Students analysis for development of student worksheets with metaphorming approach to improve student’s creative thinking skills

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Abstract. Physics learning in Curriculum 2013 has the characteristics that required mastery of concepts and improve student's creative thinking skills. To achieve the educational goal, in the learning required an analysis of initial competence possessed by the student so learning will occur according to with characteristics of learners. The reason is lack of teaching materials development in student worksheets form that can enhance creative thinking skills of students in accordance with the demands of Curriculum 2013. This analysis is aimed to get initial data of student's creative thinking skills. The data analysis technic is descriptive analysis by using the Likert scale which presented in graphical form. Initial analysis results show that creative thinking skills of students for the thinking fluency (fluency) aspects is 55.29%, flexible thinking (flexibility) aspects is 52.4%, original thinking (originality) aspects are 45.43%, and thinking detailed (elaboration) aspects is 50.72%. Based on the results of this analysis showed that student's creative thinking skills in the learning physics are still low. Results of this research are used to develop physics students’ worksheets with the Metaphorming approach to improve student’s creative thinking skills.

1. Introduction

National Education aim is to develop the ability and form the character and the civilization of dignified nation to educate life of the nation, aiming to develop potential of students in order to become a human being who believes and devoted to the omnipotent God, having noble character, healthy, knowledgeable, capable, creative, independent, and become a democratic and responsible citizen. Based on, the purpose of the law then in the world of Education required the role of teachers who can develop all the potential possessed by students. A teacher is not only able to transfer knowledge to his students, but also can embody feelings of pleasure and ability to become a learner.

Learning is not expected to make the teacher as the only source of knowledge (teacher centered), but the teacher only as a facilitator to guide students to build their own knowledge. The expected learning is learning that gives students the opportunity to continue exploring their curiosity, so that they are constantly trying and encouraged to develop creativity. Classroom learning is expected to prepare students to have creative thinking skills so that students can solve problems well and compete in the future. Various efforts have been done by the government to continuously improve the quality of National Education. Among them add the procurement of educational advice and infrastructure that aims to smooth the learning process. In addition, the government has also made improvements in the
curriculum, from the 1994 curriculum to the 2004 curriculum or competency-based curriculum (KBK), then KBK is revised to Curriculum Level of Education from KTSP to Curriculum 2013.

Curriculum 2013 aims to develop the competence of learners in a balanced way so that it can improve learning outcomes. These competencies are the competence of knowledge, attitude competence, and skill competence. Knowledge competence hopes to create students who can formulate creative problem-solving. Behavioral competence aims to form learners who are characterized while the competence of skills requires students to be productive. These three competencies should be applicable to students in schools and communities. A character-based curriculum structure of 2013 and competencies for senior secondary schools is developed comprising of compulsory subject groups and specialization subjects. The purpose of the specialization course (1) to provide opportunities for learners to develop their interests in a group of subjects in accordance with their scientific interest in college, and (2) to develop the interest in a discipline or skill. One of the subjects of specialization in physics.

Physics is a branch of science that has an important role in the development of science and technology. In the study of physics required the implementation / direct integration between knowledge gained with events in life. Physics examines the facts and principles that exist in natural phenomena and gives insight into how to obtain those facts and principles. Any events or symptoms that occur in the field is a field of physics studies. Physics lessons are at every level of education from primary school to higher education. Physical learning is expected to help learners to understand physics concepts and principles correctly. The principle in studying physics is not enough just to memorize the concept through textbooks, learning physics is essentially a process to obtain satisfactory results. It can be done in various ways, such as observation/observation of an object or a natural phenomenon, performing measurements, completing/doing exercises, and experimenting. To realize a good and directed learning atmosphere as demanded by the 2013 curriculum requires a teaching material that can create an expected learning atmosphere because good teaching materials will produce good output as well. The teaching materials used should be able to support the learning process and in accordance with the applicable curriculum demands. Good teaching materials and quality should be easy to use and make the learning atmosphere becomes fun so learning objectives are achieved.

There are various kinds of teaching materials that can be used in the learning process. The student's worksheet is a type of printed material that is often used by educators in the learning process. Students worksheet is not made by educators themselves but using students’ worksheet that bought in the market. The appropriateness of students’ worksheet is a form of achievement of physics learning objectives. However, the fact that the students' worksheets used so far has not made according to principles of students’ worksheet development and the curriculum. Students worksheet is one learning resource that can be developed by educators as facilitators in learning activities [1]. The prepared students' worksheet can be designed and developed in accordance with the conditions and situation of the learning activities to be faced. Students worksheet is a sheet of tasks that must be done by learners [2]. Activity sheets are usually instructions, steps to complete a task. The advantage of using students’ worksheet is to facilitate educators in carrying out learning, and learners will learn independently and learn to understand and run a written task. Students worksheet contains a set of basic activities that must be done by the learners to maximize the understanding in the effort to form basic skills according to indicators of achievement of learning outcomes that must be pursued [3]. Efforts to improve students 'creative thinking ability in Physics Science subjects is a must for teachers who can be used to improve students' ability to think creatively by applying the concept of learning with metaphorming.

Metaphorming is an activity that refers to the act of changing something from the state of matter and the meaning of that one other situation. In the learning process, all parts of the brain must be developed and connected. Conditions connected between these cells is the power of the brain. Herein lies the importance of metaphorming applications in learning. Metaphorming is an activity that refers to activities that change something from the state of matter and meaning that one other situation [4]. According to their origin, metaphorming comes from a meta word meaning transcending beyond the
real world, and the phora word associated with the transfer. Metaphorming begins by transferring new meanings and associations of an object or idea to another object or idea. Metaphorming is not just a new word to describe thinking but also a way of thinking and creating more deeply. Metaphorming is the next generation of brainstorming that takes a one-dimensional representation and turns it into a multi-dimensional [5]. Metaphorming tries to dig who he is with his brilliant ideas. In order to achieve this, there are four stages in the process of metaphorming to be taken are connection, discovery, creation, and application [6]. Based on the description above then conducted a characteristic analysis of learners in developing students’ worksheet physics-based learning approach Metaphorming in SMA N 1 Gunung Tuleh.

2. Research Method

Type of research used is qualitative research with descriptive method. The steps in this study were to analyze, review and revise the items, conduct tests, follow up and interview the learners, conduct a final analysis for the production of the final results. Field trials were conducted at SMA N 1 Gunung Tuleh. While the data used in this study is the primary data obtained through the questionnaire analysis of learners as well as interviews with some students and secondary data obtained through library research by collecting data relevant to the theme of research. In general, the method of collecting data in the form of a questionnaire/survey. Questionnaires conducted by researchers to get initial data creative thinking ability of learners.

The questionnaire analysis technique used is the Likert scale, because the questionnaire aims to the extent to which learners accept or reject the given statement. The Likert scale is a statement or question whose answer is a scale of approval or rejection of a statement or question [7]. Acceptance or rejection of a statement is expressed in consent which starts from strongly disagreeing, disagreeing, agreeing and strongly agreeing. The question form is created in the form of positive statements. A positive statement is a statement whose answer is in line with the researcher's expectations. The scale of respondents' answers is qualitative in the form of ordinal scale [8]. Conditions convert for positive statements as follows:

1 = Strongly disagree
2 = Disagree
3 = Agree
4 = Strongly agree

Categories of competency learners obtained by calculating the score obtained by each respondent. Scores for each respondent were obtained using the equation:

$$S_k = \frac{\sum X_i}{X_{\text{max}}} \times 100\%$$  \hspace{1cm} (1)

where: $S_k$ is the score obtained, $X_i$ is the score of each respondent and $X_{\text{max}}$ is the maximum score of the questionnaire for each indicator.

Furthermore, scores obtained from each descriptor performed data analysis. Data analysis to assess the competence of learners for each indicator using the provisions in Table 1.

| No | Category      | Values Obtained from Questionnaire               |
|----|---------------|--------------------------------------------------|
| 1  | Height        | Over 80 ($S_k > 80$)                             |
| 2  | Medium        | Over 60 and less than 80 ($60 < S_k \leq 80$)    |
| 3  | Low           | Over 40 and less than 60 ($40 < S_k \leq 80$)    |
| 4  | Very Low      | Less than 40 ($S_k \leq 40$)                     |
3. Results and Discussion

Results the research obtained from the questionnaire of students' analysis and literature study is to determine the aspects of creative thinking ability of learners that need to be analyzed. The aspects of creative thinking ability include aspects of thinking fluency (fluency), the aspect of flexible thinking (flexibility), aspect thinking original (originality) and aspect of thinking detailed (elaboration). The results obtained from the analysis of learners using the instruments developed are as follows:

3.1 The aspect of Thinking Fluency (Fluency)

Based on the instrument lattice that has been developed the results of preliminary analysis shows that the ability to think creatively students for the thinking (fluency) aspect is 55.29 %. The average value for the aspect of thinking fluency (fluency) is still low category with an average value Over 40 and less than 60 (40 <$Sk ≤ 60$).

3.2 The aspect of Flexible Thinking (Flexibility)

The instrument developed by lattice initial analysis results indicate that the creative thinking ability of learners for the flexible thinking (flexibility) aspects is 52.4%. The average value for the aspect of thinking flexible (flexibility) is still low category with an average value Over 40 and less than 60 (40 <$Sk ≤ 60$).

3.3 The aspect of Original Thinking (Originality)

Grating instruments developed by preliminary analysis shows that the creative thinking ability of learners for the original thinking (originality) aspects is 45.43%. The average value for the aspect of original thinking (originality) is still low category with an average value Over 40 and less than 60 (40 <$Sk ≤ 60$).

3.4 The aspect of Thinking Detailed (Elaboration)

Instruments developed by lattice preliminary analysis shows that creative thinking ability of students to think detailed (elaboration) aspects are 50.72%. The average value for the aspect of thinking detailed (elaboration) is still low category with an average value Over 40 and less than 60 (40 <$Sk ≤ 60$). Analysis of creative thinking ability of students seen from four indicators, fluency, flexibility, originality, and elaboration. The results of the questionnaire can be seen in Figure 1.

![Indicators of Creative Thinking Skills](image)

**Figure 1.** Results Questionnaire Analysis of Creative Thinking Ability Students

Based on data analysis of learners above can be concluded that the need to develop a students worksheet of physics learning with the Metaphorming approach to improve the ability of creative thinking appropriate with characteristics of learners in SMA N 1 Gunung Tuleh.

4. Conclusion

To achieve the purpose of education in learning requires an analysis of the initial competencies possessed by learners so that learning takes place in accordance with the characteristics of learners. Early competency analysis of learners is needed to determine what is needed in learning. This is done so that the learning according to the characteristics of learners. One of the needs in learning is teaching
materials in the form of students’ worksheet the development of instructional materials in the form of school students who can improve students’ creative thinking ability in accordance with the demands of Curriculum 2013. Thus, the competency analysis of learners is needed in designing teaching materials in the form of students’ worksheet. This analysis aims to obtain initial data creative thinking ability of learners. The competence of creative thinking ability of learners that need to be analyzed includes three aspects, namely the aspect of thinking fluently, the aspects of flexible thinking, the aspect of original thinking and the aspects of thinking in detail. Each of these aspects will be divided into several indicators and the descriptor on the questionnaire. The results obtained will be the basis of the author to design and develop teaching materials in the form of students’ worksheet learning.

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