Analysis of students creative thinking ability in physics learning

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Abstract. The purpose of this study is to find out how the initial ability of creative thinking of class XI MAN 1 Pekanbaru students. In this study the initial ability to think creatively has five aspects, namely the ability to think fluently, flexibly, original, elaborate and evaluation skills. The initial ability of creative thinking skills used is collecting, processing, interpreting, and presenting observational data in graphical form. This research is a descriptive qualitative research method with data collection techniques through the provision of questionnaires of creative thinking skills in the form of statements with four alternative choices. The results of this study indicate the initial ability of students' creative thinking as a whole, with a percentage of 63.7% in the low category. The lowest aspect is the original aspect with a percentage of 51.67% and the highest aspect in the aspect of evaluative thinking with a percentage of 73.12%. By knowing the level of creative thinking obtained will be developed teaching materials that can help students in the learning process to improve students' creative thinking skills.

1. Introduction

Education has a strategic role to prepare young people who meet the qualifications in accordance with the challenges of the 21st century, which includes skills that focus on learning innovation skills (1) critical thinking and problem solving; (2) communication and collaboration; and (3) creativity and discovery [1]. The world of education contributes to producing a quality workforce in the 21st century, so that it can connect and match the real needs of the business world and the job market. However, the decline is, at this time many practices that study Natural Sciences do not have the creative thinking skills needed in the workforce. The ability to think creatively for students is very important in the era of global competition because the level of complexity of problems in all aspects of modern life is higher. The ability to think creatively will be able to form creative individuals who can answer the challenges of globalization so that the world can compete under any conditions.

Effective learning is a suitable relationship between students and the classroom environment [2]. Some abstract concepts contained in physics studies, cause difficulties in understanding the material taught, both by students and teachers who teach. Some concepts of physics, including abstract concepts make students less active in communicating in class and low physics creativity. The importance of people who master the concept is that students can communicate, classify ideas, ideas or
events they experience in everyday life [3]. Each student has different thinking in solving the problem. This also affects how students solve problems.

But at the moment there is a suspicion that physics learning in schools has not paid attention to student learning activities that lead to divergent thinking processes, so that teachers only provide routine questions during learning and evaluation. This is one of the causes of students' lack of interest in learning physics. Thus, learning physics, now and in the future, should not stop at the achievement of basic skills, but must be designed to achieve high-level competencies.

Creativity or creative thinking as the ability to see various possibilities for solving a problem, is a form of thought that is still lacking in attention in education [4]. Creativity is a person's ability to produce a new product or a combination of things that already existed before, useful, and understandable [5]. Searching for various kinds of information that can support the ease of understanding science will improve creative thinking skills. The ability to think creatively is characterized by the ability to think fluently, flexibly, originally, and elaboratively [6]. There are five aspects of creative thinking: 1) fluently, the ability to detect (recognize and understand) and respond to statements, situations and problems; 2) fluency, ability to produce many ideas; 3) Flexibility, ability to express various solutions or approaches to problems; 4) originality, the ability to trigger ideas in an original way, and rarely given by most people; 5) Elaboration of the ability to add situations or problems so as to be complete and detailed in detail, includes tables, graphics, images, models and words [7].

To find out about the problem, this case study needs to be done in order to obtain accurate information, to provide an overview of physics learning with creative thinking skills. The ability to think creatively with 5 aspects of ability that is fluency, flexible, original, elaborate and evaluative. The purpose of this research is to: 1) category the ability to think fluency, 2) category the ability to think flexibility, 3) category the ability to original, 4) category the ability to elaborate, and 5) category the ability of evaluative thinking.

2. Research Methodology
This research is a qualitative descriptive study. The total subjects of this research were 20 students in MAN 1 Pekanbaru of class XI. This research was conducted on July 2018. The technique of data collection is questionnaire student creative thinking abilities. There are five aspects of ability to think creatively are thinking fluency, thinking flexible, thinking original, thinking elaborative, and evaluative thinking. The scale in the questionnaire used in the form of a Likert scale consists of four alternative answers.

Then, to find out the value obtained from each questionnaire statement, the obtained score is divided by the maximum score, and multiplied by 100%. The value of each indicator can be determined by the equation [8]:

\[
Value = \frac{\text{obtained score}}{\text{maksimum score}} \times 100\%
\]  

The classification category of this analysis can be seen in Table 1.

| No. | Observation Result Score | Category          |
|-----|--------------------------|-------------------|
| 1.  | 90 > score ≤ 100         | Very Good (A)     |
| 2.  | 75 < B ≤ 90             | Good (B)          |
| 3.  | 60 < C ≤ 75             | Less (C)          |
| 4.  | ≤ 60                     | Very Less (D)     |
The results of the analysis of students creative thinking abilities will be displayed in graphical form and analyzed descriptively.

3. Results and Discussion
This study discussed about students' creative thinking. Ability from 5 aspect, namely the ability to think fluently, flexibly, originally, elaboratively and evaluatively. To find out how much percentage of students' creative thinking skills from each aspect, the results of students' answers were analyzed by concentrating on the average scores obtained from the indicators of students' creative thinking. The results are as follows:

3.1 Fluently Thinking
After collecting the necessary data, researchers analyze the data and the results of data analysis into the of making new decisions. Figure 1 below is about how far students' ability to think fluency in learning can be seen in the following:

![Figure 1](image)

**Figure 1.** Ability to think creatively on the fluency thinking aspects of students

From Figure 1. it can be seen that Aspects think fluency of students on each indicator is different. Aspects of thinking fluency of students on the highest indicators are doing task with a percentage of 80% is categorized as good, while thinking about the lowest indicators is explaining the answer with a percentage of 56.5% categorized as very less. For the average aspect of fluency thinking overall, it is obtained 71.25% is categorized as less.

3.2 Flexible Thinking
After collecting the necessary data, researchers analyzed data about flexible thinking. Results of flexible thinking ability of students in learning can be seen on the figure 2.
Figure 2. Ability to think creatively on the flexible thinking aspects of students

From Figure 2, it can be seen that the flexible thinking aspect of students on each indicator is different. The flexible thinking aspect of students on the highest indicator is having a different opinion with a percentage of 62.5% is categorized as less, while thinking flexibly on the lowest indicator is solving the problem in a different way with a percentage of 56.25% categorized as very less. For the average aspect of flexible thinking overall, it was obtained 59.37% is categorized as very less.

3.3 Original Thinking
After collecting the necessary data, investigators analyze data about Original Thinking. Results of original thinking ability of students in learning can be seen on the figure 3.
Figure 3. Ability to think creatively on the original thinking aspect of students

From Figure 3, it can be seen that the original thinking aspects of students on each indicator are different. The original thinking aspect of the students on the highest indicator is thinking of new ways with a percentage of 56.25% categorized as very less, while the original thinking on the lowest indicator is proposing a strange example with a percentage of 48.75% categorized as very less. For the average aspect of original thinking as a whole, it was obtained 51.67% was categorized as very less.

3.4 Elaborative Thinking
After collecting the necessary data, investigators analyze data about elaborative thinking. Results of elaborative thinking ability of students in learning can be seen on the figure 4.
From Figure 4. It can be seen aspects of thinking elaborative students on each indicator is different. The elaborative thinking aspect of students on the highest indicator is to take detailed steps with a percentage of 72.5% is categorized as less, while thinking elaboratively on the lowest indicator is developing the ideas of others with a percentage of 52.5% categorized as very less. For the average aspects of elaborative thinking as a whole, it was obtained 63.75% was categorized as less.

3.5 Evaluative Thinking
After collecting the necessary data, the researcher analyzed data about evaluative thinking. Results of evaluative thinking ability of students in learning can be seen on the figure 5.

From Figure 5. It can be seen that the evaluative thinking aspect of students on each indicator is different. The evaluative thinking aspect of students on the highest indicator is considering other
opinions with a percentage of 83.75% is categorized as good, while evaluative thinking on the lowest indicator is surviving with their own opinions with a percentage of 60% categorized as very less. For the average aspects of evaluative thinking as a whole obtained by 73.12% is categorized as less.

From the results of the analysis with the ability to think creatively where there are five aspects, namely thinking, fluency, flexibly, original, elaborative and evaluative. From the results obtained as a whole with an average of 63.83% with a less category means students were not able to think creatively well. There are obstacles that can make someone not creative. These obstacles include: 1) habits / traditions; 2) limited time and energy; 3) environment; 4) the need for immediate handling; 5) criticism launched by others; 6) fear of failure; and 7) complacency [10].

In the aspect of evaluative thinking, it is the first highest aspect with a less category, students are able to consider other opinions, but students cannot survive with their own opinions. This can happen because students fear their own opinions are wrong. Someone who is afraid of failing to solve the problem makes the person not confident. If you do not believe that he is able to overcome these problems, this will greatly prevent someone from developing creative thinking skills.

In the aspect of fluent thinking, including the second highest aspect in the less category. Students doing a task given by the teacher, but students still cannot explain the reason for the answers they get, this can happen because of the habit / tradition factors that the teacher gives examples and students write the answer to the question given is the same as the method given by the teacher. Such habits / traditions can prevent students from developing the ability to think creatively in the aspect of thinking fluently where students have difficulty in explaining answers because the problem solving is most often given by the teacher without finding out independently.

The aspect of thinking Elaborative, including the third highest aspect with less category. students were not able to develop the ideas of others, this can occur because of feelings of complacency. This complacency can make a person stop to continue to be more creative, because they feel enough and are satisfied with their current situation. There are still many problems with varying degrees of difficulty and resolution. This actually motivates students to further develop their creative thinking skills.

The flexible thinking aspect is very less. Students were not able to solve problems in different ways, this can be due to timing. Time is often related to busyness. Students are now more likely to be busy and their energy runs out just repeating the solution in the same way than they think about creative ways to solve problems that may be more effective and efficient in terms of time and energy. Students tend to spend time repeating answers rather than learning and developing creative but effective ways to solve them.

The original thinking aspect is very less includes the lowest aspect. Students were not able to exemplify a different example. The environment can be an inhibiting factor in developing creative thinking skills. When a student is in an environment of peers who are accustomed to solving problems in the usual way, this can affect a person to be creative. The teacher also has an important role. When the teacher does not provide a creative learning environment, this can affect students to develop creative thinking skills. So the environment has an influence in preventing a person from being creative, but if this environment is changed into a creative environment, then the ability to think creatively can develop students.

If these obstacles can be overcome, someone will be able to develop mathematical creative thinking skills and help someone find many creative solutions to overcome problems develop creative thinking skills, there are 3 steps that can be used also in developing creative thinking skills. The 3 steps are as follows: 1) believe that there are solutions to each problem; 2) do not let tradition paralyze creative minds; 3) practice asking and listening [11].

Therefore, several efforts must be made to improve students' creative thinking skills. In the implementation of education, adequate facilities are needed to support learning activities independently, one is the Student Worksheet (LKPD). Student worksheets (LKPD) were originally known as Student Worksheets (LKPD). Student worksheets are sites that contain tasks that must be done by students. LKPD is usually in the form of instructions, steps to complete a task, a task that is
instructed in the activity sheet must be clear the basic competencies that will be achieved [12]. LKPD functions as a learning guide for students and also makes it easy for students and teachers to conduct learning activities. LKPD helps students carry out active learning activities in the sequence of steps. LKPD that is created creatively will make it easy for students to do it. This convenience can create a learning process that runs easier and more fun.

4. Conclusion
Based on the findings of the study and discussion of the initial ability to think creatively in class XI students showed that the aspect of creative thinking ability that can be achieved by students with the highest percentage is evaluative aspects and the lowest percentage in the original aspect is 51.67%. Overall based on the results of the questionnaire, evaluative aspects and elaborate aspects can be achieved in the less category. Flexibility and originality aspects with very lacking categories.

Based on the findings of this study the suggestions that the researchers can convey are: (a) For teachers, this research is expected to help teachers understand the ability of students’ creative thinking indicators so that teachers can design learning that can improve students' creative thinking skills. (b) For other researchers, it is expected to conduct further research that has the potential to improve students' creative thinking skills.

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