Creative Thinking Ability of Students on Open-Ended Problem Solving: Physics Ability View

by Ritin Uloli

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Creative Thinking Ability of Students on Open-Ended Problem Solving: Physics Ability View

Ritin Uloli[1], Prabowo[2], Tjipto Prastowo[2]

[1]Department of Physics Education, Gorontalo State University
[2] Department of Science Education, Postgraduate Program State University of Surabaya
[1]uloli.ritin@yahoo.com

Abstract

Abstract. Research aims to describe creative thinking ability of students on open ended physics problems solving. This research is a qualitative approach. About 6 students of majoring in Physics Education Surabaya State University are involved as the subject. Technique authenticity of data using a triangulation method. Data obtained through problem solving tests and interviews. Problem solving tests given after going through the validation phase by the expert. Test of problem solving analysed based on three stages namely data reduction, exposure data, and conclusions. The results showed that creative thinking ability of students to high category on aspects of creative thinking fluency is very good because it is able to bring more than one idea in solving open-ended problems. The results showed creative thinking ability of students to high category on aspects of creative thinking fluency is very good because it is able to bring more than one idea in solving open-ended problems. In the aspect of thinking flexibility, located on both criteria, meaning is able to solve the problem is more than one way of solving. In the category of originality results are good means to have been able to resolve the issue in a good way. Creative thinking ability of students to the moderate category for thinking fluency, flexibility and originality are the criteria for good. Creative thinking ability of students to the low category for thinking fluency, flexibility and originality are the criteria are less good
Key words: creative thinking ability, open-ended, physics capabilities

1. Introduction

The ability to think creatively and problem solving skills for learners is very important in the era of global competition. Therefore, the government always give considerable attention in the field of education. It can be seen in the efforts of policy-making in the field of education to include both these components are contained in the curriculum, learning strategies and other learning tools. The effort is intended for every activity of education or learning, to students can be trained skill that can develop creative ability and problem solving. Thus the world of education will contribute greatly in developing human resources that are creative and have the ability to solve challenging daily life problems.

But in fact the ability of students' creative thinking in solving physics problems has not been maximized. This happens because students have not been able to understand the steps of the creative thinking process. Each student has different thoughts in solving the problem. One of the means to develop the ability of creative thinking and problem solving for students in education is through the study of physics in the course of Mechanics. It can be argued that in the process of physics learning, students get explicit exercise of creative ways of thinking in solving physics problems.

According to McGregor (2007), creative thinking is what leads to the acquisition of new insights, new approaches, new perspectives, or new ways of understanding things. According to Martin (2009), creative thinking skills are skills to generate new ideas or ways of producing a product. Three aspects of creative thinking skills are productivity, originality, and flexibility. According to Wallas (Solso 2007, Munandar 2009) and Fathullah (2012), creative thinking processes include preparation, incubation, illumination, and verification.

Based on the above description, the four aspects of the creative thinking process of preparation, incubation, illumination and verification need to be analyzed. This research uses

problem solving test to know the creative thinking process of student in solving physics problem as an effort to improve student's creative thinking ability in solving physics problem.

1.1 Creative Thinking

Creative thinking is defined as the ability to create a new product. The creation is not necessarily the whole product must be new, it could be a new combination or combination used while the elements have been there before. So creative thinking is the ability to see new combinations or to see new relationships between elements, data, or things that have been there before. (Semiawan et al., 1987: 8). Creative thinking is a thing or idea that already exists and in our minds the real process actually takes place. This process should not always create new concepts, although the end result may appear to be something new resulting from the merger of two or more of the existing concepts. Fatur (2012) explains creative thinking is one of the high-level thinking stages required in people's lives. People are always faced with problems so that a creative thinking process is needed to solve the problem. Siswono (2004) explains the process of creative thinking is a process that combines logical thinking and divergent thinking. Divergent thinking is used to find ideas to solve problems whereas logical thinking is used to memferivikasi these ideas into a creative solution. Lee and Kyung (2005) stated that what is needed in the process of creative thinking includes sensitivity, eloquence, flexibility, originality. According to Ramly (2011) The test in creativity using Torrance Tests Creative Thinking (TTCT) and three capabilities measured are Fluency, Flexibility (Flexible) and Originality (novelty).

1.2 The Ability of Creative Thinking

Andangsari (2007), The ability to think creatively can be defined as the ability to place a number of objects that exist and combine them into different forms for new purposes. Anwar et al (2012), creative thinking is a new way of looking and doing something that contains 4 aspects is fluency, flexibility, originality and elaboration.

a. The aspect of fluency is related to how students build ideas. In creative thinking refers to the variety of correct answers given to students.
b. Aspects of flexibility related to the ability of students to solve problems with various ways to solve problems.
c. The originality aspect relates to the way the student solves a unique problem or another of his friend's answers.
d. The elaboration aspect relates to the students' ability to solve problems in detail and interrelated problem-solving steps.

1.3 Physical Problem Solving

Open-ended questioning is one way to encourage creativity as a creative thinking product of students. Open matter has many solutions and many ways to get a settlement. Krulik & Rudnick (1987) defines problem solving as a means of using a previously acquired knowledge, skill, and understanding to meet the demands of unusual circumstances. According Hudoyo (in Utami, 2012) that problem solving is a process of acceptance of the problem as a challenge to solve the problem. Thus, problem solving is a psychological process that involves not only the application of postulates or theorems studied but involving reasonably complex thinking activities. The interaction between knowledge and the application process that uses cognitive and affective factors in solving a problem. Krulik & Rudnick (1995) has 5 steps in solving the problem. Namely Reading or studying, exploring and planning, choosing strategies, seeking answers or completing and developing.

1.4 Open-ended Learning

Problems (problems) arranged in such a way that having the correct answer (many Solutions) are called open-ended problems or open questions. According to Suherman et al (2003) the problem is formulated to have multi correct answers called incomplete problem or

also called open-ended problem (open matter). The open-ended approach is a problem approach that is believed to encourage the creativity and innovation of physics thinking of students secra more varied. This approach can also encourage students to be critical, open, able to work together, and be diligent in problem solving and communicate logically and argumentatively. In addition, the open-ended problem-solving approach also allows increased reasoning and physical communication. The open-ended approach provides an opportunity for students to invest in various strategies and ways they believe in their abilities to elaborate problems.

2. Method

This research is an explorative descriptive analytic research with qualitative approach to describe students' creative thinking ability in solving physics problem in mechanics course. Prabowo (2011) stated that qualitative research is essentially observing people in their environment, interacting with them, trying to understand their language and interpretation of the world around them.

2.1 Research subject

This research will be conducted on the students of Physics Education Study Program of FMIPA Universitas Negeri Surabaya which program the Mechanics course. To determine the subject of research, students are given problem-solving tests based on the stages of creativity that is fluency, flexibility, and original. Students who are selected as creative subjects will be interviewed.

2.2 Research Instruments

Instruments in collecting data in this research is the researcher himself as the main instrument and supporting instrument is the instrument of problem solving task and interview instrument. This research uses problem-solving test to see students' creative thinking ability in solving problems in Mechanics course.

2.3 Data analysis technique

Data analysis in qualitative research is conducted by field activities and field activities. Activities in Data Analysis are as follows.

a. Reduction of data. The data obtained from the field amount is quite a lot, for it needs to choose the things that matter, focus on the things that are important, sought the theme and pattern.
b. Presentation of data. Presentation of data is done in the form of brief description, chart and relationship between categories.
c. Conclusions. The conclusions raised are supported by valid and consistent evidence.

3. Result and Discussion

The ability of creative thinking for high category students in the aspect of thinking smoothly very good because high category students able to bring up more than one idea in solving the problem of physics open ended so that the aspect of thinking smoothly for high category no trouble. For the flexible thinking aspect, high category students are on good criteria because they are able to find more than one way of solving the physics problem of open ended using using the formula of Newton, Lagrange and Hamilton. Students in the high category for the authenticity aspect are also in good criteria because high-end students are able to solve problems in new ways and be able to connect physics concepts well.

The ability of creative thinking of the students for the middle category on the aspect of smooth thinking is good because it is able to come up with an idea in solving the physics problem open ended so that on the current aspects of the middle category students do not have difficulty. Aspects of flexible thinking, students are in the category of good criteria means able to solve the problem of physics open ended two ways that is only using the formula Newton

and Lagrange. In the aspect of creative thinking authenticity is also said to mean that students have been able to solve problems in a new way and able to connect the concept of physics correctly.

The ability of students' creative thinking for the low category on the aspect of smooth thinking, flexible thinking and thinking of authenticity are on the criteria less good. In thinking smoothly only able to bring up one idea in solving the problem of physics open ended, so that aspect of smooth thinking is said to have difficulty. For the flexible thinking aspect, students in the low category can only solve the physics problem of open ended in one way. For the authenticity of students in solving the problem of open-ended physics has not been able to connect physics concepts correctly.

4. Conclusion

Based on the results of research and discussion can be concluded as follows. The ability of students' creative thinking in solving open ended problems for high category in the aspect of thinking smoothly is very good, the aspects of flexible thinking are in good criteria, and on the aspect of authenticity are also in good criteria. The students' creative thinking ability for the medium category, in the aspect of thinking smoothly, the aspects of flexible thinking and the aspect of genuineness thinking are in good criteria. The ability to think creatively for the category of students is low on the aspects of smooth thinking, flexible thinking and the aspect of authenticity is in the criteria less good.

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