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The effectiveness of guided inquiry learning tools in increasing students' activities and creative thinking skills

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Abstract. This study aimed to describe the effectiveness of guided inquiry learning tools in increasing students' creative thinking activities and skills. Student activities include: paying attention, formulating problems, hypothesizing, conducting experiments, recording observations, discussing, communicating results, and concluding, while creative thinking skills components namely: fluency, flexibility, originality, and elaboration were also identified in this study. The study used a one-group pre-test post-test design which was implemented on 22 students. Research data were collected using activity observation sheets and creative thinking skills test instruments. The results showed that the activity and creative thinking skills of students increased after learning, so it can be concluded that guided inquiry learning tools were effective in increasing students' activities and creative thinking skills.

1. Introduction

The implications of the development of science and technology today are very influential in the world of education, both in terms of the provision of facilities and infrastructure as well as in the learning process, this is done nothing but as part of achieving educational goals. Educational goals can be achieved if in the ongoing learning process, teachers can develop and create a more innovative learning climate such as meaningful learning, train skills for students. 21st century education not only pays attention to subject matter (core subjects) as happened in the previous century, but also places an emphasis on life skills, learning skills and thinking skills, literacy in information technology and communication (ICT literacy), and the demands of the 21st century (21st century content) [1, 2]. Students in the 21st century need certain skills, including being creative to be successful in their career and future [3, 4].

The teacher, as the manager of learning, must also change the mindset of students. The teacher is not only the main source of information for students, but also acts as a facilitator who is tasked with directing and motivating students. Students will find and build their own knowledge from various learning sources that are no longer limited by the walls of the classroom and then use the knowledge building to solve problems in real life. Furthermore, students are facilitated and guided to use the knowledge that has been built to identify various science issues, analyze phenomena, make decisions, and dare to convey creative ideas or ideas, so that students will become competent graduates, improve the better life benefits in society, nation and state. This is also regulated in UUSPN No. 20 of 2003



article 3 states that education aims to develop the potential of students to become human beings who believe in and fear God Almighty, have a noble, healthy, knowledgeable, competent, creative, independent and become citizens who are democratic and responsible for society and nationality [5].

Three things need to be highlighted in the context of improving the quality of education, namely curriculum issues, improving the quality of learning, and the effectiveness of learning methods. The curriculum must be comprehensive and responsive to social dynamics, relevant, not overloaded, and able to accommodate diverse needs and technological advances. The quality of learning must be improved to improve the quality of educational outcomes. On the micro level, effective learning methods or approaches must be found and developed in the classroom, which empower students' potential so that students are more enthusiastic and active in learning [6]. Based on this description, the teaching and learning process should aim to prepare Indonesian people as productive, creative and innovative individuals.

Low student learning outcomes in physics subjects are not only influenced by the inability of students to understand the lesson, but are also influenced by the ability of teachers to manage teaching and learning activities. The teacher is responsible for adapting all learning situations to the background interests and maturity of students [7]. The results of interviews with class XI physics teachers at MA Jabal Noer Geluran Siduarjo, show that (1) Physics learning is only at the level of conceptual understanding, (2) Students rarely do experiments or identify physics problems in everyday life through observation, (3) Students have never been trained in creative thinking skills to solve physics problems, so that it has an impact on (4) the lack of student scientific activity during learning.

Students' creative thinking skills decline over time among American students of all ages. Students who have the same IQ do not guarantee the same level of creative thinking. It was further explained that America was successful in the education system because it was previously successful in encouraging creativity in children [8]. Based on this description, it is important to teach students skills, especially creative thinking skills.

According to Razik, creative thinking involves the ability to produce original ideas, feel new and unsuspecting relationships, or build a unique and good sequence among seemingly unrelated factors [9]. Meanwhile, Stokes [10] said creativity is what happens when an individual produces something that is novel as well as appropriate, generative or influential.

According to Torrance, there are four characters of creative thinking, namely (1) Fluency, namely the ability to create as many ideas as possible; (2) Flexibility, namely the ability to overcome mental obstacles when issuing ideas. This is indicated by the absence of the same idea when someone is asked to express their ideas or opinions; (3) Originality, namely the uniqueness of the ideas expressed; (4) Elaboration is shown by a number of additions and details to each idea so that simple stimuli become more complex [9].

Teachers are required to deliver materials that can develop students' thinking skills by presenting authentic scientific phenomena so that students can come up with many ideas or alternatives in solving problems. The more ideas that come up, the greater the chance to get a good idea. Physics learning in schools is often dominated by the presentation of facts and laws [11]. This is evident from the findings which state that 88% of learning is taught using the lecture method [12]. This statement indicates the importance of implementing learning-oriented student scientific activities such as guided inquiry learning.

This study aims to test the effectiveness of guided inquiry learning tools in increasing students' creative thinking activities and skills on fluid material. Guided inquiry can help students to practice in a team, develop competence in research, knowledge, motivation, writing skills, cooperative learning and social skills [13]. Guided inquiry-based learning can improve junior high school students' understanding of science concepts and foster the character of cooperation, discipline, independence, curiosity, hard work, honest and polite [14]. The implementation of inquiry-based learning can improve students' scientific attitudes and interest in learning [15].

2. Method

This research is a pre-experimental research with one-group pre-test post-test design implemented in class XI MA Jabal Noer Geluran Siduarjo, with a total of 22 students. Guided inquiry based learning

tools on Fuida material that are implemented include syllabus, lesson plans, worksheets, textbook, and creative thinking tests. The effectiveness of the guided inquiry learning model tool in this study was viewed from scientific activities (paying attention, formulating problems, hypothesizing, conducting experiments, recording observations, discussing, communicating results, and concluding) and students' creative thinking skills.

Observation of student activities is carried out by coding the student activity numbers on the observation sheet. The observed student activities were adjusted to the steps in the learning and the time set. Observations are made at the beginning to the end of the lesson. The reliability of the observer's observations was determined using the Borich [16] equation: $percentage\ of\ agreement = 100 [1 - (A - B) / (A + B)]$.

Assessment of students' creative thinking abilities is obtained from creative thinking tests which refer to Guilford's creative thinking test. Students are said to be creative if the results of the creative thinking test score $\geq 61.2\%$ [17]. The increase in creative thinking skills was obtained by analyzing students' creative thinking test scores before and after learning.

$$\text{Score} = \frac{\text{score obtained}}{\text{maximum score}} \times 100\%$$

The percentage of students' creative thinking skills is further categorized based on Table 1.

Table 1. Students' creative thinking skills criteria [17].

Average score	Category
81.00% - 100%	Very creative
65.00 % - 80.99%	Creative
41.00% - 64.99%	Less creative
0.00% - 40.99 %	Not creative

3. Result and Discussion

Student activity data were obtained through observations made by two observers during learning activities. Student activities observed in this study included eight components, namely: paying attention, formulating problems, hypothesizing, conducting experiments, recording observations, discussing, communicating results, and concluding. A recapitulation of student activities during the three meetings is presented in Table 2.

Table 2. Results of Student Activity Analysis Recapitulation

Student activity	1 st meeting		2 nd meeting		3 rd meeting	
	Score	R	Score	R	Score	R
paying attention	59	1	60.5	0.99	62.5	0.99
formulating problems	59.5	0.97	61.5	0.99	63	1
hypothesizing	59.5	0.99	62.5	0.97	64.5	0.99
conducting experiments	61	0.96	63	0.96	65	0.98
recording observations	61	0.98	62	1	64	0.98
discussing	63	1	63.5	0.99	65.5	0.99
communicating results	61.5	0.99	62.5	0.99	64.5	0.99
concluding	61	1	62	0.98	63.5	0.99
Percentage of Agreement	0.986		0.983		0.988	
	0.986					

The results of student activity observations obtained with values ranging from 1-3, then the value of student activity obtained with an average at the first meeting was 2.75 in the second meeting 2.83 and the third meeting 2.91. While the percentage of appropriateness of the assessment between observers during learning activities was 0.986 or 98.6%.

The active involvement of students in learning makes them trained to find other alternatives in solving problems found in learning. This is in line with Vygotsky in Arends [17] intelligence develops because people face new experiences and confuse them and then try to resolve differences by linking new knowledge with initial knowledge and constructing new meanings.

The instrument used to measure students' creative thinking skills was a creative thinking test in the form of an essay. The questions used are open-ended, which is a type of question that has many possible correct answers. Open-ended questions can help increase creativity by generating various ideas, and students can solve their own problems in the future [18, 19].

The measured creative thinking skills are fluent thinking, flexible thinking, original thinking and elaboration. Creative thinking test questions arranged were tested on students at the beginning of time, namely before being treated as a pretest and after being given treatment as a posttest. Pretest questions are given to determine students' initial creative thinking abilities before they get learning using the developed tools. Posttest questions are given in order to determine the results of students' creative thinking skills after taking learning using the developed device.

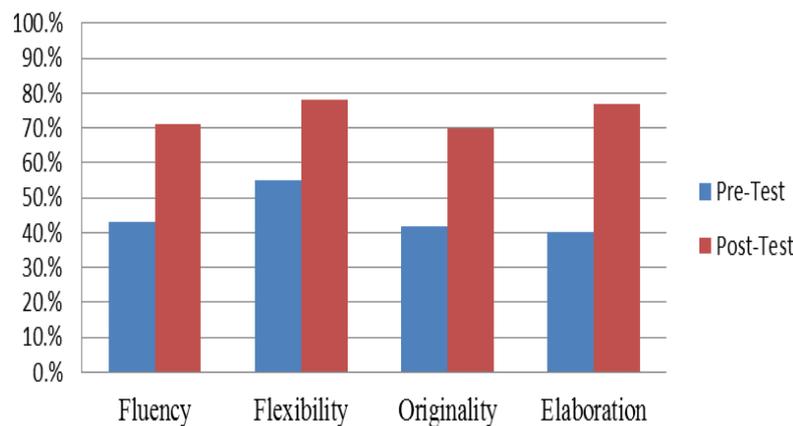


Figure 1. Results of Students' Creative Thinking Skills Analysis

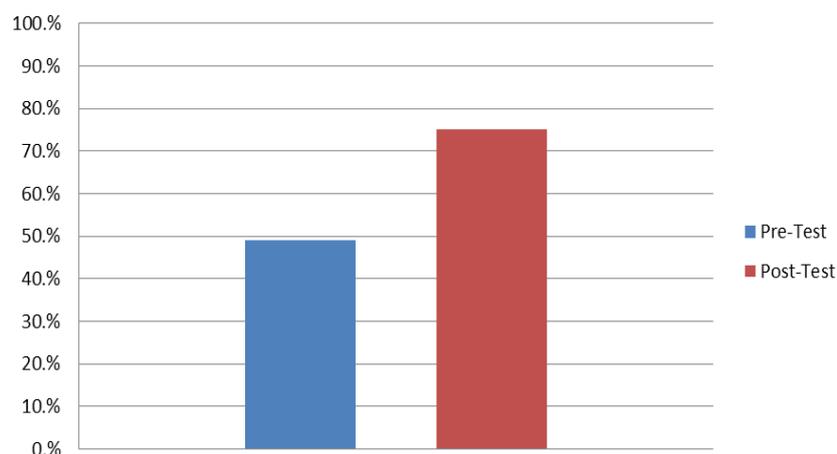


Figure 2. Comparison of Students' Creative Thinking Skills between Pre-test and Post-test

The results of the analysis of the improvement in creative thinking skills on average of all students after participating in learning for three meetings on the aspects of creative thinking before treatment were 55.3% in the less creative category. Meanwhile, 85.2% was given the very creative category. These results are inseparable from the characteristics of the guided inquiry learning model which

emphasizes understanding to students in knowing and understanding various learning materials using scientific steps [20] and the implementation of the learning process [21] which involving maximally all students' abilities to search and investigate systematically, critically, logically, analytically, so that students can formulate their own findings confidently [22].

4. Conclusion

Based on the results of the analysis and discussion, it can be concluded that guided inquiry-based physics learning tools are effective for increasing students' creative thinking activities and skills. The results of this study indicate that the indicators of elaboration (38%) and originality (29%) have the highest increase after learning using guided inquiry models. The results of this study can be used as a basis or comparison in future studies.

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