Preliminary study of development of students worksheet using creative problem based learning model in physics learning on senior high school

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Abstract. The ability of students to think creatively in finding solutions to a problem is important in learning physics. However, teaching materials that used in school have not integrated learning model that can enhance students' creative thinking abilities. The solution to improve students' creative thinking skills is to develop worksheet using the Creative Problem-based Learning (CPBL) model in physics learning on Senior High School. To develop the worksheet, a preliminary study was conducted. This study used a descriptive method with the subjects of physics teacher in Senior High School at Padang. The instruments used are in the questionnaires and interview guidelines. Analyzing of the data is using descriptive analysis. The results showed that the performance analysis and the level of difficulty in learning were in the less category, and the student’s creative thinking abilities in physics learning were in the very less category.

1. Introduction

Creativity is often associated with the art about creating a new work. Rarely do people think that creative thinking is also required in science, especially in physics. In the 2013 curriculum it was explained that the results of attitudinal, knowledge and skills competency were the creation of productive, innovative, affective, and creative students [1]. 2013 curriculum applies student-centered learning using a scientific approach. The purpose of applying the scientific approach is that students can actively construct concepts, principles, and laws found through scientific steps [2]. These steps are observing, asking, trying, reasoning, and communicating [3]. Through these steps students are able to actively teach themselves.

Physics as a science that studies natural phenomena requires students to be able to find concepts through scientific processes. The scientific process can be in the form of exploration, experimentation and problem solving activities. Exploration is an activity carried out by students to find concepts related to basic competencies in accordance with the syllabus. Experiments are pre-clinical activities in the laboratory to prove the truth of the concept [4]. Both of these activities can be carried out independently by students by applying the ability to think scientifically.
The role of the teacher is as a facilitator, motivator, and one of the learning resources [4]. Teachers are expected to be able to provide information needed by students in learning such as books, modules, worksheets, and so on. These sources can be designed by the teacher according to the right criteria according to the curriculum or obtained from certain authorized distributors. The goal is of course to support classroom learning so that students are able to reach all competencies with good learning outcomes.

Student's worksheet is one of the resources used in learning. Those are sheets that contain basic competencies from the material presented and contain guidance on activities and tasks to be carried out by students. The task can be in the form of theoretical tasks and practical tasks [5]. The theoretical task can be in the form of a collection of practice questions that must be completed by students, while the practical assignment is in the form of lab work. The function of student's worksheet is to enrich the learning outcomes of students to expand the material learned in class [6]. The preparation of the student's worksheet contains at least 8 components, which is: title, basic competencies to be achieved, time of completion, tools and materials, brief information, procedure, exercises, and reports to be made [7].

The use of student's worksheet as a learning resource has become a common thing. However, the student's worksheet used in school does not meet the exact criteria according to the curriculum. According to interviews with teachers in SMA N 1 Padang, it is known that student’s worksheet which is used as a learning device has not been effective to be used at the time of practicum and work on the questions. The student’s worksheet is independently developed by teachers without regard to the steps of the learning model applied in it. The developed student's worksheet is practicum student's worksheet and student's worksheet a collection of practice questions. The student's worksheet is arranged in the form of a sheet containing procedures for practicum implementation which are presented briefly and only contain titles, work steps, data tables, and questions that students must complete. The questions presented in it are only simple questions related to practicum that have been done by students. Literally, students have indeed carried out scientific activities through the practicum, except that the student's worksheet has not yet loaded the right model so that scientific activities have not been carried out maximally to meet the achievement of competencies.

Based on the 2016 revised 2013 curriculum there are four suggested learning models, one of which is the Problem Based Learning (PBL) model. PBL is a learning model with steps that guide students to find solutions to a problem independently. In principle, the main purpose of PBL is to motivate students and explore the ability to solve the problems with creative thinking skill [8]. However, in practice, students still have not been able to independently develop these abilities so that PBL is considered to still have weaknesses.

Applying the creative element in learning is an idea to maximize the results of applying the PBL model. There are 4 creative elements that are used as guidelines in applying the model, namely fluency in giving answers to problems in the right way; flexibility in solving problems in various ways; novelty of ideas, ways, and languages used in answering problems; and elaboration skills, namely developing, elaborating, and enriching a mathematical idea [9]. Basically, all these elements train students to improve their ability to think creatively and be able to submit and solve problems. These creative elements are applied in the PBL model so that students are able to submit and solve problems with the ability to think creatively. Next this model is called Creative Problem Based Learning (CPBL).

To implement the CPBL model, student's worksheet was developed using this model. Preliminary studies need to be done before developing student's worksheet to improve the creative thinking skills of high school students in physics. The purpose of the study was to analyze the development needs of the student's worksheet using the Creative Problem Based Learning model.
2. Method
The method used to analyze the results of this study is descriptive qualitative. The research subjects were physics teachers from several high schools in Padang, which is SMA N 1 Padang, SMA N 2 Padang, and SMA N 5 Padang. The research instruments were questionnaires and interview guidelines. The questionnaire contains statements filled in by the teacher as an observer by giving a value to the statement. The interview guide contains questions that will be asked in the interview process with the teacher. Data collected in June 2019, analyzed by percentage techniques and score categories as in table 1.

| No. | Category  | Score            |
|-----|-----------|------------------|
| 1   | Very good | 90 <X ≤ 100      |
| 2   | well      | 75 <X ≤ 90       |
| 3   | less      | 60 <X ≤ 75       |
| 4   | Very less | ≤ 60             |

Source: [10]

3. Result and Discussion

3.1. Result
The results were obtained from questionnaire data filled in by the observer and supported by the results of the interview. Questionnaire which was filled in by the teacher as an observer, then processed to get a percentage. Questionnaire consists of several analyzes. Each analysis is described in several indicators. The first analysis is performance analysis. This analysis is conducted to find out whether the teacher has prepared learning according to the demands of the curriculum. This analysis consists of 2 indicators, namely identification of teachers and completeness of facilities and infrastructure. The results of the percentage of each indicator are shown in Figure 1.

The percentage of teacher identification is 67.12% which means in the less category. This shows that the teacher has not shown good performance in preparing learning. This is also illustrated in interviews where the teacher stated that the equipment was prepared as needed according to the needs without regard to the source and achievement according to the curriculum. However, learning has been supported by good facilities and infrastructure, indicated by the percentage of facilities and infrastructure, namely 81.25% which means in the good category. Then the average analysis of teacher performance is 74.2 which is in the less category.

The second analysis is the analysis of graduation standards. This analysis is related to the achievement of competencies demanded in the 2013 curriculum. This analysis consists of indicators of
spiritual attitudes, social attitudes, knowledge, and skills. The results of the percentage of this analysis can be seen in Figure 2 below.

![Chart](attachment:chart.png)

**Figure 2. Analysis of Graduation Standards**

Students have a good spiritual attitude with a percentage of 81.25. However, a social attitude with a percentage of 60.42% which shows students have a social attitude that is not good at learning. This has an impact on the low competency of students' knowledge which is 41.41% which is included in the very less category. Likewise, the skills competency of students is low with a percentage of 56.25%. Overall, the average graduation standard analysis is 59.8%, which means it is still very less than expected.

The third analysis is an analysis of learning difficulties. This analysis is related to factors that influence learning difficulties. According to the interview’s result, it is known that students have difficulty mastering learning because learning resources are less effective, namely teaching materials used (student's worksheet), and learning models applied in the classroom provide low motivation. The results of the questionnaire obtained the percentage of this analysis which can be seen in Figure 3.

![Chart](attachment:chart2.png)

**Figure 3. Learning Difficulty Analysis**

From the graph, it can be seen that the learning difficulties experienced by students from the student's worksheet used are not yet effective and the learning model applied is not appropriate. Both indicators are in the very poor category. The percentage of both is below 60%, namely 57.03% for student's worksheet and 50% for the learning model. So, the average learning difficulties analysis is 53.3% which means it is in the very less category.

From the overall analysis, it was obtained an analysis of the level of creativity of students from several items contained in each indicator. Creativity analysis includes creative aspects of knowledge and keatif aspects of skills. The results of the analysis is shown in Figure 4.
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3.2. Discussion
The results of the performance analysis show that the teacher has not prepared good learning according
to the demands of the curriculum. Before the study begins, teacher have to prepared things include
teaching materials, learning media, assessment tools, etc. In fact, it does take a long time to prepare all
the learning tools that are in accordance with the demands of the curriculum and the lack of knowledge
of the teacher in making learning devices. This is the main factor why teachers are not optimal in
preparing learning devices [11]. The result of this has an impact on the results of the achievement of
students' competencies in learning.

The 2013 curriculum demands the achievement of all expected basic competencies. The results of
the graduation standard analysis show the low competence of social attitudes, knowledge and
skills. Social attitudes are often constrained by adverse environmental conditions. The social
environment of students is outside of school and in school. A bad environment will cause low
achievement of competencies in social attitudes of students and will significantly affect the motivation
and learning outcomes of students [12].

The competence of knowledge and skills is also in the very less category according to the analysis’
result. This is related to the ability of students to think. Based on the questionnaire, it was found that
students' creative thinking skills were very low. Factors that cause learners habit to work on the
problems of low-level course and learners do not find the right learning style [13]. Related to this,
learning styles can be found through the application of appropriate learning models. In this case, to
improve the skills of think creatively of the student, needed a model that applies the element of creativity,
namely the CPBL model. The implementation of the model is implemented into the student's worksheet
developed according to the needs of students and the demands of the 2013 curriculum.

4. Conclusion
Based on the results of data analysis, the ability to learn creatively is very less. Students find learning
difficulties due to the poor student's worksheet used and the learning model applied in learning is not
appropriate. Therefore, the development of student's worksheet is needed by implementing the steps of
the CPBL model to improve student’s creative thinking skills, especially in physics learning.

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