

THE RELATIONSHIP BETWEEN CRITICAL THINKING SKILLS AND CREATIVE THINKING SKILLS OF BIOLOGY OF HIGH SCHOOL STUDENTS IN THINK PAIR SHARE (TPS) LEARNING MODEL

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ABSTRACT

Abstract: Critical thinking enables students to process information logically, creative thinking brings out imaginative ideas. Both can be empowered by applying the Think Pair Share (TPS). This research is a quasi-experimental design involved students of grade 10 and 11 SMAN 9 Malang. Aspects of critical and creative thinking skills are measured using essay test. To show the relationship between critical and creative thinking skills and the contribution, regression analysis was carried out. The results showed that there was a significant relationship between critical and creative thinking.

INTRODUCTION

According to Corebima (2016), the essentials of functioning in the information age (the 21st century) include critical and creative thinking skills. Critical thinking abilities are essential for formal education since they are the key to success in a world where new information arises at a rapid rate. Creative thinking skills are crucial for students because they enable them to generate a variety of novel notions or ideas to address difficulties. In accordance with the special aim of thinking, the purpose of empowerment in science education and disciplines is to strengthen students' thinking skills while preparing them for future success. Science-acquired critical thinking skills can have a long-lasting impact on students' life, including their ability to solve daily challenges. (Saïdo, Siraj, Nordin, and Saadallah, 2015).

Students are able to analyze knowledge logically and prepare for independent study through the use of critical thinking. Students with critical thinking skills can distinguish between significant, irrelevant, and useless information (Snyder and Snyder, 2008). According to Duron, Limbach, and Waugh (2006), critical thinking produces clear perception, vision, and logical explanation procedures. Critical thinking requires the skills of analysis, judgment, problem solving, and determining logical responses.

Creative thinking skills also play a role in students' mental development and mindset changes, so that the learning process in the classroom is expected to be successful (Salih, 2010). Turkmen and Sertkahya, (2015) adding creative thinking skills can help students find ideas in solving a problem. Students have the flexibility to apply something into new sheets, innovations. Creative thinking combines and synthesizes new existing thoughts or brings up original ideas from his mind characterized by a high level of innovation, divergent thinking, and responsibility (Danesh and Nourdad, 2017).

Studies on the relationship between critical thinking skills and creative thinking skills, one of which is expressed by (Gok and Erdogan, 2011: 55), indicate that the thought process implicitly involves critical and creative thinking processes, as seen at the stage where creative solutions and strategies will be generated, followed by the evaluation and decision-making stages for specific actions, which require critical thinking. Moreover, based on his research, Lger (2016: 701) discovered that the process of addressing a tough problem has a substantial impact on the relationship between critical thinking skills and creative thinking. (Chang, Lib, Chena, and Chiuc, 2015:347) The positive association between the two proposed by several of the experts above is related to students' problem-solving thought processes. Students who can solve problems must be empowered in their learning, particularly in the subject of Biology; therefore, it is crucial that students develop both skills (Birgil, 2015:73).

This research was undertaken to use TPS learning model. The TPS learning model is a collaborative teaching technique in which students solve issues or respond to questions on assigned readings in groups. These three activities will inspire students to not only refine their thinking skills, but also sharpen their ability to express the outcomes of their thinking, as well as enhance their attitudes and collaboration skills. This study examines the relationship between critical and creative thinking in high school students in grades

10 and 11 using the TPS learning model. This study also examines the impact of the relationship between the two skills on high school pupils in grades 10 and 11.

METHOD

This correlational study was expected to uncover the association between creative and critical thinking skills. High school students in grades 10 and 11 in the city of Malang during the odd semester of the 2019-2020 school year are required to take all subjects. In High School, samples were collected at random (random sampling) from the equivalent classes of two classes divided into two grade levels (SMA). The sample consisted of 62 students. Each class employs the Think Pair Share instructional model (TPS).

The instrument for collecting data was a description test. Analysis of correlational data employed the linear regression test. Prior to this, a test was performed to see whether the acquired data was suitable for use in parametric statistics. The test for normality was performed initially.

RESULTS

Relationship between Critical Thinking Skills and Creative Thinking Skills Among Students in Grade 10

Table 1. Summary of ANOVA Results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2274,763	1	2274,763	25,462	0,000
Residual	2322,822	26	89,339		
Total	4597,585	27			

The results of the ANOVA summary indicate that there is a relationship between critical thinking skills and creative thinking skills with TPS learning. Based on Table 2, the correlation coefficient was 0.703 by contributing 49.5% in explaining the critical relationship between creativity and TPS learning. Based on Table 3, it is known that the regression line equation is: $Y = 1,258x + 7,912$

Table 2. Summary of Regression Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,703	0.495	0.475	9,45195

Table 3. Regression Coefficient

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
(Constant)	7,912	12,084		0.655	0.518
XCritical	1,258	0.249	0,703	5,046	0,000

Relationship between Critical Thinking Skills and Creative Thinking Skills Among Students in Grade 11

Table 4. Summary of ANOVA Results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1355,770	1	1355,770	84,462	0,000
Residual	513,656	32	16,052		
Total	1869,426	33			

The results of the ANOVA indicate that there is a relationship between critical thinking skills and creative thinking skills in grade 11 semester 1 with TPS learning. Based on Table 5, the magnitude of the correlation coefficient was 0.852 with a contribution of 72.5% in explaining the critical relationship between creativity and TPS learning. Based on Table 6, the regression line equations is: $Y = 1.178x - 4.622$

Table 5. Summary of Regression Results for Class 11 SMA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.852	0,725	0,717	4,00646

Table 6. Regression Coefficient for Class 11 SMA

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4,622	6,564		-0.704	0.486
	XCritical	1,178	0.128	0.852	9,190	0,000

DISCUSSION

The results of the analysis indicate a correlation between critical thinking skills and creative thinking skills among 10th and 11th grade students over the course of one semester. This research indicates that the connection between critical and creative thinking indicates that critical thinking influences creative thinking. The higher the students' level of critical thinking, the higher their level of creative thinking. Baker and Rudd (1989: 182) demonstrate that there is a 0.40 correlation between critical thinking and creative thinking. Khoshhal & Hosseini (2017:40) cite the results of several studies that demonstrate the connection between critical thinking and creative thinking (p 0.05). Lger (2016:700) explains that the relationship between critical thinking skills and creative thinking skills will be apparent when students optimally utilize these two higher-order thinking skills in activities designed to analyze problems, evaluate problems, and generate the most effective solutions from the problem-solving process. (Hidayati, Zubaidah, Suarsini, and Praherdhiono, 2019:172; Changwong, Sukkamart, and Sisin, 2018:45) also explained that critical thinking is known as activities to analyze, evaluate, and synthesize the best ideas from a problem, whereas creative thinking focuses on activities to generate imaginative ideas from various different perspectives, detailing ideas according to the subject matter, and combining ideas to find the best answer. On the basis of this statement, it is possible to explain that the critical thinking process involves several analyzing, evaluating, and synthesizing activities that indirectly involve the thinking process in order to generate many answer ideas, detail the main ideas of answers, seek answer ideas from various different points of view, and link answer ideas in order to produce the best answer. The entire procedure is described in terms of the components or signs of critical and creative thinking abilities.

In this study critical thinking makes a significant contribution to creative thinking. Glassner and Schwarz (2007:14) explain the relationship between critical thinking skills and creative thinking will be seen when students optimally utilize these two higher-order thinking skills in activities that have been designed to analyze problems, evaluate problems, and make the best solutions from the problem solving process. . (Setiawati and Corebima , 2017) added that these activities need to be trained for students in Biology learning so that students can carry out the investigative process in investigating scientific problems. It will also cultivate creative thinking skills tend to generate original ideas, viewpoints, and varied perspectives to solve Biology problems. Activities that can be formed include producing imaginative ideas from different perspectives, detailing ideas according to the subject matter, and combining ideas to get the best answer. (Im , Hokanson, and Johnson, 2015) . Activities that train students' thinking skills are applied in various independent learning activities as well as group learning in class, online learning, and practicum in the laboratory.

The amount of the contribution given to Grade 10 was 49.5%, while Grade 11 received 72.5%. The varying worth of contributions in each class demonstrates that each class has diverse potential for enhancing their cognitive abilities. Factors such as student circumstances, student learning motivation, and student learning environment might influence the value of contributions in a class (Himmatussolihah & Susanni, 2019). Consequently, various contribution levels in each class are feasible despite utilizing the same learning model, TPS.

The TPS learning model has the same capacity to empower students' thinking as other models. In the think stage, the instructor provides individual time for reflection. Individual thought at this stage can be structured since it follows a particular method, so reducing the likelihood that the mind would be distracted by the need to think and report its findings to the partner or the partner's friend. There is a waiting period or time for thought at this step, which is a significant role in enhancing students' capacity to reply to questions. (Razzouk & Shute, 2012); Azlina, 2010) . Students must be able to present sensible and original ideas during the problem-solving process in order to acquire the most effective type of decision-making: new information. In the pair and share phase, students discuss combining the thoughts of pair and group members to solve the presented difficulties. By comparing the results of their ideas or notes and identifying the solutions they believe to be the best, most convincing, or most original, students can demonstrate their understanding of the material (Azlina, 2010). When this activity occurs, students are obliged to report to their peers on the outcomes

of their thinking. In addition, pupils are presented with a dialogue process at this level. This discussion procedure can enhance their social activity (Kwok & Lau, 2015).

CONCLUSION

It can be concluded that: (1) critical thinking skills have a significant relationship with students' creative thinking skills in both grade 10 and 11 SMA Biology, (2) the contribution to each class was 49.5% for Grade 10 and 72.5% for Grade 11. This research could be carried out with a larger number of samples, and could be carried out under different conditions, not only based on one learning model but also based on several learning models. Analysis of the regression equations obtained can be carried out to reveal the differences in the regression equations formed from critical thinking skills with creative thinking skills.

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