



The Effect of Generative Learning Model to the Creative Thinking Skills of High School Students

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ABSTRACT

The purpose of this research is to determine the effectiveness of generative learning model to the creative thinking skills of the high school students. The problem is the creative thinking skills of students are still low. The type of this research is a quasi experiment with cluster sampling technique. Creative thinking skills is measured by adapting torrance test of creative thinking. Before using the instrument, it has to be validated by physics expert. The validity score is 0.93 and is categorized valid. The instrument is also tested for its validity and reliaskill. The data is obtained from the creative thinking skills of students which is adopting torrance test of creative thinking. Data analysis is done by using t-test statistic. The result of this research shows that the creative thinking skills of students in experimental class is 82 and the creative thinking skills of students in control class is 75. Based on the table of t-distribution, t_{table} is 1,99 and t_{count} is 2,78. The requirement of H_0 is denied is when $t_{table} < t_{count}$. The score of t_{count} is in H_0 denial, so H_1 is accepted which means that there is an effect of generative learning model towards the creative thinking skills of students.

Keywords: Generative learning model; creative thinking skills; high school students.



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I. INTRODUCTION

Education is a process of human interaction between teachers and students to achieve educational goals [1]. Formally, education is organized in schools. The school in which education takes place must be organized systematically and purposefully in order to achieve educational functions and goals. The implementation of education in schools is better known as the learning process.

The learning process is an activity of educational value. This educational value colors the interaction that occurs between teachers and students [2]. The learning process contains a series of events designed and arranged in such a way as to influence and support the occurrence of the learning process of students [3]. One of the subjects in the learning process is Physics.

Physics is one of the important subject areas. Physics develops curiosity through the discovery of experience directly through scientific work, utilizing facts, building scientific concepts, principles, theories, and methodologies [4]. So, Physics developed with the advancement of science and technology.

The development of science and technology as a whole has affected various aspects of human life. Human beings can increase their basic potential including physical, intellectual, emotional, mental, social, and ethical potentials. Humans in improving aspects of their lives require a high level of thinking skills [5]. One of the higher-order thinking skills needed is the skills to think creatively.

The skills to think creatively is to think consistently and continuously to produce something original [6]. Creative thinking is useful in the process of solving problems. One will come up with a lot of ideas in problem solving [5]. Students are required to have a high creative thinking skills to produce many alternative problem solving.

The skills to think creatively for students aims to generate unique ideas. Students' creative thinking skills divided into three indicators of creative thinking skills, namely fluency, flexibility, and originality [7]. Fluency allows students to generate ideas. Flexibility allows students to come up with a lot of ideas. Originality allows students to come up with different and original ideas. However, students have low creative thinking skills.

Based on interviews conducted by researchers with teachers at SMA Negeri 1 Payakumbuh and SMA Negeri 2 Payakumbuh, students have low creative thinking skills. Research conducted that the creative thinking skills of students is still low in fluency, flexibility, and originality [8]. The research states that students still have a low skill to produce many alternative answers [9]. Low creative thinking skills will have an impact on low student learning outcomes.

The skills to think creatively has a very important role to improve student learning outcomes [10]. Research states that students who have high creative thinking skills will have high learning outcomes [11]. The skills to think creatively and the learning outcomes of students are very closely related [12]. Based on several studies that have been done before, the high creative thinking skills of students will make student learning outcomes high and vice versa. Based on the observation, the learning outcomes at SMA Negeri 1 Payakumbuh is still low. Based on the interview results, students have low learning outcomes on standing wave and stationary wave.

Standing wave and stationary wave is one of the Physics materials found in class XI. Standing wave and stationary wave requires students to be able to analyze the physical magnitudes of standing wave and stationary wave in various real cases and conduct experiments of standing wave and stationary wave along with the presentation of the results of the experiments and their physical meaning. Therefore, standing wave and stationary wave is chosen to see the creative thinking skills of students.

The low creative thinking skills of students in schools is caused by the use of learning models that are not yet suitable in the learning process [13]. Based on the results of the interview, the learning model applied in schools is still unable to improve the creative thinking skills of students. So, an appropriate learning model is needed to improve the creative thinking skills of students.

The solution offered is to apply learning models to improve the creative thinking skills of students. The learning model applied is a generative learning model. A generative learning model is a learning model that explains how a data is generated in several possibilities [14]. The generative learning model applies a learning pattern that makes students actively explore information in the learning carried out. Generative learning models help students to think creatively.

One of the influences of the application of the generative learning model is to help students to have the skills to think creatively [15]. Students will get used to thinking creatively and producing unique and different thinking. However, there has been no previous research that discusses the influence of the application of generative learning models on the creative thinking skills of students. Previous studies used different variables. Based on the explanation above, researcher is about to research about the effectiveness of generative learning to the creative thinking skills in high school students.

II. METHOD

The type of this research is a quasi experiment with randomize control group design only. Population is a generalization area consisting of objects that have certain qualities and characteristics that are set by the researcher to study and then draw conclusions [16]. The population of this study is all students of class XI of SMAN 1 Payakumbuh who are registered in Semester 2 of the 2021/2022 Academic Year. The sample is part of the number and characteristics of one population to be taken [16]. Sampling in this study was carried out using the cluster sampling technique. The main characteristic of cluster sampling is sampling in groups of individuals who have been in school, namely classes, not individuals. Based on the technique that has been done, XI IPA 3 and XI IPA 5 are determined as samples. The data in this research is the creative thinking skills of students that is using the instrument that is adopted from torrance test of creative thinking.

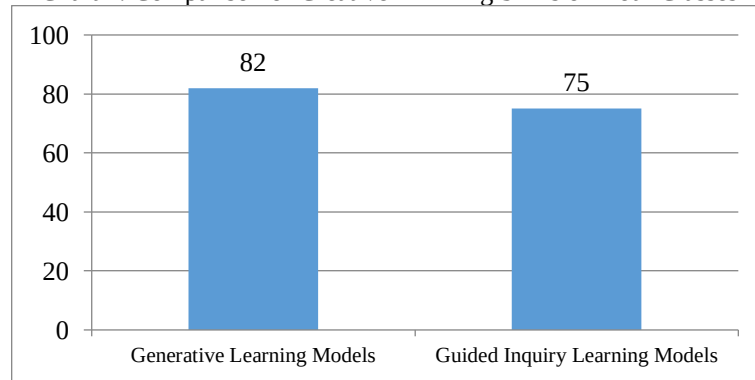
The instrument of creative thinking skills is tested for validity and reliabilty. The instrument of creative thinking skills that has been compiled based on a grid of questions is validated by 5 physicists. The validated aspects of the question are the feasibility aspects of the content and the linguistic aspects. The instrument is validated by physicists using validation instruments with a range of 1, 2, 3, and 4 for each indicator. After the score is obtained, the Aiken calculation is carried out to determine whether the instrument developed is valid or invalid [17]. Data analysis on the study aims to test the correctness of the hypothesis proposed in the study. Data analysis in this research is using the t-test statistic.

III. RESULTS AND DISCUSSION

A. Results

The effectiveness of applying the generative learning model is known by looking at the results of students' creative thinking skills. This study used two classes of samples. Assessment class that applied generative learning models and control class that apply guided inquiry learning models. The comparison of the creative thinking skills of students in the experimental class is 82 and the creative thinking skills of students in the control class is 75.

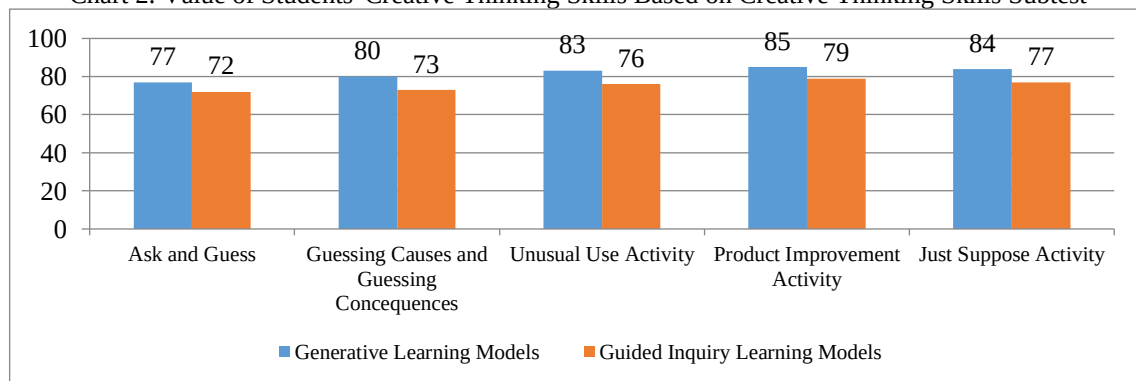
Chart 1. Comparison of Creative Thinking Skills on Both Classes



Based on Chart 1, it can be described as a comparison of students' creative thinking skills after carrying out the learning process by applying the generative learning model and the guided inquiry learning model. The comparison of the creative thinking skills of students in the experimental class is 82 and the creative thinking skills of students in the control class is 75.

Students' creative thinking skills are measured using the Torrence Test of Creative Thinking. The questions are arranged based on the creative thinking skills subtest which consists of ask and guess, guessing causes and guessing consequences, unusual use activity, product improvement activity, and just suppose activity.

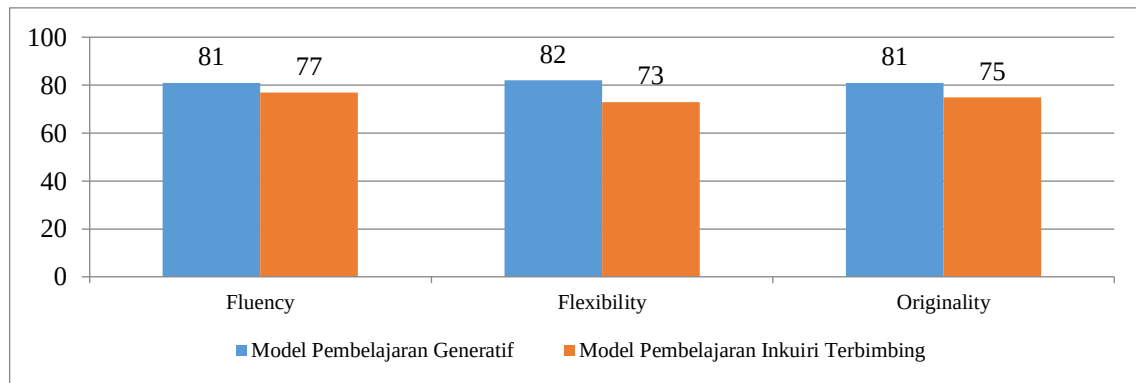
Chart 2. Value of Students' Creative Thinking Skills Based on Creative Thinking Skills Subtest



Based on Chart 2, it can be described the value of students' creative thinking skills based on the creative thinking ability subtest. The percentage of the creative thinking skills score for the experimental class in the ask and guess subtest is 77, the guessing causes and guessing consequences subtest is 80, the unusual use activity subtest is 83, the product improvement activity subtest is 85, and the just suppose activity subtest is 84. The percentage of the creative thinking ability score of the control class in the ask and guess subtest is 72, the guessing causes and guessing consequences subtest is 73, the unusual use activity subtest is 76, the product improvement subtest activity is 79, and the just suppose activity subtest is 77.

Students' creative thinking skill can be distinguished by indicators of creative thinking skill, which consist of fluency, flexibility, and originality.

Chart 3. Value of Students' Creative Thinking Skills Based on Indicators of Creative Thinking Skills



Based on Graph 3, it can be described the value of students' creative thinking skills based on indicators of creative thinking skills. The percentage of the experimental class creative thinking ability score on the fluency indicator is 81, the flexibility indicator is 82, and the originality indicator is 81. The percentage of the experimental class creative thinking ability score on the fluency indicator is 77, the flexibility indicator is 73, and the originality indicator is 75.

The research results show that there is a significant difference between the class implementing the generative learning model and the class implementing the guided inquiry learning model. Based on the two-mean equality test, the result obtained $t_{count} > t_{table}$, indicating that H_0 is rejected. Therefore, H_1 is accepted.

Table 1. Test Results for the Similarity of Two Averages of the Two Sample Classes

Class	N	X	S ²	S	t _{count}	t _{table}
Experiment	36	82	76,22222	9,14	2,78	1,99
Control	36	76	90,87446			

Based on the t distribution table, $tt = 1,99$ is obtained. Acceptance criteria H_0 if $-t\left(1 - \frac{\alpha}{2}\right) < t < t\left(1 - \frac{\alpha}{2}\right)$ or $-1,99 < t < 1,99$. The value $th = 2,78$ is within the rejection of H_0 . Therefore H_1 is accepted. It means that generative learning models have a positive effect on students' creative thinking skills.

Based on the results of the research obtained, the generative learning model affects the creative thinking skill sof students. This is in accordance with previous research which states that through the application of generative learning models, students are accustomed to thinking creatively [15]. This causes students to be able to create something new and a unique work that is different from previous works.

B. Discussion

The purpose of this study is to determine the effect of implementing the generative learning model on students' creative thinking skills in the topic of traveling and standing waves. The hypothesis proposed in this study is that the implementation of the generative learning model affects students' creative thinking skills in the same topic. The generative learning model consists of six syntaxes: orientation, cognitive conflict, disclosure, construction, application, and reflection evaluation [15]. Students' creative thinking skills are measured using the Torrance Test of Creative Thinking. The measured indicators of creative thinking skills include fluency, flexibility, and originality [7]. The effects of implementing the generative learning model on creative thinking skills are as follows.

Generative learning models begin with orientation syntax. The orientation syntax contains how teachers prepare students before the learning process. Students are prepared by checking attendance. Teachers also provide motivation to students in the form of facts related to learning materials. This orientation stage requires students to be able to think more specifically and variedly. The study was conducted on the material of standing waves and stationary waves. Students no longer think about waves in general, but think about standing waves and stationary waves more specifically. Students are also required to think about more than one idea. This shows that orientation syntax can improve fluency and flexibility indicators in students [8]. The students will then be given a problem according to the material.

The problems given to students are carried out in conflict cognitive syntax. The conflict cognitive syntax contains how teachers provide a conflict cognitive to students. Conflict cognitive is a conflict that makes students think in a different way. Teachers provide questions in the form of problems to students. Based on the material, a vertically driven rope will produce a running wave. An example of a problem that teachers ask students is "What if the rope is moved horizontally? Will it produce a running wave as well?". Based on the research conducted, students will answer that the standing wave will still be formed from a rope that is moved horizontally. Based on the problem, teachers guide students to find the answer to the problem. This shows that conflict cognitive syntax

can increase flexibility indicators in students [18]. Teachers will then guide students so that they do not have different concepts.

Different student concepts will be guided by teachers on the disclosure syntax. The disclosure syntax contains about how teachers provide explanations about the learning theory of standing waves and stationary waves. The teacher does not explain the entire learning material. Teachers make students able to think directedly so as to produce the same concept. This shows that disclosure syntax can increase flexibility indicators in students [19]. The concepts that the students have will then be constructed.

Knowledge construction is done on construct syntax. The construct syntax is about teachers constructing students' knowledge. Teachers act as facilitators who direct students to construct knowledge quickly and efficiently [20]. This makes students able to relate the initial knowledge with the new knowledge they have gained. The construction of knowledge is carried out by experimental activities.

Experimentation is an activity that helps students to find concepts through experiments [21]. Students carry out experimental activities equipped with LKPD. Students conduct experiments in groups. This makes students have different ideas for each group member. The results of this construction will produce a new knowledge that originally comes from the student. This shows that the construct syntax can improve the indicator of originality in students [8]. The knowledge of the students who have been constructed will subsequently be used in problem solving.

Troubleshooting is done on syntax. The application syntax requires students to be able to solve problems about standing waves and stationary waves. The problems given are in the form of questions about standing waves and stationary waves. Students are required to be able to answer questions using their own abilities, provide many alternative answers, and provide answers that originally came from these students. This shows that application syntax can improve indicators of fluency, flexibility and originality in students [9]. Problems that have been solved by students are then given feedback.

Teachers provide feedback on the reflection evaluation syntax. The reflection evaluation syntax contains how teachers provide actions to students on the problems solved. Providing feedback to students is able to improve student learning achievement [22]. Teacher direct students to analyze the advantages and disadvantages of learning. Teachers also direct students to conclude learning. This shows that the reflection evaluation syntax can improve the indicator of originality in students [19].

Based on the research results, the generative learning model influences students' creative thinking skills. This is in line with previous studies stating that the implementation of the generative learning model encourages students to think creatively [15]. As a result, students can create something new and produce unique works that differ from previous ones.

IV. CONCLUSION

Based on the data analysis that has been carried out, researchers can conclude that there is an influence of generative learning models on the creative thinking skill of students in standing wave material and stationary waves. The results of the study were reviewed from the creative thinking skill score obtained through a test adopted using the torrance test of creative thinking steps. Generative learning has an influence on the creative thinking skill of students.

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