



The Influence of Project-Based Learning Model to Improve Students' Creative Thinking on Colloid Subject

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Abstract

Creative thinking skill plays important roles in developing student's creativity in solving problems. This study aims at investigating the influence of project-based learning model in improving students' creative thinking on colloid subject. This study used experimental one group (pretest-posttest) design. 38 students were involved in this study as the samples. According to the analysis results, the N-gain score of the students' creative thinking skill was 0.72 (high). The analysis showed that project-based learning model gave significant improvement, and the students showed very good response to project-based learning model. Therefore, the model is recommended to be applied in schools.

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INTRODUCTION

Chemistry is an issue closely related to environment (Supardi & Luhbandjono, 2016). Understanding chemistry is also needed in social life. Chemistry subject, such as colloid, is applied in daily life and industry. An example of its application is air freshener, which requires deep understanding of chemistry concept.

Learning process can develop students' skills following the time demands. One of the skills required in the 21st century is creative thinking as it will increase competitiveness in order to get opportunity for better life (Abidin, 2015; Redhana, 2015). Regarding that fact, it is critical for teachers and future teachers to develop students' creative thinking in teaching and learning. Based on the observation results in SMA N 12 Semarang, it is reported colloid subjects are given in lecture, question and answer session, discussion, and exercises – project-based activities and creative thinking have not been optimally developed.

The subject taught focus on the preparation of national examination by doing exercises a lot. The subject on types of colloid is only studied based on gas, liquid, or solid phases – the students only learn by memorizing – without understanding deeply what substances are contained and how their relationship forms colloid.

According to the fact above, it is needed to apply learning model which facilitates students in actively constructing knowledge and developing their creative thinking. The model is expected to eventually improve students' creative thinking.

One of the learning models which can be used is project-based learning (PjBL). Based on the definition given by the Ministry of Education and Culture in 2013, project-based learning is a learning model focusing on students (student-centered active learning). Trianto (2014) affirms that project-based learning is an innovative learning focusing on students (student-centered), and teachers function as facilitator and motivator in which students are autonomously given working opportunities to construct their learning. In addition, it is a learning model developing student creativity in collaboration work through real-life projects and student performance in

various perspectives in social activities (Zhou, et al., 2012; Damayanti, et al., 2014; Wekesa & Ongunya, 2016).

Project-based learning can be used as an alternative of innovative learning model in chemistry subject. The application of project-based learning requires several stages. The initial stage is determining basic questions leading to a product created by the students as a final stage.

Stages of project-based learning can provoke student's creativity in creative thinking leading to a product and improve student's response, self-management skill, demonstration skill, and self-evaluation skill (Sugiastini, et al., 2013). It is in accordance with Woro (2015) that project-based learning is a constructive approach and student-centered so that it allows knowledge application in real-life situations. According to (Munawaroh, et al., 2012), the application of project-based learning prompts 4 student principles: learning to know, learning to do, learning to live, learning to be.

Therefore, this study investigates project-based learning model in colloid subject. It aims at allowing the students actively learn and explore problems or phenomena related to colloid concept in real-life situation and finally create useful product. The model is expected to stimulate the students to think creatively in constructing, reasoning, and imagining the concept of colloid.

RESEARCH METHOD

This study was conducted in SMA N 12 Semarang on colloid subject. Population of this study refers to the 11th grade students of SMA N 12 Semarang in the 2017/2018 academic year. The samples were taken through simple random sampling. The samples consisted of 38 students, and this study used pre-experimental one group (pretest-posttest) design.

The free variable of this study is project-based learning model, and the independent variable of this study refers to creative thinking skill. Meanwhile, the control variable of this study is learning material, curriculum, and learning hours.

The data was collected through questionnaires, observation, and documentation. Written test in the form of open-ended question was used to uncover the data of students' creative

thinking. Questionnaires was also employed to reveal students' response to the application of project-based learning, carry out assessment of the learning model, and unveil attitude aspects. The documentation involved list of the students, number of the students, and all data needed in this study. The data of creative thinking was then analyzed by using test of N-gain improvement to find out whether there was skill improvement in students' creative thinking.

RESULTS AND DISCUSSION

This study uses project-based learning to improve creative thinking skill in learning colloid subject. Creative thinking skill can be measured from open-ended questions created by the teacher in project-based learning model. The students' answers can be used to represent their creative thinking skills so that it can be developed through the application of project-based learning.

The first stage in applying project-based learning is giving basic questions on colloid subject by assigning the students to find a topic related to real-life situation and investigate it to be further presented.

The students' creative thinking skill can be measured from their answers on post-test consisting of open-ended questions. The test result is then elaborated holistically in detail in the form of creative thinking skill.

Improvement of creative thinking skills is illustrated based on N-gain score. The improvement is measured from the condition before and after learning model is applied. The implementation of project-based learning encourages the students to be more creative, and it is in accordance with Aisyi's, et al., (2013) study stating that project-based material stimulates students to be more creative and innovative. The students design the activities on which they will work with their group members.

Project-based learning gives the students opportunities to determine the relationship between propositions and ideas used to solve the problems more creatively (Wahida, et al., 2016). The result from Yunianta, et al., (2012) study states that there is improvement of creative thinking skill on the indicators of awareness,

building knowledge, developing information, and inventing ideas.

The result of final post-test data analysis on creative thinking skill shows there is significant improvement of creative thinking skill in which average score of experiment group is higher than that of control group. The result of pre-test and post-test is presented as follows.

Table 1. Average score of pre-test and post-test and N-gain

Class	N	Average Score		N-gain
		<i>Pre test</i>	<i>Post test</i>	
Experiment	38	27.61	80.05	0,72

The improvement of the students' creative thinking skill is measured from the analysis of N-gain score from pre-test and post-test, in which the N-gain score is 0.72 (high).

Descriptive analysis of the students' attitude score is gained from average score of attitude aspect based on the observation during the learning activity.

The average aspects of attitude observation include 8 aspects with average attitude 3.60 (very good category). The application of project-based learning catches the students' interest in learning, paying attention to the teacher and the tasks assigned. Cooperation between students is also established between groups to produce projects with full responsibility and discipline to complete the projects on time.

The application of project-based learning, in addition, encourages students in asking and answering questions at the project activity stage, being active in presentation of project results and evaluating experience. Study conducted by Insyasiska, et al., (2015) shows that project-based learning raises curiosity, intrinsic motivation so that students can exchange experiences in learning directly to get information they need to master.

The result of the students' attitudes obtained based on the observation during learning process shows that the application of project-based learning has positive impact on students' attitudes because they have opportunities to actively participate during learning, and the students can learn to solve problems honestly, critically, openly and collaboratively. Mahanel, et al., study (2010) shows that project-based learning is effective in

improving attitudes and learning outcomes. Thus, the model is recommended to be applied.

The application of project-based learning, moreover, can develop honest attitude in writing the results of the experiment and solving the questions given. Collaboration can also be developed during group learning in completing the projects. Curiosity, respect for the other's opinions, presentation and discussion can also encourage the students' attitudes to ask and answer questions.

Project assessment can be carried out by monitoring the students' activities in the process of project learning which involve report components, product authenticity, group participation, time management of project completion, and presentation. The project carried out by the students is based on project-based teaching materials: investigation project of recognizing colloid by writing reports, making presentation media on the functions of colloid, and making air freshener

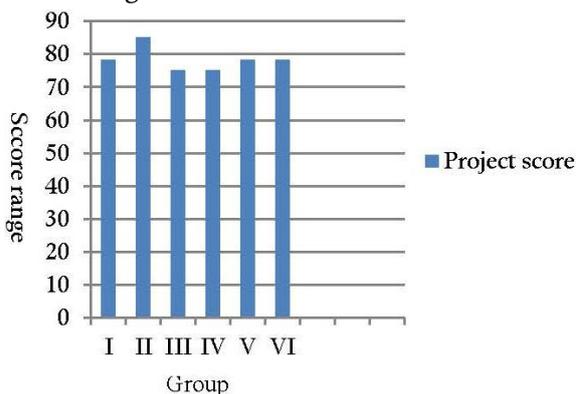


Figure 1. Project score of group work

The figure shows that all groups have been able to solve the project well, in addition to be able to work in group and write report.

All groups are able to arrange the project components well, write the report, submit the product on time, and present the results.

The students are given 20 questions regarding motivation, cooperation, mastery of the subject, the ability of questioning, presentation, and reward after the application of project-based learning model on colloid subject and its application. Based on the questionnaire analysis on the students' responses in the application of project-based learning, the students dominantly agree and strongly agree – considered positive

response to the application of project-based learning model on colloid subject. The students are motivated to work cooperatively in group, easily master the material, feel confident to ask questions and respond to peers' answers during presentation session, and become more enthusiastic in learning because of the rewards given during the learning process. This is because the stages in project-based learning involve many students in designing project plans, preparing project schedules, making projects with groups, testing projects and evaluating experiences. Therefore, the students are more challenged to complete the project for maximum results.

CONCLUSIONS

According to the results of this study, it can be concluded that the project-based learning model influences the ability to think creatively and can improve the ability to think creatively based on N-gain score (increase of 0.72). Aspects of students' attitudes in applying the PjBL model show very good result, and all groups are able to compile project components properly in their groups, complete the project report, submit the product on time and perform good presentation. In conclusion, project-based learning model is recommended to be applied in schools

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