

Study of Innovation in Learning Styles of Students in Different Secondary School Branches

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Abstract

Learning, creativity, and innovation are considered as the axis of the activities of all educational and entrepreneur-based institutions. Learning style of students as one of the factors effective in learning and academic progress has always been taken into consideration. By identifying the learning style and rate of creativity of individuals, each style can be a more appropriate teaching method adopted by teachers and also a more correct method of learning by learners.

Accordingly, the main goal of the present article is to identify the differences of learning styles of individuals in different academic majors and the rate of the creativity of individuals in each learning style. The present methodology employed in this research is of descriptive-correlational research design. The statistical population consists of all the last-year students at the high school level in the city of Ghaen. The statistical sample consisted of 115 girls and 117 boys selected by classified sampling. Kolb's learning style inventory and Abedi creativity were used to collect the required data. These two tools are standardized, therefore their validity is verified. On the other hand, the reliability of the Kolb's inventory and that of Abedi's creativity were 0.74 and 79.5, respectively. To analyze the data obtained by Chi-square tests, one-way analysis of variance, Pierson covariance and stepwise regression were employed.

The results show that there is a meaningful difference between the creativity of the students with diverging and assimilator learning styles. Learning styles of students of different branches are also different. Creativity of the students of Mathematics is more than that of the Humanities and there is also a meaningful negative relation between concrete experiential learning methods and creativity ($r=0.702$ and $p<0.01$).

Keywords: Learning style; Creativity; Humanities

Introduction

Due to their important and serious role in educating the future-making generation, educational institutions are considered as one of the important and fundamental institutions in society. One of the main preoccupations of educational system is to transfer knowledge to the future generation. Increasing production of knowledge and information; extensive cultural, social, and economic development and changes along with new problems and consequently new expectations for educational system have resulted in teaching the manner of learning and methods of creativity and innovation instead of the transfer of a collection of knowledge and information to individuals. In the present age, students should apply creative thought skills and correct learning methods to make appropriate decisions and solve the problems of society to cope with changes. Skinner believes that an effective educational system is based on appropriate learning and teaching methods for students [1]. Creativity and innovation can also prepare the background for the growth and realization of talents as well as the self-prosperity of people. Of the most important places where talented people can grow are educational environments and teachers are of the group of people who can bring about creativity in students or inhibit creativity by the application of inappropriate methods [2]. Most people can learn the manner of realizing creativity. The key to creativity is the development of some basic skills and abilities. All people are equally and potentially creative. Creative people are endowed with special skills. Every person can learn these skills, speed up the creativity process, and guide it. With regard to the role of the educational centers in fostering creativity and appropriate methods of teaching for better learning, it is therefore required to address this critical issue. In examining domestic and foreign literature, the researcher did not find any document regarding a study performed on the relation between learning style and

rate of creativity in people. This research therefore intends to compare the rate of creativity of the subjects in each of the styles in addition to determining the learning style of each of the educational groups (experimental sciences, mathematics, and humanities) and inform the educational programmers of better teaching methods at the beginning of the academic year so as to help them to have access to more qualified strategies for the acquisition of science and knowledge.

Individual factors are considered as the integral components of creativity of people in most viewpoints and have been emphasized by researchers [3]. Of the most important individual-level variables effective in creativity, one can refer to capability, personality features, cognition style, intelligence, and challengeable personality of people [4]. In continuation, several examples of the researches performed in the area of learning styles and creativity are pointed out.

- A research performed by Azam et al. showed that A) There was a meaningful relation between the learning style and problem solving of university students. B) There was a meaningful difference among the learning styles of the students majoring

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Received June 03, 2016; Accepted July 26, 2016; Published August 04, 2016

Citation: Kalantari M, Tahan M, Taraghi A (2016) Study of Innovation in Learning Styles of Students in Different Secondary School Branches. J Psychol Psychother 6: 274. doi: 10.4172/2161-0487.1000274

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in basic sciences, humanities and technical-engineering disciplines, so that the students majoring in technical-engineering disciplines preferred sensory, general, active and visual learning style, while those majoring in basic sciences preferred verbal, sequential, intuitive, and contemplative learning style, and on the other hand, students majoring in humanities mostly employed active learning style [5].

- Rezai et al. studied the learning style of the students of Arak School of Medicinal Sciences. With regard to the dominant assimilator and convergent style of learning among the students, it was suggested that lectures and self-study along with reading materials, demonstration, and use of diagrams, teacher's handwriting, and one-to-one teaching be adopted. It was also suggested that the communication skills of the students of medicinal sciences be reinforced, since the assimilators and also convergent show less interest to subjects entailing cooperation with others [6].
- Pasha studied and compared the effect of three methods of fostering creativity on the enhancement of creativity in students. The results showed that regardless of the teaching method, creativity teaching helped the growth and fostering of creativity in students [7].
- A research was also performed by Yazdi to study and compare the methods and styles of learning of the students at different colleges of Al-Zahra University. The results showed that the students at different colleges employed different methods and styles of learning. The students at the college of arts mostly employed concrete experiential method and divergent—accommodator styles; the students at the technical college used reflective observation, abstract conceptualization, and assimilator styles; those at the psychology college used active experimentation, abstract conceptualization and convergent styles; and the students at the college of basic sciences also used abstract conceptualization and convergent styles [8].
- Ross [9] studied the learning styles and methods of problem solving. The goal of this research was to study the levels of motivation related to tourist industry and marketing experience. The results showed that those who avoided running tourist management enjoyed less creativity to trust preparation as a method for learning method, but they relied more on distance learning [1,5].
- Sternberg performed a research on the effect of creativity on the performance of 110 students and concluded that the rate of the effect of creativity training stems from the cognition and personality traits of students [10].
- The researches performed in relation to learning styles have shown that if individuals are trained with regard to their styles of learning and they know about their own style of learning, their learning will improve [11].

Methodology

The present research is of correlational type in terms of both applicability and methodology. The variables of this research consists of different Kolb's learning styles (convergence, divergence, accommodative and assimilator) as the predictor and incentive variables for the creativity of the students at high school level are the criterion variables. The present statistical population consists of all the last year high school students (majoring in experimental sciences,

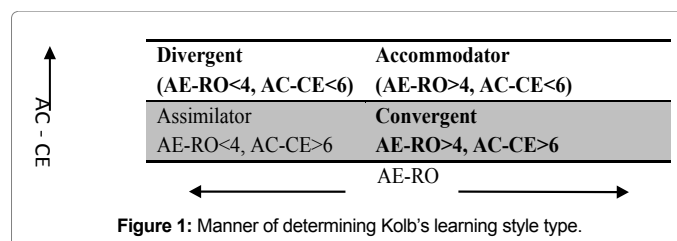
humanities and mathematics) in the academic year of 2013-2014. The classification method and Morgan table were also employed for the selection and determination of the sample size, respectively. Then, the simple random method was used for the selection of the sample. Therefore, 115 girls and 117 boys were selected as the sample size. Kolb's learning style and Abedi's creative questionnaires were also used for the execution of the test [12,13].

The goal of Kolb's learning style questionnaire is to describe the manner of learner's learning and not to evaluate the learner's ability. There is no correct and incorrect answer in this questionnaire and all the choices are equally acceptable. The questionnaire consists of twelve questions classified into four sections of concrete experience (CE), reflective observation (RO), abstract conceptualization, and active experimentation (AE); each evaluating a part of the individual's ability. Since each of the learning styles is a combination of the above four learning methods, therefore justification of the type of learning style is based on the sum of these four scores representing four styles of learning specifying the individual's learning style. By the two-by-two subtraction of these styles, i.e., subtraction of abstract conceptualization from concrete experience and active experimentation from reflective observation, two scores are obtained. These two scores are then put on the coordinate axis. One is the vertical axis of AC-CE (concrete experience—abstract conceptualization) and the other is the horizontal axis of AE-RO (reflective observation—active experimentation) forming four quadrants of a square. These four quadrants of the square of the coordinate show the learning style of an individual [14]. The validity and reliability of this tool has been verified in numerous researches including the present research. Therefore, the reliability of the present research based on Cronbach's alpha method shows a high coefficient.

Active experimentation, abstract conceptualization, reflective observation, and concrete experience were 0.83, 0.74, 0.71 and 0.69, respectively. On the whole, it was estimated to be 0.74 (Figure 1).

Abedi test was devised on the basis of the theory and definition of creativity by Torrance. The test is made up of four sub-tests of fluency, elaboration, originality, and flexibility. Each question consists of three choices. The choices reflect low, medium, and high originality with scores of 1, 2 and 3 for low, medium, and high originality, respectively. The sum of the scores acquired in the four sub-tests (fluency, elaboration, originality and flexibility) show the overall score of creativity.

The validity of this questionnaire was checked by factor analysis and correlation with similar tests (Torrance); its reliability was checked by re-testing and Cronbach's alpha. The reliability of this test was also verified by the use of Cronbach's alpha in the present research. The flexibility, originality, elaboration, and fluency were 0.88, 0.74, 0.81, and 0.75, respectively. On the other hand, in several researches including Shahni et al. [15] and Sohrabi [16], the validity and reliability of this test were also verified by factor analysis, re-testing and Cronbach's alpha.



Findings

Research question

Are there meaningful differences among learning styles of students majoring in different branches? (Table 1)

The Table 1 shows that the observed value of χ^2 (89.69) is larger than that of χ^2 the table at $p < 0.01$ level, i.e., it can be said that there is a difference among the learning styles of the students and different majors at a confidence level of 99%. Also, calculating the linear and columnar values of χ^2 , it was observed that the value of the linear χ^2 was meaningful at a confidence level of 99%, i.e., the learning style of humanities was meaningfully different and the most observed frequency was at the contingency style, but in calculating the columnar χ^2 , it was observed that the value of the χ^2 of the convergent (3.25) and contingency (15.68) styles were significant at a confidence level of 99%. With regard to the frequency of learning styles of the students in different majors, it can be said that most of the students in experimental branch used the convergent style and those in humanities used contingency style more than those in other majors.

Research question 2

Is there any meaningful difference between the rates of the creativity of the students at high school level with regard to their learning styles? (Table 2)

With regard to the results obtained from data analysis, it is observed that the calculated F ratio for the purpose of comparing the creativity scores of the students on the basis of their learning styles is greater than that of the Table 2 (at the error level of 0.05). It can therefore be concluded that there is a meaningful difference between the creativity rates of the students based on their learning styles. This ratio is only indicative of creativity difference in learning styles, but it does not identify where these differences are?

Therefore, for the purpose of studying the meaningfulness of the mean difference of each group compared with that of another group, it seems necessary to perform a post-experimental or Tukey post-hoc test (HSD). The results obtained from the computation of the above test are presented in the Table 3.

With regard to Tukey test, it is observed that there is a meaningful

difference between the creativities of the students in the two styles of assimilator and divergent, in other words the creativity of the students employing the assimilator learning style is higher than those who use divergent learning style. Furthermore, with regard to the results obtained from the Table 2, there is no meaningful difference between the creativity of the students in any other learning styles.

Research question 3

Is there a meaningful relation between the learning styles of the students (concrete experience, reflective observation, abstract conceptualization, and active experimentation) with their creativity? To study the relation between learning styles and creativity of students, Pierson correlation test and stepwise regression were employed (Tables 3A and 3B).

With regard to the results of the Table 3, it is observed that the multivariable correlation coefficient between different learning styles and creativity score is 0.720 which is larger than the correlation coefficient of the Table 3 at the confidence level of 0.01. Therefore, there is a meaningful relation between learning styles (concrete experience, reflective observation, abstract conceptualization, and active experimentation) and creativity of the students.

Furthermore, the computed value of (R^2) is 0.49 indicating that 49% of the creativity scores is related to the learning styles (concrete experience, reflective observation, abstract conceptualization, and active experimentation) and the remaining 51% depends on factors outside the model. Since the computed correlation coefficient might be due to sampling error or random sampling, computation of F ratio seems necessary. It should be specified whether the observed multivariable correlation coefficient after the computation of F is meaningfully different from null hypothesis or not. By computing the value of F , it is observed that it is equal to 8.466, greater than that of the table at the confidence level of 0.01. Therefore, the null hypothesis is rejected and the result is in conformity with the result obtained from the multivariable correlation coefficient. So, there is a meaningful relation between the learning styles (concrete experience, reflective observation, abstract conceptualization, and active experimentation) with creativity. From among the four styles (concrete experience, reflective observation, abstract conceptualization, and active experimentation), the concrete experience learning style enjoyed the

Total	Value χ^2	Learning styles				Learning Style Branch	
		Contingency	Assimilation	Convergent	Divergent	Mathematics	Branches
74	2.25	11	24	22	17	Humanities	
85	*4.60	23	10	20	19	Experimental Sciences	
73	3.85	16	40	16	11	Value of χ^2	
---	---	*15.68	4.32	3.25	*5.5	Total	
219	---	82	72	86	72		

$$\chi^2 = 89.69; df=6; p < 0.01^*$$

Table 1: Contingency table of the variables of two learning styles and students of different branches.

Sources of changes	Sum of squares	Df	Df	F ratio	α
Intergroup	1181.613	2	393.871		
Intragroup		217	111.982	3.517	0.016
Total	23130.000	218			

Table 2: One-way ANOVA.

Statistical indices Learning styles		Mean differences	Standard error	Significance level (α)
Convergent	Contingency	0.0707	2.912	0.195
	Divergent	5.026	1.965	0.054
	Assimilator	-0.762	1.889	0.978
Contingency	Convergent	-0.707	2.912	0.495
	Divergent	4.318	2.924	0.453
	Assimilator	-1.470	2.873	0.956
Divergent	Convergent	-5.026	1.965	0.054
	Contingency	-4.318	2.924	0.453
	Assimilator	*-5.789	1.906	0.014
Assimilator	Convergent	0.762	1.889	0.978
	Contingency	1.470	2.873	0.956
	Divergent	*5.789	1.906	0.014

Mean difference at 5% significance level

Table 3: Test-tukey.

most correlation with creativity, with a correlation coefficient of 0.702 which is larger than that of the table at the significant level of 0.01. So, there is a meaningful relation between the learning style of concrete experience with creativity (by deleting reflective observation, abstract conceptualization, and active experimentation) (Table 4).

As it is observed, the regression coefficient for the variable of concrete experience learning styles is equal to -0.4 according to the Table 4, while the result of the t-test shows the meaningfulness of this coefficient. The computed t is larger than the t of the Table 4 at a significant level of 0.01; therefore, the null hypothesis is rejected. Therefore, there is a negative (reverse) meaningful relation between the concrete experience learning styles with creativity which is in conformity with the result obtained from correlation. In this analysis, the regression equation for the creativity of the students is: (concrete experience) $131.971 - 0.4 = \text{creativity}$.

Research question 4

Is there a meaningful difference among the creativity of the students of different majors (mathematics, humanities, and experimental sciences)?

To answer this research question, the one-way analysis of variance (ANOVA) was used. The results are presented in the following Table 5.

The results of the Table 4 show that statistically there is no meaningful difference among the variances of creativity of the students of different majors in the comparison test among the variances ($p\text{-value} > 0.05$). But, the results of Table 6 show that there is a meaningful difference among the creativity means in different majors.

With regard to the data analysis, it is observed that the F ratio computed for the purpose of comparing the creativity scores of the students in different majors (2.534) was greater than the Table F (at 0.05 levels). Therefore, it can be concluded that there is a meaningful difference among the rates of the creativity of the students of different majors. The results obtained from the computation of the post-experimental or Tukey post-hoc test (HSD) are presented in the Table 7.

With regard to the Tukey test it is observed that there is a meaningful difference between the creativity of the students in humanities and mathematics majors. In other words, the mathematics students enjoy more creativity relative to those in humanities. But, there is no meaningful difference between the creativity of the students

majoring in experimental and humanities as well as students majoring in experimental and mathematics.

Discussion and Conclusion

Question 1) The results show that there is a meaningful difference

Learning Components creativity	Concrete experience	Reflective observation	Abstract conceptualization	Active experimentation
Correlation coefficient	0.74	0.68	0.81	0.59
Significance level	0.000	0.000	0.000	0.000

Table 3A: Pierson correlation coefficient between learning styles and creativity.

Statistical index Variable	N	Multivariable correlation coefficient R	Determination coefficient R ²	Multivariable correlation coefficient Statistical validity	Significance level α
Concrete experience learning style	200	0.702	0.49	8.466	0.004
Reflective observation learning style					
Abstract learning style					
Active learning style					
Creativity					

Table 3B: Results of multivariable correlation between learning styles and creativity.

Statistical index	Non-standard coefficients		Standard coefficient β	Statistical validity of correlation coefficient t	Significant level α
	B	Standard deviation			
Constant	131.97	3.58	---	37.624	0.000
Concrete experience	-0.400	0.138	0.202	-2.910	0.004

Table 4: Regression equation for the components of learning with creativity.

Significant level	df 2	df 1	Value
0.269	217	2	1.344

Table 5: Variance test.

Sources of changes	Sum of the squares	df	Sum of squares df	F ratio	Significant level α
Intergroup	39.139	2	19.570	2.534	0.002
Intragroup	197007.638	217	907.869		
Total	197046.777	219			

Table 6: Regression equation of learning components with creativity.

Statistical index Major		Mean difference	Standard error (SE)	Significant level (α)
Mathematics	Humanities	*0.2200	0.05382	0.000
	Experimental	0.1200	0.05444	0.124
Experimental	Humanities	0.0700	0.05002	0.500
	Mathematics	-0.1200	0.05444	0.124
Humanities	Mathematics	*-0.2200	0.05832	0.000
	Experimental	-0.0700	0.5002	0.500

Table 7: Tukey test.

between the students learning styles and their majors. This difference stems from humanities. With regard to the abundance of styles in different branches, it can be said that most of the students majoring in experimental sciences use the convergence style and those in humanities use the contingency style more than other majors, while those majoring in mathematics use the assimilation style. These findings are similar to those of Yazdi [8] and Fard [17].

Question 2) The results of the research witness the fact that there is a meaningful difference between the creativity mean of the students on basis of learning styles and this difference results from the creativity score of the students in two styles of assimilation and divergent; in other words, the creativity of the students who use the assimilation learning style is more than those using divergent learning style. The findings are consistent with those of Lorgani [18], Rezai et al. [6] and Anderson and Ryhammer [19]. Since different styles of learning affect the creativity and academic achievement of students, it is therefore required that teachers be aware of the manner and types of learning so that they can help their students in optimal use of different learning styles [20]. Schneider also believes that since individuals are different, we should therefore recognize their differences and coordinate ourselves with them. Also, according to Kolb's theory, those who use the assimilation style enjoy higher ability for acquiring information, memorizing, and saving it in their minds. These people enjoy the ability to combine information in a justified and logical manner and pay more attention to the logic of a theory.

Question 3) The results confirm that there is a meaningful relation between the scores of learning style (concrete experience, reflective observation, abstract conceptualization, and active experimentation) with the creativity of the students. The findings of this research are consistent with the findings of Rahbar [21], Talebi [22], Amirkhani [23], and Barari [24]. According to Kolb and Fry, the learner requires four types of abilities to function effectively: concrete experience, reflective observation, abstract conceptualization, and active experimentation. That is, the learner should be able to completely, willingly, and without bias involve himself with experiences; he should be able to observe these experiences from different viewpoints and reflect on them. He should be able to create concepts and merge his observations with logically right theories. He should be able to use these theories to make decisions and solve problems.

Question 4) Results show that there is a meaningful difference among the rates of creativity of the students in different majors and this difference results from the creativity of the students majoring in humanities and mathematics. Therefore, the students majoring in mathematics enjoy more creativity relative to the students in humanities. The findings of this research are in conformity with those of Barari [24], Leila et al. [25] and Rezai et al. [6].

With regard to the results, it is proposed that:

A) Educational planning and suitable teaching methods of learning styles for the students majoring in different disciplines seem to be necessary for an increase in the rate of creativity of the students and reduction of creativity difference of students in different majors.

B) Through familiarity with learning styles, teachers and educational planners can conform planning and educational methods to the learning styles of the learners.

C) Teachers should accept the fact that each student might adopt a special style of learning for different subjects, so they have to adopt an appropriate style and method of learning for each student.

D) Informing the individual of his learning style can prepare his background knowledge to adopt optimal methods for learning.

References

1. Mehryar, Azam, Sabori, Khani B (2009) Comparison of learning style first and fifth year students in medicine and its relationship with academic achievement. *Journal of Steps in the Development of Medical Education* 6: 118-110.
2. Kazemi, Yahya N, Jafari (2008) Inhibitors of student's creativity: Activities and teacher characteristics. *Journal of Modern Educational Thought* 4.
3. Saadet, Esfandiari, Sadeghi M (2005) Model to explain the design and creativity in preparing the groundwork for the country's research institutes. *Journal of Daneshvar Behavior* 14: 35-46.
4. Craft A, Jeffrey B, Leibling M (2001) *Creativity in education: Current perspectives on policy and practice*. Cassell, London.
5. Azam M, Khani M, Ibrahim B, Amin K, Bighlerkhony (2009) Styles of first year students in Medicine University of Medical Sciences. *Journal of Evolution and Development of Medical Education*.
6. Rezai, Kourosh, Koohestani FG, Zoreh A (2008) Learning style of freshman students of Arak University of Medical Sciences. *Journal of Arak University*.
7. Pasha SH (2008) The relationship between creativity and personality traits of high school students in Tehran. *Journal of Educational innovations* 3: 11-32.
8. Yazdi M (2001) Review and comparison of different learning styles of students of Alzahra University. *Educational Research Journal of Andisheh Nevin* 5: 123-145.
9. Ross G (2003) Ethical beliefs, work problem solving strategies and learning styles as mediators of tourism marketing entrepreneurialism. *Journal of Wacation Marketing* 9: 118-119.
10. Sternberg (2001) It doesn't add: Effect of instruction to be creative. *Creative Research Journal* 13: 197-210.
11. Aliabadi K (2005) Learning styles inventory of down, down and price learning styles of fifth grade students and third grade students in Tehran in the year 2002-2003. PhD thesis, Allameh Tabatabai University, Faculty of Psychology and Educational Sciences.
12. Abedi J (2002) A latent-variable modeling approach to assessing reliability and validity of a creativity instrument. *Creativity Research Journal* 14: 267-276.
13. Joseph A (2010) How to take conflict management strategies among the librarians of public libraries: The role of creativity. *Inform research and public libraries* 16: 29-44.
14. Mike G, Priest H (2010) Exploring the physical health needs of people with learning disabilities: Facilitation student engagement in learning, using Kolb's experiential learning cycle. *Nurse Education in Practice* 10: 115-118.
15. Shahni, Manijeh SF, Shokrkon H (2005) The effect of education brainstorming Creative student's Chamran University of Ahvaz Shahid intelligence control. *Journal of Education and Psychology* 12: 9.
16. Sohrabi SN (2002) Evaluation of creativity and psychological pressure on drug groups, drug traffickers and normal samples and review the relationship between creativity and psychological pressure, addiction and challenges Congress.
17. Fard M (2010) Study of the relationship between learning styles (visual, verbal, reading/writing, movement, multi-senses) of Payam Noor Center of Tehran University students with academic achievement. Thesis, Tehran Payam Noor University.
18. Lorgani M (1998) Comparison between the students learning style of three fields of medicine, technical - engineering and humanities of Allameh Tabatabai University. Thesis, Faculty of Psychology and Educational Sciences, Allameh Tabatabai University.
19. Andersson AL, Ryhammer (1998) Psychoanalytic models of the mind, creative functioning and perceptgenetic reconstruction. *Psychoanalysis and Contemporary Thought* 21: 359-382.
20. Saif A (2000) *Psychological development*. Agah Publications, Tehran.
21. Rahbar A (2005) Investigates the relationship between girl students' learning styles of first year of the Isfahan 13th district state high school and academic achievement in the academic year 2004-2005. University Khorsgan Islamic Azad University.

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22. Talebi N (2002) Examining the relationship between personality types and learning styles of female students in Tehran. Tehran University, faculty of humanities and social sciences.
 23. Amirkhani J (2003) Examining the relationship between thinking styles of teachers and students and its impact on student learning and achievement. Islamic Azad University Tehran Central.
 24. Barari M (2008) Examining the relationship between the tetragonal Kolb learning styles and academic achievement of students at university of Mazandaran. University of Mazandaran, faculty of humanities and social sciences.
 25. Leila V, Azar EF, Zamanzadeh V (2007) Features associated with the learning progress of students of nursing and midwifery. *Iranian Journal of Medical Education* 7: 443-450.