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Comparison Between Correlation of Creative Thinking Skills and Learning Results, and Correlation of Creative Thinking Skills and Retention in the Implementation of Predict Observe Explain (POE) Learning Model in Senior High Schools in Malang, Indonesia

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Abstract

This correlational research was conducted in order to uncover the correlation between creative thinking skills and learning results, as well as between creative thinking skills and retention in the implementation of Predict Observe Explain (POE) learning model. The population of this research were students of Class X senior high schools in Malang, Indonesia, in the odd semester of 2017/2018 academic year. The sample used was F1 class students of Senior High School 5 Malang. The results of simple linear regression analysis show that creative thinking skills correlate with learning results through the implementation of POE learning model. The contribution of creative thinking skills toward learning results was as much as 32%. However, creative thinking skills do not correlate with students' cognitive retention. Students may experience difficulties retrieving information stored in their memory because new knowledge is stored only in their short-term memory. Factors that might have caused this to occur are that students only learn in order to pass examinations. Learning is undertaken in order to obtain high exam scores and when students are forced to complete assignments, but they do not continue learning afterwards.

Keywords: creative thinking, learning results, retention, POE.



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Introduction

Creative thinking skills are vital in this era of globalization, in order that we not only follow the flow, but are able to make decisions independently. Creative thinking skills are cognitive activities that produce new products that have not been thought of by others. This premise is in line with Awang and Ramly (2008) in that creativity makes new things exist. Creative thinking produces original and constructive ideas which emphasize intuitive and rational thinking. Thus, creativity includes the ability, attitude, process and potential to understand problems and to find solutions to problems through various methods (Johnson, 2002).

Creative thinking skills are very important for students because they can direct students to find various and innovative concepts or ideas in order to solve problems (Binkley, 2012). Creative thinking skills also play a role in students' mental development and change of mindset, so that the learning process is expected to succeed (Trilling & Fadel, 2009). Coughlan (2007) said that creative thinking skills were an important competency to enrich one's knowledge, especially in biology learning where students are required to perform experiments. In addition, creative thinking skills helps students understand how to view themselves, how to perceive the world, and how to connect with other people. Through creative thinking skills, students can analyze their own thinking to ensure that they have made choices and drawn conclusions appropriately in solving problems effectively (Snyder Gueldenzophr & Snyder, 2008). This is in line with Greenstein's (2012) opinion that creative thinking skill is a process of becoming more sensitive to problems and to weaknesses in one's knowledge, and in identifying difficulties, finding solutions, and making hypotheses about the weaknesses and forming new solutions.

Various research results have shown that creative thinking skills correlate with learning results. For example, Nuriadin and Perbowo (2013) reported a significant correlation between creative thinking skills and students' learning results, where creative thinking skills contributed 31.2% toward learning results. Jannah (2017) showed a positive and significant correlation between students' creative thinking skills and science learning results, where the contribution of creative thinking skills toward learning results was as much as 80.9%. In another research, which was conducted by Gunawan, Suraya, and Tryanasari (2014), a significant correlation was reportedly found between creative thinking skills and students' academic achievement on the science II concept lecture in the PGSD Study Program of IKIP PGRI Madiun, where creative thinking skills contributed 20.13% towards learning results.

Theoretically, creative thinking skills helps students to store information and to retrieve information previously received. The aspects of creative thinking include *fluency*, *flexibility*, *originality*, and *elaboration*. These aspects require students to generate ideas, to come up with different ways of solving problems, and to come up with original ideas which are rarely produced by most people, in order that students are able to more easily recall more information stored in their memory (Berry, 2012). This is in line with the statement by De Bono (1967) that the aspects of creative thinking require students to be able to combine existing ideas and then to produce an innovative product. Unique, incredible, and extraordinary ideas strengthen the memory, which eventually improves retention.

Basically, creative thinking skills help students to improve their retention. However, there has been no research that specifically investigates the correlation between creative

thinking skills and retention through implementation of the *Predict Observe Explain* (POE) learning model. The POE learning model in biology learning has been proven to improve students' creative thinking skills and learning results (Indriana, Nurdin, & Usman, 2015; Suyanto, Susanto, & Linuwih, 2012; Wulandari, 2015). The purpose of the current research is to determine the correlation between creative thinking skills and learning results, as well as the correlation between creative thinking skills and retention with the implementation of the *POE* learning model.

Methodology

This research was conducted as a correlational research aiming to reveal the correlation between creative thinking skills and learning results, as well as the correlation between creative thinking skills and retention with the implementation of the *POE* learning model. Data for creative thinking skills and learning results were collected by using *pretest* and *posttest*, while the data for retention were collected by using *posttest* and *retention test*.

The population of this research were all students of class X of Senior High Schools in Malang, Indonesia. The samples were selected by *random sampling technique*. The sampling began with a placement test. Based on the results of the placement test, class F1 of Senior High School 5 Malang was selected as the research sample, and consisted of 33 students.

Creative thinking skills were measured by using a creative thinking skills rubric that was developed by Treffinger, Young, Selby, and Shepardson (2002). Learning results and retention were measured through application of an essay test with non-rubric assessments. The learning result test was carried out at the beginning of the learning and again at the end of the learning, while retention was measured based on *posttest* and *retention test*.

The hypothesis test began with prerequisite tests in the form of a normality test and a homogeneity test. The normality test employed *One Sample Kolmogorov Smirnov* test, and the homogeneity test employed *Levene Test of Equality of Error Variances*. The data were analyzed by using simple linear regression analysis with the assistance of *SPSS for Windows* analytical software and performed at a significance level of .05.

Results

The results of regression analysis on the correlation between creative thinking skills and learning results of the students who learned by using POE learning are presented in Table 1.

Table 1. Results of Regression Analysis on Correlation between Creative Thinking Skills and Learning Results at Implementation of POE Learning Model

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.566 ^a	.320	.298	9.18221

Table 1 shows that the correlation coefficient (R) is .566 with a reliability value (R^2) of .320. Thus, it can be said that creative thinking skills have a contribution of 32% toward the students' learning results, while the remaining 68% is influenced by other factors in addition to creative thinking skills. Furthermore, Anova test was performed to determine whether or not predictors can significantly predict the criteria.

Table 2. Results of Anova on Correlation between Creative Thinking Skills and Learning Results

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1191.656	1	1191.656	14.134	.001 ^b
	Residual	2529.391	30	84.313		
	Total	3721.046	31			

The results of Anova in Table 2 show that the *p-value* = .001. Thus, it can be concluded that creative thinking skills have a significant correlation with learning results. Furthermore, the results of the regression equation analysis on the correlation between creative thinking skills and learning results are presented in Table 3.

Table 3. Results of Regression Equation Analysis on Correlation between Creative Thinking Skills and Learning Results

Model		Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	Sig.
		B	Std. Error	Beta		
1	(Constant)	16.703	12.516		1.335	.192
	Creative2	.975	.259	.566	3.759	.001

Table 3 explains that the regression line equation of the correlation between creative thinking skills and learning results is $Y = .974X_1 + 16.703$. The graph depicting the correlation between the two variables along with the equation can be seen in Figure 1.

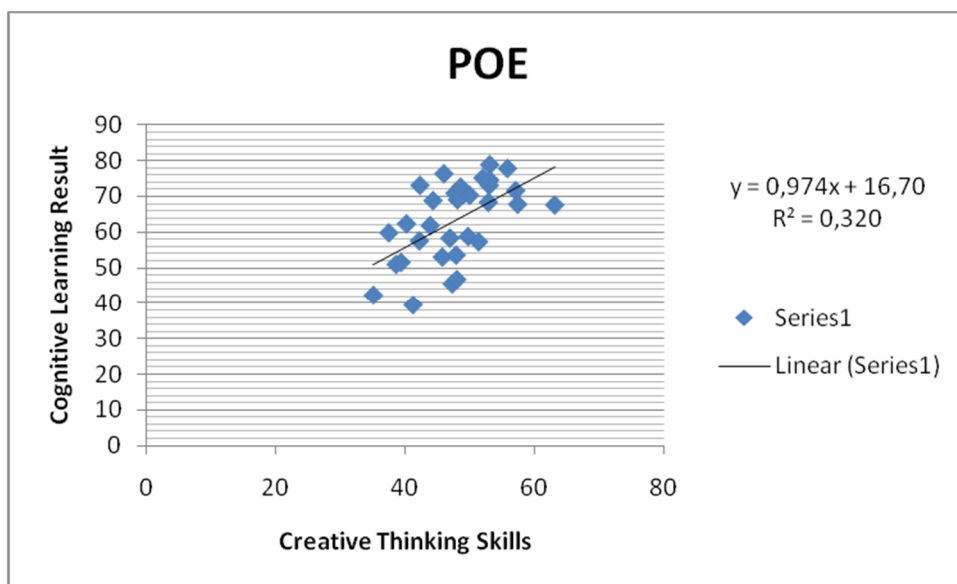


Figure 1. Correlation Between Creative Thinking Skills and Learning Results at the Implementation of POE Learning Model

Correlation between creative thinking skills and retention

The correlation between creative thinking skills and retention can be seen in Table 4.

Table 4. Results of Anova on Correlation between Creative Thinking Skills and Retention

Model		Sum of Squares	<i>Df</i>	Mean Square	<i>F</i>	Sig.
1	Regression	.484	1	.484	.008	.930 ^b
	Residual	1827.716	30	60.924		
	Total	1828.200	31			

The results of Anova in Table 4 show that the significance value was .930. This shows that creative thinking skills have no correlation with retention. Thus, it can be concluded that the improvement of creative thinking skills in this research does not affect students' retention ability.

Discussion and Conclusion

The results of this research indicate that creative thinking skills have a correlation with learning results through the implementation of the POE learning model. In this case, creative thinking skills contributed as much as 32% toward learning results. However, creative thinking skills did not correlate with students' retention because the significance value of creative thinking skills toward students' retention was .930.

That creative thinking skills did not correlate to students' retention is a fact influenced by students' motivation in learning activities. The students only learned when they were having examinations, and did not continue learning after the examinations had finished. This made the information that had been previously obtained not stored in their long-term memory, but only stored in their short-term memory; during the two weeks prior to the retention test, the information stored in the short-term memory was easily lost, because the short-term memory has limited capacity to accommodate previously learned knowledge. This is in line with Atkinson and Shiffrin's (1968) findings that information received and not stored in long-term memory would be very fragile, and if there was no repetition, it would be easily lost. Thus, when the research on the correlation between creative thinking skills and retention was conducted, correlation between the two variables was not found. This is supported by the statement by Corebima (2016) that this phenomenon is a common practice encountered in the learning activities in Indonesia. The learning was carried out with the purpose that every student passes the test. The students strive in every way, both lawful and unlawful, in order to be able to answer the questions in the tests.

In addition, that the creative thinking skills do not have a correlation with the students' cognitive retention is caused by the fact that the students only learned with the primary purpose to obtain a high test score. As a result, students only cared about how to get a high score regardless of the learning process. Consequently, previously learned knowledge will be easily lost, because the learning activities were not interpreted as a process to gain knowledge, understanding, skills, values and attitudes. This is in line with the statement by Corebima (2016) that biology learning in Senior High Schools in Indonesia is not implemented to prepare students for life.

On the other hand, students' motivation in learning was only to complete the assignments. Learning activities are considered as a burden and an order, so that learning

activities are not considered as a responsibility that must be undertaken at any time, but that learning activities are only forcefully performed in order to fulfill the tasks assigned by the teachers. This fact causes the knowledge or information that has been previously obtained to be easily forgotten, because learning is not interpreted as learning to live, but just to fulfill the obligations of students.

This phenomenon is commonly encountered in education in Indonesia. This phenomenon is supported too by Hadibyono (2013), saying that student learning activities are essentially regarded as a burden and as an order that must be completed. Learning is no longer a necessity and as a result students tend to avoid these learning activities, and this causes the emergence of the phenomenon of learning overnight during examinations or better known as the term *SKS* (overnight learning system). This condition causes impaired brain function, because the brain is forced to work all night, with no time to rest, so that it disrupts the memory and the brain's working system (O'Neel, Fuligni, & Huynh, 2013). Thus, the current research on the correlation between creative thinking skills and retention found no correlation between the two variables.

The results of this research are in line with Agustina and Noor (2016), who stated that creative thinking skills did not correlate with retention, because the students had difficulties in recalling information stored in their memory. Hilgard and Bower (1975) revealed that one of the causes of forgetting was that the previous knowledge, if rarely used, might be lost over time. This condition causes a person to have difficulties in retrieving information that has been stored in the memory. Ellis and Hunt (1993) stated that the length of time between the *act of learning* until the learning material is generated was related to retention; the longer the interval the weaker the retention, hence the retention decreased. Furthermore, it is explained that the activities that occurred during the interval would disturb the memory trace, so that individuals would most likely experience forgetfulness.

Winkel (2004) explained that if students cannot retrieve information from memory, it was not necessarily that the information was unavailable in their memory, but that they were unsuccessful in retrieving the information. Thus, forgetting is the difficulty of retrieving (from memory) previously received information. One factor causing people to forget is interference. Interference occurs when information intermingles with other information or is shifted about by other information. This condition causes difficulty in remembering already-received knowledge (Slavin, 1993).

Forgetting is a case in which stored information cannot be retrieved for use. There are four theories about forgetting according to Anderson (1995) and Sternberg (2006), which are *Decay Theory*, *Interference Theory*, *Retrieval Failure Theory* and *Motivated Forgetting Theory*. According to *Decay Theory*, memories will increasingly erode over time if the information received is not repeated. Information held in memory leaves a trail, but if over a long time no deliberate repetition occurs, it will breakdown or disappear. Thus, in general this theory focuses on the length of the interval. *Interference Theory* focuses on the contents of the interval. The information stored in long-term memory is still in the memory and does not break down, but previously existing memories are mixed with new information received, so that new information may disturb the old information or vice versa. *Retrieval Failure Theory* is similar to *Interference Theory* in that the information stored in the long-term memory is always there, but failure in retrieving the information is not caused by

interference. *Motivated Forgetting Theory* states that we will tend to forget information which is not considered meaningful to us.

On the other hand, Suyanto (2006) revealed that a person's mental process also affects the memory. Information received and memorized is more easily and quickly forgotten than information produced through good mental processes. Meanwhile, less meaningful things are quickly forgotten by students. In order that information is not easily forgotten, the information must be transferred from the short-term memory to the long-term memory. Therefore, it requires interaction between the senses, especially the senses of sight and hearing. Involving an emotional aspect; the quality of the information received must be different from the others, as well as things heard or performed repeatedly (DePorter & Hernacki, 2000, p. 213).

Meaningful learning which involves the student actively can help to improve retention. Bos and Vaughn (1994) stated that if no attention was paid to the concept being learned, the information would disappear within approximately 15 seconds. Students can use memory strategies to keep information active. Therefore, information should be meaningfully stored into the long-term memory in order to be part of the student's cognitive structure. In fact, learning should be an attempt by students to master everything useful in their lives. Learning will be useful for students if it can be applied in daily life (Sunaryo, 1989).

Based on the current study's results and discussion, it can be concluded that there is a correlation between creative thinking skills and learning results through the implementation of the *POE* learning model. Creative thinking skills contribute 32% toward learning results. However, creative thinking skills do not correlate with cognitive retention. This phenomenon may be caused by difficulties experienced by the student in retrieving information stored in their memory, because the received knowledge is not stored in their *long-term memory*, but only in *short-term memory*. This condition might have occurred because the students only learned when having examinations in order to achieve high scores and to pass the test. Learning is forcefully done to complete the tasks given.

Notes

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