

## Study the Impact of Merrill's First Principles of Instruction on Students' Creativity

Mehrdad Jalilehvand<sup>\*1</sup>

<sup>\*</sup>Department of Education, Sari Branch, Islamic Azad University, Sari, Iran  
Email: jalilehvand.iau@gmail.com

Doi:10.5901/mjss.2016.v7n2p313

### Abstract

*The current study aims to study the impact of Merrill's first principles of instruction on First year high school students' creativity. In this study, quasi experimental research method with control group was used. The population was all boys public first year high school students of 6th district of Tehran which were in the 2014-2015 school year. Two classes were selected as the research sample by using simple random sampling. Abedi's creativity test was used in order to assess participants' creativity. Method of research was as follows: "chapter 5 of the biology lesson was taught for the experimental group based on the Merrill's first principles of instruction and the control group was taught by the conventional method". At the end of study, the collected data was analyzed by the Covariance Analysis. The results showed that there was a meaningful difference between the creativity level of experimental group and control group. Moreover, findings indicated that students of the experimental group were better than the control group students in terms of 4 components of creativity.*

**Keywords:** Instructional design, Merrill's first principles of instruction, Creativity.

### 1. Introduction

Man-kind's today life is severely transformed compared to the previous centuries and millennia. This kind of life really requires certain skills, because of the complexity of social, educational, economic and cultural and high-level thinking can be pointed as an important skill among these vital proficiencies. High-level thinking can be seen as a complex and non-algorithmic thinking that often provides a variety of solutions. Various types of high-level thinking have been identified so far, including creative thinking and critical thinking (Miri et al, 2007). Creativity is considered as one of the important aspects of high-level thinking. Creativity is a concept associated with differences in people. This concept was developed in order to explain why some people have more ability to invent new solutions with regards to problems (Jauk et al, 2013).

A lot of definitions have been pointed out about creativity; Sternberg (2001) believes that creativity is a combination of initiation, flexibility and sensitivity against the theories which make individuals enable to think about productive outcomes that resulted personal satisfaction and others' happiness. But now, many researchers have come to the unit definition of creativity: Creativity means creating new and useful ideas or solutions (Chen et al, 2013; Antonio et al, 2014).

The psychologists believe that the creativity is not an innate phenomenon; in fact it can be acquired. Based on this idea, through education can teach students to think about unusual solutions and through divergent thinking, children can think about their problems and to find appropriate solutions (Parsamanesh & Sobhigramaleki, 2013). Even many researches have shown that creativity is capable to be learnt and it can be much more considered as the acquired talent rather than a natural talent (Torrance, 1980). The human mind is an unknown galaxy that are constantly calving and creating. Undoubtedly, the power of thought and the spirit of creativity and innovation are distinguished humans from other creatures (Samkhanian, 2008). According to Shabani (2007), modern educational systems should train individuals who are puissant in understanding complexity of the world and creative and initiative in world's management and leadership. Nowadays, the necessity of creativity is clear, because an advance of every country is vitally dependent on human capital and human creativity rather than land and underground resources (Zanganeh et al, 2013).

Creativity can play an important role to improve and exalt human's aspects and it is not just popularity, but also necessary, first, because of the advent of various trends least contain alternative solutions to a problem at least in a way that learners learn how to think (Redecker, 2008). Learners of new millennial generation are characterized by multitasking functions, quick and low energy costs as well as information on non-linear methods (Pedro, 2006). Therefore, in this situation, teachers are forced to use new educational strategies that new ways to attract attention and thereby given them creative approaches to develop novel learning. This can be done by using information technology (IT) capabilities.

Lecture is a traditional approach to education, its origin dates back to the fifth century BC. Because many teachers still use this method to teach while that is only transmitting information to the learners; it is considered as a barrier to

understand science (Halpern & Hakel, 2009; Michael, 2006). In the lecture method, data is conveyed directly from teachers to learners and in this case, students are completely passive during teaching process. The other objections to this method are that learners are not active, their patience is getting to be over, their creativity does not foster and they are only just receiver of the information. In general, it can be said that this method is useless (Seif, 2013). In opposite of lecture method which is considered as the barrier of effective learning; active method can improve learner's creative thinking. Studies have shown that active learning can improve students' understanding and thinking, because it can facilitate students' learning processes (Michael, 2006; Prince, 2004). Active learning occurs when students have more opportunities for interactive communication with the course subject and it can encourage learners to produce knowledge and its application to their life. In an active learning environment, teachers are more facilitators of learning rather than dictating learning to students.

Merrill (2002) in an article entitled 'First principles of instruction' articulated principles that underpin effective learning. He has studied varied models and experiences in order to extract these principles. Merrill's first principles of instruction is one of the theories that Merrill believes it can be used in instructional design model to design educational environments (Merrill, 2013). First principles of instruction includes 5 important educational principles that by using them, meaningful learning can occur, and learners become more active in the learning process (Merrill, 2006). These 5 First principles of instruction are as follows: 1) The demonstration principle: Learning is promoted when learners observe a demonstration. 2) The application principle: Learning is promoted when learners apply the new knowledge. 3) The problem-centered principle: Learning is promoted when learners engage in a task-centered instructional strategy. 4) The activation principle: Learning is promoted when learners activate relevant prior knowledge or experience. 5) The integration principle: Learning is promoted when learners integrate their new knowledge into their everyday world. Merrill has raised the First principles of instruction theory in his the most recent researches. One of the researches has done related to the First principles of instruction, is Gardner (2011) research which was done at Utah State University. In this study, Gardner has found that active teaching methods (based on First principles of instruction) had a positive impact on students learning and problem solving ability. In another study, Archibald (2010) used Merrill's first principles of instruction in conjunction with other variables. The result showed that merging social annotation, Merrill's first principles of instruction and team-based learning has positive effects on comprehension, critical thinking and meta-cognitive skill of the students. In another study was widely done by the Thompson company, it was concluded that educational products that observe First principles of instruction were much more efficient and effective in comparison with the present education at the company. Nordhoff (2002) suggested that the activation of students' prior knowledge is the most important factor in the success of Merrill's theory and using this theory has precious outcomes (Fardanesh, 2011). The main question of this study was whether Merrill's first principles of instruction has meaningful impact on creativity of first grade high school students or not? According to this research question, hypothesis of the current study is:

Instructional design based on Merrill's First principles of instruction has a meaningful effect on students' creativity.

## **2. Method and Materials**

The present study is considered as a quasi-experimental method and research plan is pre-test and post-test with control group. The population was all boys public first year high school students of 6th district of Tehran city which were studying in the 2014-2015 school year. The sample of this study was 52 students of the mentioned society which were selected by the random sampling. From among schools of 6<sup>th</sup> district of Tehran city, one school was chosen and two biology classes of this school were selected as the main samples. One of these classes has 27 students and the other one has 25 students and they were randomly selected as the control group and experimental group. To run the study, first, essential arrangements with school officials were done and then two chosen classes were imposed Abedi's creativity questionnaire as the pre-test. (For both groups (control and test) were considered the same teacher) Next, chapter 5 of the biology lesson (Given that Season 5 was good at the time of this season was selected, Because the teacher taught the lesson of friends, his opinion was that it is (first principles of instruction) more suitable for biology lessons) was taught for the experimental group based on the Merrill's First principles of instruction and the control group was taught by the conventional method. At the end of the study, post-test was given for both groups and then collected data was analyzed by covariance analysis method.

### **2.1 Research tools**

Creativity Test: Creativity test is based on the Torrance theories and was made by Abedi in 1993. The reason for this choice was that the research was conducted in Iran; Iran is more suitable for Abedi creativity questionnaire. This

questionnaire was revised several times and finally the form of 60 questions was developed at the University of California by Abedi. The test has 60 three choices questions for four subtests fluid, expansion, innovation and flexibility. Each option has been scored from 1 to 3 which score 1 shows low creativity, 2 presents average and 3 indicates high creativity. Total scores on each subscale represent the participants' grade in the sector and participants' score in the four subscale shows creativity overall score. Total creativity score range for each participant was between 60 and 180. Questions 1 to 22 are about fluid, 23 to 33 are developed about expansion, 34 to 49 are related to initiative and 50 to 60 are in terms of flexibility. Reliability for fluid, initiation, flexibility and expansion is 0/85, 0/82, 0/84 and 0/80, respectively (Abedi, 1993). In another study was done on 2270 Spanish students In order to determine the validity and reliability of the test creativity. The reliability was obtained by Cronbach's alpha as follow: Fluid 0/75, flexibility 0/66, initiation 0/61 and expansion 0/61 (Auzmendi et al, 1996).

### 3. Results and Discussion

**Table 1.** Mean and standard deviation score for pre-test and post-test of creativity test in both control and experimental group

test	group	mean	Standard deviation	number
Pre-test	control	86	15.145	25
	experimental	89	13.210	27
Post-test	control	88	140.027	25
	experimental	112	70.080	25

As it can be seen in the table 1, control group's mean and standard deviation in pre-test are 86 and 15.145, respectively and in post-test are 88 and 140.027; on the other hand, for experimental group in pre-test, mean is 89 and standard deviation is 13.210 and in post-test is 112 for mean and 70.080 for standard deviation.

In this study, ANCOVA analysis method was used in order to investigate the hypothesis. The reason why this analysis method was used is the importance of controlling the effect of previous readiness and adjusting the variable's effect which is done by considering pre-test as the control variable. Some important assumptions should be examined before using analysis of covariance, otherwise study results may be accompanied with bias. Covariance analysis assumptions are: normal distribution of data dispersion, error variance equality and homogeneity of the regression lines. These three assumptions were investigated and fortunately, all three assumptions of covariance analysis were established. It means the use of analysis of covariance to analyze data of this study was appropriate. Covariance analysis results were represented in the table 2.

**Table 2.** The result of covariance analysis for creativity in pre-test and post-test

	Total squares	Degrees of freedom	Mean square	F	Significance level
Fluency	510/126	1	510/126	26/523	0/000
Innovation	10/597	1	10/597	6/423	0/013
expansion	685/270	1	685/270	48/824	0/000
flexibility	80/149	1	80/149	21/096	0/000
<b>creativity</b>	<b>2720/320</b>	<b>1</b>	<b>2720/320</b>	<b>49/589</b>	<b>0/000</b>

In the table 2, the covariance analysis results were clearly shown. As it can be seen in the table 2, 2720.320 is the sum of squares of creativity that leads to the size of the F 49.589 which is significant at the one percent level. In other words, there is a significant and meaningful difference between the control and experimental group even after adjusting the effect of pre-test. Based on the mean scores of the control and experimental group in post-test (table 1), it can be concluded that teaching by using the Merrill's First principles of instruction has a positive impact on students' creativity. Furthermore, findings of the creativity's subcomponents showed that First principles of instruction has a significant impact on Fluency, Innovation, expansion and flexibility as well.

### 4. Conclusion

The present study seeks out to understand the effect of instructional design based on Merrill's First principles of

instruction on students' creativity and the results pointed out that instructional design based on Merrill's First principles of instruction has a positive impact on students' creativity. This finding was in line with the results of Badali (2013), Zanganeh et al (2013) Gardner (2011), Archibald (2010), Thompson Company (2002) and Nordhoff (2002) researches. It is supposed that the main reason why experimental group has got higher scores compared to the control group is the important role of instructional design based on Merrill's theory which is the cornerstone of the education. First principles of instruction consist of five basic principles as follows: problem-centered, activation, demonstration, application and integration. The problem-centered principle is one of the most important principles of this theory and when adhered to and engage students with the problem or task, creativity and ideas are provided for learners. In other words, when the problem or issue is given to the learner, he or she will work on the problem and will be engaged intensively with the issue and in this case, it will improve his creative thinking. Gardner (2011) study showed that using Merrill's first principles of instruction has a positive impact on problem solving and learning. According to the Merrill's theory, after presenting problem, activation stage should be commenced (Merrill, 2013). In many of the educational training it is seen that training is started and content is given regardless of previous experiences or knowledge of learners; while, it must be considered that if the learners could not link the new knowledge to their mind, learning will not reside. Therefore, it can be said that creativity will be improved by every educational measure that activate learners' earlier knowledge and experiences; even finding of Nordhoff (2002) announced that previous knowledge activation is the most important factor in success of Merrill's theory and use of this theory has valuable outcomes besides lecture, books, exercise and other materials. In general, by using the First principles of instruction and four stages of effective education, educators first should encourage the learners' earlier knowledge. Activation can be explained by different methods such as, using pre-organization, talking and discussion on the topic, schemas, conceptual or mental map. In the second step, instructor represents information, giving information does not summarize in just verbal expression. According to the Merrill's theory, information should be indicated along with proper media and also, learners should be guided very well. In the third stage, the application of knowledge or skills is taken into account. First, teachers help learners to apply their learning and then they gradually reduce the amount of their help till to reach to the point learners could apply their learning independently and without any help. At the end, learners should be able to use the knowledge in the real situations (integration stage) that causes the contents to be considered as the practical issues in the real world and thus, students' creativity will increase. It can be said that students will show more curiosity, creativity and innovation when they face with problems in order to deal with the issue effectively and efficiently (Lee, 2005). Moreover, by using these principles, challenging and problem-based environments are constituted which enforce learners to be more critical, creative and also encourage them to think more and in different ways that all help to raise the creativity. In general, this theory with expressing mentioned principles has played a vital role in the education and it was successful to play his role in the education. Finding indicated that how much it is important to take Merrill's first principles of instruction into account in every educational attempt, because it grows creativity and leads to the meaningful learning.

According to the findings, the following recommendations were presented:

1. The research showed that First principles of instruction has positive impact on students' creativity, but teachers are not enough familiar with this theory. Therefore, it is recommended for educational centers, universities and schools to provide appropriate opportunities to take advantage of these principles.
2. For officials, authorities and everyone who is in charge is recommended to encourage teachers to use Merrill's First principles of instruction in their guidebook, classes and other contexts.
3. It is suggested to do a study that shows the percentage of teachers who apply first principles of instruction.
4. It is advised to do a research at the same title in different areas like industry and other organizations.
5. It is recommended to do a research at the same title in different areas like e-learning.
6. It is recommended to take other variables like motivation, critical thinking, problem-solving and students satisfaction into account in the similar researches.

## References

- Abedi, J. (1993). Creativity and new methods in measuring. *Psychological researches*, 2(1,2), 46-54.
- Antonio, T., Lanawati, S., Wiriana, T. A., & Christina, L. (2014). Correlations Creativity, Intelligence, Personality, and Entrepreneurship Achievement. *Procedia - Social and Behavioral Sciences*, 115(0), 251-257. doi: <http://dx.doi.org/10.1016/j.sbspro.2014.02.433>
- Archibald, T. N. (2010). *The effect of the integration of social annotation technology, first principles of instruction, and a team-based learning on students reading comprehension, critical thinking, and meta-cognitive skills*. PhD Thesis. Department of Educational Psychology and Learning Systems in partial fulfillment.
- Auzmendi, E., Villa, A., and Abedi, J. (1996). Reliability and Validity of a Newly Constructed Multiple-Choice Creativity Instrument. *Creativity Research Journal* 9(1), 89-95.

- Badali, M., Dana, A., Farrokhitriandaz, S., Herfedoost, M. (2013). The effectiveness of using e-portfolio on students' creativity. *Journal of Innovation and Creativity in Human Science*, 3(3), 45-67.
- Chen, A., Li, L., Li, X., Zhang, J., & Dong, L. (2013). Study on Innovation Capability of College Students Based on Extenics and Theory of Creativity. *Procedia Computer Science*, 17(0), 1194-1201. doi: <http://dx.doi.org/10.1016/j.procs.2013.05.152>
- Fardanesh, H. (2011). Theoretical foundation of instructional technology. 3<sup>rd</sup> edition. Tehran: SAMT.
- Gardner, J. (2011). Testing the Efficacy of Merrill's First Principles of Instruction in Improving Student Performance in Introductory Biology Courses. All Graduate Theses and Dissertations. Utah State University.
- Halpern, D. F., & Hakel, M. D. (2002). Learning that lasts a lifetime: Teaching for longterm retention and transfer. *New Directions for Teaching and Learning*, 89: 3-7.
- Jauk, E., Benedek, M., Dunst, B., & Neubauer, A. C. (2013). The relationship between intelligence and creativity: New support for the threshold hypothesis by means of empirical breakpoint detection. *Intelligence*, 41(4), 212-221.
- Lee, K. S. (2005). The Relationship between Childrens Computer Game Usage and Creativity in Korea. Doctoral Dissertation. Submitted to the Office of Graduate Studies of Texas A&M University.
- Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development*, 50(3), 43-59.
- Merrill, M. D. (2006). *First principles of instruction: A synthesis*. In R. A. Reiser & J. V. Dempsey (Eds.). Trends and issues in instructional design and technology, 2nd Edition (Vol. 2). Upper Saddle River, NJ: Merrill/Prentice-Hall, Inc.
- Merrill, M. D. (2009). First principles of instruction. Instructional-design theories and models: Building a common knowledge base. New York: Routledge.
- Merrill, M. D. (2013). *First principles of instruction*. San Francisco: Pfeiffer.
- Michael, J. (2006). Where's the evidence that active learning works?. *Advances in Physiology Education*, 30(4), 159-167. <http://dx.doi.org/10.1152/advan.00053.2006>
- Miri, B., David, B.-C., & Uri, Z. (2007). Purposely Teaching for the Promotion of Higher-order Thinking Skills: A Case of Critical Thinking. *Research in Science Education*, 37(4), 353-369. doi: 10.1007/s11165-006-9029-2
- Nordhoff, N. (2002). *The design and implementation of a computer-based course using Merrill model of instruction design*. PhD Thesis. University of Pretoria.
- Parsamanesh, F., Sobhigaramaleki, N. (2013). The effect of educational games on children's creativity. *Journal of Innovation and Creativity in Human Science*, 2 (4): 141-157.
- Pedró, F. (2006). *The new millennium learners: Challenging our views on ICT and learning* (No. 9228). Inter-American Development Bank. <http://www.oecd.org/dataoecd/1/1/38358359.pdf>
- Prince, M. (2004). Does Active Learning Work? A Review of the Research. *Journal of Engineering Education*, 93(3), 223-231. <http://dx.doi.org/10.1002/j.2168-9830.2004.tb00809.x>
- Redecker, C. (2008). *Review of learning 2.0 practices*. Seville: Institute for Prospective Technological Studies (IPTS).
- Samkhanian, M. (2008). *Creativity and innovation in educational organization (concepts, theories, techniques and assessment)*. Second press. Tehran: Specific meida.
- Seif, A. (2013). *Modern Educational Psychology*. 8<sup>th</sup> edit. Tehran: Doran publishing.
- Shabani, H. (2007). *Educational skills (methods of teaching)*. Tehran: Samt publishing.
- Sternberg, R. J. (2001). What is the common thread of creativity? Its dialectical relation to intelligence and wisdom. *American Psychologist*, 56(4), 360-362.
- Thomson, I. (2002). *Thomson job impact study: The next generation of corporate learning*. Retrieved July, 7, 2003.
- Torrance, E. P. (1980). Growing Up Creatively Gifted: A 22-Year Longitudinal Study. *Creative child and adult quarterly*, 5(3), 148-158.
- Zanganeh, H., Mousavi, R., Badali, M., (2013). The effect of Information and Communication Technology on students' creativity. *Journal of Innovation and Creativity in Human Science*, 10 (3), 39-50.