Development of contextual teaching and learning based science module for junior high school for increasing creativity of students

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Abstract. The purpose of this research are to analyze the the properness of contextual teaching and learning (CTL)-based science module for Junior High School for increasing students’ creativity and using CTL-based science module to increase students’ learning creativity. Development of CTL-based science module for Junior High School is Research and Development (R&D) using 4D Model consist of 4 steps: define, design, develop, and disseminate. Module is validated by 3 expert validators (Material, media, and language experts), 2 reviewer and 1 peer reviewer. Based on the results of data analysis, it can be concluded that: the results of the validation, the average score of CTL-based science module is 88.28%, the value exceeded the value of the cut off score of 87.5%, so the media declared eligible for the study. Research shows that the gain creativity class that uses CTL-based science module has a gain of 0.72. Based on the results of the study showed that CTL-based science module effectively promotes creativity of students

1. Introduction

Students need an understanding of concepts related to activities in everyday life. One science learning approach to link material to the real situation of students in the life of the community in which they will work and live is a contextual approach [1].

Based on preliminary study that researchers do through interviews in science teachers, observation of the learning process of science and questionnaires to 24 students in SMP Takmirul Islam Surakarta obtained: (1) Students assume that studying science too much mathematical equations. (2) Students are less enthusiastic and passive when learning science. (3) Students assume that science learning activities are always done in the classroom. (4) Students are less active to ask the teacher if they have difficulty in learning science. Students are less active in group discussion activities. (5) Students do not actively give responses, thoughts or even ask about the phenomena displayed by the teacher. (6) Students are less brave in the presentation of the work, the teacher must appoint one of the new group one of the group representative students willing to present. (7) Students feel less enthusiastic in working on science problems. (8) Teachers have not given direction to students to formulate conclusions in accordance with the material that has been studied. (9) Teachers are still lacking in applying authentic assessment because it only focuses on the activities of students in doing the questions. To overcome these problems, it is necessary to innovate in student-oriented learning. This change of learning should lead students to find the concept independently, shaping students to be
active and creative. Creative thinking skill makes students are motivated to put forward their best ideas [2].

This study is a CTL learning model which is a combination of CTL learning model according to Jhonson, Blanchard, and Sounders which consists of ten components with the following components: Constructivism, questioning, experiencing, inquiry, learning community, modeling, self learning, critical and creative thinking, reflection and authentic assessment.

CTL as a teaching-learning concept that helps teachers and students connect the material learned with everyday life [3]. The point is that individuals do, in fact, construct conceptions of knowledge and knowing from their participation in daily activity [4]. The application of the Lesson Study-based CTL approach can improve students' physics learning outcomes with low, medium and high ability level in SMPN in Padang [5].

2. Methods

This research uses research and development method aimed to know the feasibility of CTL-based science module for Junior High School and to improve student creativity after using CTL-based science module for Junior High School developed. The model used as the basis for the development of CTL-based science module for Junior High School is the result of adaptation of 4-D model proposed. The learning of CTL-based science module for Junior High School should be tested to see its feasibility and effectiveness in enhancing creativity. This research was conducted at SMP Muhammadiyah 1 Surakarta in the academic year of 2016/2017. The subjects of this study were students of class VIII amount 23 students. The subjects are homogen. The dependent variable in this research is creativity of students and independent variable is CTL model. Science materials used as media are light reflecting materials. Technique of data collecting at trial conducted by observation of learning process, questionnaire creativity of students. The data obtained are qualitative data and analyzed quantitatively. The effectiveness of CTL-based science module for Junior High School in improving creativity of students is measured using factor gain (N-Gain). Base on the indicator of the success of this research and development is the increase of gain results of the analysis of the score before and after the activity at least middle brawl. This means that if the gain obtained more than 0.3 then the CTL-based science module for Junior High School is said to effectively improve creativity of students. If this is not the case, then the CTL-based science module for Junior High School has not been said to effectively improve creativity of students.

3. Result and Discussion

3.1. The feasibility of CTL based junior science module

The feasibility of CTL-based science module for Junior High School has been tested through the validation. The developed learning modules are eligible based on the validation results of the validators, among others:

a. Material experts, including: material coverage, material accuracy, and contextuality, material presentation techniques, and supporting material presentation.

b. Media experts, including: cover design, content design and module size.

c. Language experts, including: suitability of writing, straightforward, communicative and interactive, language appropriateness with the development of learners, and consistency of terms or symbols.

d. Reviewers and peer reviewers, including material components, presentation of learning, language, and graphics.

Validation results from validators in the form of quantitative and qualitative assessment. Quantitative assessment is obtained from questionnaire validation based on indicators. Qualitative assessment of suggestions and recommendations of validators is to correct deficiencies of CTL-based science module for Junior High School. The result of the assessment of the feasibility of CTL-based science module for Junior High School is determined by the cut off score method on the percentage of validation of the validation result. The result of the cut off score method is shown in table 1.
Table 1. Results of cut off score analysis

| Validator       | Ideality (%) |
|-----------------|--------------|
| 1. Media expert | 96.67        |
| 2. Material expert | 91.67      |
| 3. Language expert | 78.33      |
| 4. Reviewer     | 91           |
| 5. Peer reviewer | 83.75       |

Maximum Value 96.67
Minimum Value 78.3
Natural Cut off Score 87.5
Average Value 88.28
Results Feasible

Table 1 shows that the lower limit score of the assessment is 87.5%, while the mean score of the percentage of the evaluation result of CTL-based science module for Junior High School to improve creativity of students on light reflectance subjects for class VIII is 88.28%, so it can be concluded that the CTL-based science module for Junior High School is feasible to use. According to the results, CTL-based science module for Junior High School to improve creativity of students on light reflectance subjects for class VIII is feasible to use but still requires improvement based on suggestions and recommendations from the validators. Recommendations and suggestions from validators are a form of assessment of the qualitative learning module used for revision. Revisions are made to make the module better and match the module criteria.

3.2. Creativity of Student

Creativity of students in following the learning process using CTL-based science module for Junior High School is measured using observation sheet and questionnaire. Methods of observation and questionnaire were conducted in class VIII and performed before and after students using CTL-based science module for Junior High School. The assessment of creativity in the observation sheet of the learning independence aspect is spelled out into two indicators (Be creative in learning and effort in doing task) each indicator is spelled out into two points of assessment. The learning activeness aspect is spelled out into three indicators (Ability to solve problems, ability to find alternative answers, and ability to provide ideas or opinions) the indicator is split into four points of assessment. Assessment of the observation sheet on student learning creativity was shown in Table 2.

Table 2. Observation results creativity of students

| Creativity     | Score | Category     |
|----------------|-------|--------------|
| Initial Creativity | 56    | Good enough  |
| Final Creativity   | 88    | Good         |
| Gain factor       | 0.73  | High         |

Table 2 shows the average score of creativity of students who obtained before attending learning using CTL-based science module for Junior High School is 56 with good enough criteria. After the students follow the learning using CTL-based science module for Junior High School average score creativity of students is 88 with good category. With N-gain of 0.72 which is high. Based on the table above, it can be seen that there is an increase student’s creativity before and after using CTL-based science module for Junior High School during the learning process. Performance Assessment puts students in real contexts so that learning is easier for an authentic destination. Performance behaviour demonstrated work habits, caring for the timeliness and quality of the work, responsibility, able to work together in groups, task management, systematic, attention to safety, all components can be assessed using observational format [6].
Figure 1 shows the average percentage graphic observation creativity of student. The initial creativity of students is 56% before using CTL-based science module for Junior High School and the final creativity of the students is 88%, so that creativity of students increased by 32%.

Based on the picture above, it can be seen that there is an increase creativity of students before and after using CTL-based science module for Junior High School. During the learning process after the students follow the learning using CTL-based science module for Junior High School the student becomes active in expressing his thoughts in questioning component, students can explore in the school environment and link their knowledge to solve problems in experiencing component. Students conduct experiments in a group to collect data through measurement, make table and input data, analyzing data, draw a graph and make conclusion in inquiry component. The level of student creativity provides a real role in problem-solving skills in science lessons. The learning process in the context of contextual learning is helpful for knowing student creativity, in the context of investigation, exploration, collaboration, critical and creative thinking [7].

Assessment of creativity in the questionnaire as aspects creativity of students was measured, among others, the independence of learning and activeness in learning. The aspect of learning independence is spelled out into two indicators, and activity in learning is spelled out into three indicators. The data of the average score of creativity of students before and after following the learning using CTL-based science module for Junior High School presented in Table 3.

Table 3. Questionnaire results creativity of students

| Creativity       | Score | Category       |
|------------------|-------|----------------|
| Initial Creativity| 92    | Good enough   |
| Final Creativity  | 141   | Very good     |
| Gain factor      | 0.72  | High          |

Table 3 shows that the average initial creativity of students score who obtained before attending learning using CTL-based science module for Junior High School is 92 with good enough criteria, and the average final creativity score after the students follow the learning using CTL-based science module for Junior High School is 141 with very good criteria. The calculation result with N-gain score is 0.72 and included in the high category increase. Based on the table above, it can be seen that there is an increase creativity of students before and after using CTL-based science module for Junior High School during the learning process. Contextual learning makes students discuss with their group members and do not always ask the teacher, and also follow the learning activities well in the group discussion [8].
Figure 2. The average percentage graphic questionnaire creativity of students

Figure 2 shows the average percentage graphic questionnaire creativity of students. Based on the figure 2 the initial creativity of students before using CTL-based science module for Junior High School is 58% and the final creativity of the students after using CTL-based science module for Junior High School is 88%, so that creativity of students increased by 30%.

Based on the picture above, it can be seen that there is an increase creativity of students before and after using CTL-based science module for Junior High School. During the learning process after the students follow the learning using CTL-based science module for Junior High School the student becomes active make small groups in learning activities as group discussion in learning community component. Students do self-learning to solve problems with acquired knowledge, they understand the examples given in the module and then presenting to the front of the class in modelling component. the creativity of the students in solving the problem depends on the experience of students in learning. The more students experience in learning the more creative the students are also in solving the problem [9].

Figure 3. The average percentage graphic aspects of creativity

Figure 3 shows that the average percentage graphic aspects of creativity, the initial aspect of students independence learning before using CTL-based science module for Junior High School is 62%, after using the CTL-based science module for Junior High School independence learning become 90%, so aspects creativity increased by 28%. The aspect of activity learning of students before using CTL-based science module for Junior High School is 55%, after using CTL-based science module for Junior High School activity learning of students become 86%, so aspects creativity increased by 31%.
Students with an interest in science participating in small-scale research projects provide a useful experience for their daily lives [10].

Result of creativity of student initial and final after student learn to using CTL-based science module for Junior High School then determined big N-gain score to see module effectiveness. The determination of the creativity of students improvement using the N-gain score criteria presented in Table 4.

Table 4. Creativity improvement criteria based on N-gain score

| Average Creativity | N-gain score | Criteria |
|--------------------|--------------|----------|
| Initial 57%        | Final 88%    | 0.72     | High     |

Table 4 shows that the results of data analysis, the average creativity of students before using the CTL-based science module for Junior High School by 57%, while the creativity of students after the CTL-based science module for Junior High School is 88%. The calculation result with the N-gain score is 0.72 and is included in the high category increase. Based on these results can be concluded that creativity of students increased after learning by using the CTL-based science module for Junior High School. Therefore, the CTL-based science module for Junior High School is effective to improve creativity of students.

Learning creativity is very important in contextual based teaching science, because students are required to connect the learning that has been provided with the knowledge that students have from their daily experience. Science education should be done with an open approach, namely by encouraging learners to form their own hypothesis and build the design experiment [11]. The CTL-based science module for Junior High School can improve creative thinking of student. Students allows to systematically study the problem, deal with challenges in an organized way, formulate innovative questions, and design original solutions.

4. Conclusion
The results of the validation, the average score of contextual the CTL-based science module for Junior High School is 88.28%, the value exceeded the value of the cut off score of 87.5%, so the media declared eligible for the study. Research shows that the gain creativity class that using the CTL-based science module for Junior High School has a gain of 0.72. Based on the results of the study showed that contextual the CTL-based science module for Junior High School effectively promote creativity of students.

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