements of things, generating guesses and hypothesis about these problems, evaluating and testing these guesses and hypothesis, reforming and retesting of them and eventually connecting the results. Turance believed that creative thinking is comprised four main factors which are: a) fluency: means the ability to producing a lot of ideas, originality: means the ability to producing novel, unusual and new idea, flexibility: means the ability to producing various ways and ideas, and elaboration: means the ability to paying attention to the details (Sheikh-al-eslami and Razaviyeh, 2005).

Nowadays, it is proved that contrary to the believes of many who consider the innovation and creativity as an inherent characteristic for some individuals, this ability in mankind has generality like memory and it can be developed by using determined techniques and principles and creating new thinking ways and appropriate environment (samkhanian, 2005). Robert Apthian (1985, cited in Samkhanian, 2005) after twenty years of research, believes that all of humans have the power of creativity and there is not any exception. So, we can developed the natural talent of creativity by doing the activities that create the most capabilities to develop creativity. To develop the creative talent, organizatoins should provide the necessary conditions and atmosphere although the individual himself/ herself has a basic role in developing this talent (samkhanian, 2005).

One of the subjects that seems has effect on developing the creativity of students is learning styles. According to many authors, learning styles are a kind of cognitive styles. Keefe (1979) has defined the learning styles as relatively permanent ways of perception of and interaction with learning environment by students. Robynne and Gravenhorst (2007) defined learning styles as an individual's tendency to learning and adapting with environment. Learning styles are ways that individuals organize and process new experiences and information in their mind in order that they can solve their problems (Seif, 2009). Also, Daff (2004) has defined learning styles as different kinds of receiving, coding, storing and processing information.

Some theories and models have been presented on learning styles. For example, kolb (1984, cited Azizi Abarghooee, Naseri and Eslami, 2009) presented cyclic model of learning styles that consist of four learning styles. These styles include objective experience, reflective observation, abstract conceptualizing and active experimentation. These four styles have a cyclic state and they are assessed by learning styles questionnaire, and determine the location of individuals and their learning styles in this cycle. In fact, their combined scores of students in these styles indicate their tendency to use information

in spectrum from abstract to objective and from active to reflective that eventually result in four learning styles: convergent, divergent, attractive and adapting.

Another model of learning styles was proposed by Honey and Mumford (2000; cited in Fleming, McKee and Huntley-Moore, 2010). This model introduce four learning styles in school and university students including: active, reflective, theorist and pragmatist.

Also another model of learning styles has been presented by Vermunt and Vermetten (2004, cited Azizi Abarghooee and Colleagues, 2009) that presents four learning styles: cognitive process, supervising on learning, subjective model of learning and orientating learning.

Felder and Silverman (1988) have presented a model of learning styles which it consists of five dimensions. Each dimensions is indicative of two opposite learning styles. Two dimensions from these dimensions are taken from proposed model of Meyers-Briggs and Kolb proposed model. The dimension of perception (sensing-intuitive) is similar to the perception dimension in the Meyers-Briggs and Kolb models and the process dimension (active-reflective) which exists in Kolb's model. Additionally, dimensions of Felder-Silverman model include other three dimensions: input (visual-verbal), organizing (inductive-analogical) and understanding or comprehension (sequential-global) (Montgomery and Groat, 1998).

Individuals who have sensing learning style are tended to gain information by senses, events and observations and are interested in learning objective events while individuals having intuitive learning style are tended to gain information by symbols and commentaries and are interested in discovering relationships and possibilities. Individuals having active learning style are tended to discuss with others about information or to explain it for others, while individuals having reflective learning style are tended to think about information in peace. Active learners in comparison with reflective learners who are interested in doing activities collectively. Individuals having visual learning style are tended to gain information by figures, diagrams and images, while individuals having verbal learning style are interested in gaining information by words whether written words or spoken (oral) explanations. Individuals having sequential learning style are tended to comprehend in ordered stages, stages which each one follows the previous stage logically. On the other hand, individuals having global learning style are interested in learning in large jumps and absorb the materials almost randomly and without paying

attention to the relationships between them and then comprehend them suddenly (Felder, 1993).

Some studies have been done on the relationship between learning styles and creativity. For example, Michelle and Piatecofska (2000, cited in Dashti, Minakari and Heidari, 2006) indicated that creativity test scores of students having divergent learning style are higher than other students significantly. In another study Braten and Valasun (2004, cited in Dashti and colleagues, 2006) concluded that students who have higher creativity use divergent cognitive style more than students who have lower creativity. Martinsen, Coffman and Frenham (2011) found that cognitive styles are connected with some aspects of creativity.

In iran, Khooeeni (2005) concluded that there is a significant relationship between judicial and legislatively thinking styles and creativity but executive thinking style does not have a meaningful relationship with creativity. Dashti, Minakari and Heidari (2006) found that there is a significant relationship between cognitive learning styles and creativity. Elmi (2001, cited in Dashti and colleagues, 2006) concluded that there is a positive and significant relationship between Kolb's divergent learning style and creativity in high school students and the rate of students creativity in males is higher than females. Also Agahi Isfahani, Neshatdoost and Naeli (2004) found in a study that there is a positive and significant relationship between scores of dependent/independent on background cognitive style and creativity. In this study there was not significant difference between females and males in cognitive style and creativity.

Considering what stated on the relationship between learning styles and ceativity indicate that few studies with different methods and models accomplished about this topic. Therefore, the present study considers the relationship between learning styles and creativity in the students of Gomishan which is one of the towns of Golestan province in I.R.Iran. Therefore hypothesis of the present study are as follows:

There is a significant relationship between perception dimension (sensing-intuitive learning styles) and creativity in students.

There is a significant relationship between input dimension (visul-verbal learning styles) and creativity in students.

There is a significant relationship between process dimension (reflective-active learning styles) and creativity in students.

There is a significant relationship between understanding dimension (sequential-global learning styles) and creativity in students.

In learning styles there is a significant differences between male and female students.

In creativity there is a significant differences between male and female students. Additionally, learning styles predict creativity.

2. Material and Methods

The method of the current study was correlational descriptive method in which the relationship between learning styles and creativity in high school students of Gomishan is studied.

population was all third grade high school students of Gomishan. Sample was 255 individuals based on Krejsi & Murgan that have been selected by stratified random sampling method. In this way first the schools were classified with regard to educational branch and frequency of the students in five main fields sciences, humanities, physics and mathematics, vocational knowledge and engineering and then individual selected randomly.

Instruments

Index of Felder-Soloman Learning Styles:Index of Felder-Soloman (1997) learning styles has been designed based on model of Felder-Silverman (1988) learning styles. This questionnaire consists of 44 questions which do not have cultural dependency. The questionnaire is able to evaluate four learning dimension comprised of eight learning styles as follows: 1-perception dimension: sensing-intuitive learning styles; 2-input dimension: visula-verbal learning styles; 3-process dimension: reflective-active learning styles and 4-understanding dimension: sequential-global learning styles. There are 11 questions to evaluate each dimension. Subject select one option ("A" or "B" option) connected to each question and two learning styles are evaluated which are opposite (Emamipoor and Shams Esfandabad, 2007).

Zwanenberg and colleagues (2000) gained calculated Alpha coefficient for each dimension of learning styles with implementing the questionnaire on 284 English students: 0.41 for sequential-global dimension, 0.51 for reflective-active dimension, 0.56 for visual –verbal dimension and 0.65 for sensing-intuitive dimension. Also Litzinger, Lee, Wise and Felder (2007) have estimated the test-retest reliability coefficient for subscales of the test as follows: sequential-global style, 0.55; reflective-active style, 0.61; visual-verbal style, 0.76; and sensing-intuitive style, 0.77.

In Iran Shams Esfanabad (2003) has estimated Cronbach's Alpha coefficient for sequential-global style, 0.61; reflective-active style, 0.87; visual-verbal style, 0.77; and sensing-intuitive style, 0.75. Samadi

(2011) has estimated Cronbach's Alpha coefficient for subscales of the questionnaire from 0.69 to 0.79.

Also on the validity of the questionnaire, Zywno (2003) and Litzinger and colleagues (2007) gained by confirmatory factor analysis and estimated high validity for the questionnaire. Samadi (2011) indicated that the questionnaire has high simultaneous and convergent validity. Also in this study goodness of fit of index has been estimated from 0.52 to 0.91.

Turence Creativity Questionnaire:This test which was made by Turence (1965) include 60 questions that evaluate four dimensions of fluency (questions 1 to 16), originality (questions 17 to 38), flexibility (questions 39 to 49) and elaboration (questions 50 to 60). In this test, each question has three options that score 1 is given to the first option, score 2 to the second option and score 3 to the third option. (Rezaee and Manoochehri, 2008).

Internal consistency reliability coefficient was gained in Spain by Cronbach's Alpha for fluency, 0.75; originality, 0.76; and flexibility and elaboration, 0.61 (Rezaee and Manoochehri, 2008). Abedi (1993) by implementing this test on 650 third grad guidance school students of Tehran gained reliability of the test by retesting. Reliability coefficient for fluency was 0.85; originality, 0.82; flexibility, 0/84; and elaboration, 0.80. Rezaee and Manoochehri (2008) have estimated Cronbach's Alpha coefficient 0.87 generally.

Also in order to examine the validity of this test, Abedi (1993) implemented the original form on 650 students of Tehran. Also, Turence's creativity test was implemented on a group of 200 individuals from the same students. Correlation coefficient between total score of Turence's test and total score of the test was gained (Rezaee and Manoochehri, 2008). Validity of this test was confirmed in the study of Rezaee and Manochehri (2008) by factor analysis method.

3. Results

Table 1. Frequency and percent of gender subject

Gender	Frequency	Percent
Female	120	47.1
Male	135	52.9
Total	255	100

Table 1 shows that 47.1 percent of the individuals were females and 52.9 percent were males.

First hypothesis: There is a significant relationship between perception dimension (sensing-intuitive learning styles) and creativity in students.

Table 2. correlation between sensing-intuitive learning styles and creativity

First variable	Second variable	r	df	P
Intuitive style	Fluency	-0.04	255	0.52
	Flexibility	0.04	255	0.49
	Originality	0.16	255	0.01
	elaboration	0.03	255	0.67
	Total creativity	0.08	255	0.22
Sensing style	Fluency	0.04	255	0.52
	Flexibility	-0.04	255	0.49
	Originality	-0.16	255	0.01
	elaboration	-0.03	255	0.67
	Total creativity	-0.08	255	0.22

Table 2 shows that sensing-Intuitive style of perception dimension has significant relationship only with the originality component creativity and this relationship is reverse in sensing style and these

styles (sensing-intuitive) do not have a significant relationship with fluency, flexibility, elaboration and general creativity. Therefore, the hypothesis is rejected.

Second hypothesis: There is a significant relationship between input dimension (visual-verbal learning styles) and creativity in students.

Table 3. correlation between visual-verbal learning styles and creativity.

First variable	Second variable	r	df	P
visual style	Fluency	-0.04	255	0.53
	Flexibility	-0.22	255	0.0001
	Originality	-0.13	255	0.04
	elaboration	-0.24	255	0.0001
	Total creativity	-0.19	255	0.002
verbal style	Fluency	0.04	255	0.53
	Flexibility	0.22	255	0.0001
	Originality	0.13	255	0.04
	elaboration	0.24	255	0.0001
	Total creativity	0.19	255	0.002

Table 3 indicates that visual-verbal styles of input dimension of learning has a significant relationship with the flexibility, originality and elaboration components of creativity and total score of creativity. This relationship is reverse in visual style. But these styles do not have a significant relationship with the fluency component of creativity. Therefore, the hypothesis is confirmed.

Third hypothesis: There is a significant relationship between process dimension (reflective-active learning styles) and creativity in students.

Table 4. correlation between active-reflective learning styles and creativity.

First variable	Second variable	r	df	P
active style	Fluency	-0.15	255	0.01
	Flexibility	-0.23	255	0.0001
	Originality	-0.15	255	0.02
	elaboration	-0.24	255	0.0001
	Total creativity	-0.24	255	0.0001
Reflective style	Fluency	0.15	255	0.01
	Flexibility	0.23	255	0.0001
	Originality	0.15	255	0.02
	elaboration	0.24	255	0.0001
	Total creativity	0.24	255	0/0001

Table 4 indicates that active-reflective learning styles of process dimension have a significant relationship with creativity and its components and this relationship is reverse in active style. Therefore, the hypothesis is confirmed.

Fourth hypothesis: There is a significant relationship between understanding dimension (sequential-global learning styles) and creativity in students.

Table 5. correlation between sequential-global learning styles and creativity.

First variable	Second variable	R	df	P
global style	Fluency	-0.09	255	0.17
	Flexibility	-0.11	255	0.09
	Originality	-0.005	255	0.93
	elaboration	-0.02	255	0.73
	Total creativity	-0.06	255	0.34
sequential style	Fluency	0.09	255	0.17
	Flexibility	0.11	255	0.09
	Originality	0.005	255	0.93
	elaboration	0.02	255	0.73
	Total creativity	0.06	255	0.34

Table 5 indicates that sequential-global learning styles of understanding dimension do not have a significant relationship with creativity and its components. therefore, the hypothesis is rejected.

Fifth hypothesis: In learning styles there is a significant differences between male and female students.

Table 6. comparing means of male and female students in learning styles.

Learning style	gender	Mean	SD	t	df	P
intuitive	Female	4.99	1.72	-1.71	253	0.09
	male	4.63	1.66			
sensing	Female	6.01	1.72	1.71	253	0.09
	male	6.37	1.66			
visual	Female	5.88	1.69	1.55	253	0.12
	male	6.21	1.73			
verbal	Female	5.13	1.69	-1.55	253	0.12
	male	4.79	1.73			
active	Female	6.19	1.83	-0.58	253	0.56
	male	6.07	1.62			
reflective	Female	4.81	1.83	0.58	253	0.56
	male	4.93	1.62			
global	Female	6.05	1.73	-1.99	247.61	0.047
	male	5.62	1.68			
sequential	Female	4.95	1.73	1.99	247.61	0.047
	male	5.38	1.68			

Table 6 indicates that in sequential-global learning style there is a significant difference between male and female students and in sensing-intuitive, visual-verbal and active-reflective learning styles there is not a significant difference between male and female students. Therefore, the hypothesis is rejected.

Sixth hypothesis: In creativity there is a significant differences between male and female students.

Table 7 indicates that there is a significant difference between males and females in the elaboration subscale and mean of females is higher. There is not a significant difference between males and females in the fluency, originality and flexibility subscale and total score creativity.

Seventh hypothesis: Learning styles predict creativity.

Table 7. comparing the mean of male and female students in creativity.

creativity	gender	Mean	SD	t	df	P
fluency	Female	32.28	3.63	1.54	253	0.13
	male	33	3.88			
flexibility	Female	22.37	3.44	0.09	253	0.93
	male	22.41	3.57			
originality	Female	46.17	5.4	-1.003	253	0.32
	male	45.47	5.59			
elaboration	Female	23.4	3.14	-2.87	253	0.005
	male	22.30	2.97			
total creativity	Female	124.21	12.03	-0.66	253	0.51
	male	123.19	12.59			

Table 8. regression for predicting creativity from learning styles.

model	B	SD	Beta	t	P
constant	102.71	4.35		23.6	0.0001
Active -reflective	1.76	0.43	0.25	4.09	0.0001
Sensing-intuitive	0.62	0.44	0.09	1.43	0.16
Visual-verbal	1.43	0.43	0.20	3.33	0.001
Sequential-global	0.45	0.43	0.06	1.04	0.30

Table 8 indicates that active-reflective styles explains 25 percent and visual-verbal styles 20 percent of the variance and it is significant and sensing-intuitive styles explains 9 percent and sequential-global styles 6 percent of the variance and it is not significant.

4. Discussions

Humans have various abilities. Creativity is one of these abilities. Solving problems and creativity are located at the highest level of humankind's cognitive activities and they are considered as of the most valuable educational purposes and education ends. In fact, the main purpose of all educational institutions is producing the ability to solve problems and creativity in students. Learning style is one of the variables related to creativity. Every student as a learner has his/her own learning style. Each learning style needs different educational strategies and teaching styles, educational experiences, organizational ways, quantity and quality of using educational tools and so forth. Knowledge of planners and educational staff including educators and teachers abut creativity and it's factors can help to providing appropriate conditions for students' learning and creativity. Purpose of the current study is the same.

Some hypotheses have been proposed in the current study. The first hypothesis considers the relationship between perception dimension (sensing-intuitive learning styles) and students' creativity. The results indicate that sensing-intuitive styles of perception dimension has significant relationship only with the originality component of creativity and

this relationship is reverse in sensing style. This dimension does not have a significant relationship with the fluency, flexibility, and elaboration components of creativity and total score of creativity. This finding is incongruent with the results of studies of Altun and Yazici (2010), Martinsen and colleagues (2011) and Aghahi Isfahni and colleagues (2004). These researchers have found a significant relationship between cognitive and learning styles and creativity and have considered appropriate learning style as one of the strategies of increasing creativity. But the results of the current study is congruent with the results of Khooeeni's study (2005). This researcher did not find any relationship between learning style and creativity.

Such result may be because of that students might have difficulty in understanding the test questions related to this subscale.

The second hypothesis studies the relationship between input dimension (visual-verbal learning styles) and creativity in students. The results indicate that input dimension of learning has a significant relationship with the components of flexibility, originality, elaboration components and total score creativity, but it does not have a meaningful relationship with fluency component of creativity. This relationship is revers in visual style. This finding is congruent with the findings of Michelle and Piatecofska (2000, cited in Dashti and colleagues, 2006) and Sarvghad and Dianat (2008). In other words, researcher have found in their researches that students who use their visual and verbal abilities more are more creative than other students.

The third hypothesis is dedicated to the relationship between process dimension (active-reflective learning styles) and students' creativity. The results indicate that process dimension of learning has a significant relationship with creativity and its components and this relationship is reverse in active style. This finding in incongruent with the results of the Khooeeni (2005) study, but it is congruent with the researches of Tulbure (2011) And Fleming, Mckee and Huntley-Moore (2010). In other words, on this case some researchers have considered active-reflective learning styles as one of the ways of increasing student's creativity and some researches have not gained a meaningful relationship on this case.

Fourth hypothesis considers the relationship between understanding dimension (sequential-global learning styles) and creativity in students. The results indicate that sequential-global style does not have a significant relationship with creativity and its components. This result is inconsistent with the findings of Graf and colleagues (2009), Joy and Kolb (2009) and Valizadeh, Fathiazar and Zamanzadeh (2010). Also in this case doing the activities suddenly or in a sequential steps may have no role in creativity. Additionally, also in this subscale, incorrect answering the questions might have bring about that.

The fifth hypothesis of the study examines the difference between male and female students in learning styles. The results indicate that in sequential-global learning style there is a significant difference between male and female students and in sensing-intuitive, visual-verbal and active-reflective learning styles there is not a significaant difference between male and female students. This result is congruent with the results of the researches of Hosseini nasab and Sharifi(2010) and Moeinikia and zahed-Babolan (2010) who did not find a meaningful difference in the creativity rate of males and females in their researches.

In the seventh hypothesis predicting creativity based on learning styles is examined. The results indicate that active-reflective dimension explains 25 percent and visual-verbal dimension 20 percent of the variance and it is significant and sensing-intuitive dimension explains 9 percent and sequential-global dimension 6 percent of the variance and it is not significant.

In a general conclusion it can be said that visual-verbal and active-reflective learning styles have relationship with creativity and sensing-intuitive and sequential-global learning styles do not have relationship with creativity. Therefore, we can teach these styles to develop the students' creativity better and try to develop these styles in students.

Future studies can be concentrated on the mechanism of the effect of these styles on creativity.

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