

Project Based Learning Using Ethno-Stem Approach: Improving Creative Thinking Skill of Pharmacy Students at Medical Vocational High School

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Abstract. This study aims to determine the application of PBL learning with an Ethno-STEM approach and to increase the creative thinking skills of health vocational students in Cirebon. The method used in this research is pre-experimental method and descriptive method. The research sample used in this study was one class from five existing classes, namely class X pharmacy with a total of 35 students by purposive sampling. This study uses observation techniques, written tests, questionnaires, and documentation for collecting data. The data analysis technique used the classical assumption test including the normality test, homogeneity test, and the Normalized Gain (N-gain) test. The results showed that the highest pre-test score was 32.18 and the lowest score was 10.11 with an average value of 21.19. Meanwhile, the post test results obtained the highest score of 95.23 and the lowest score of 49.13. This means that there is an increase in creative thinking skills after the learning. The value of the N-gain of first improvement is in flexible thinking skills which is 70.95% in the medium category, the second improvement is the ability to think fluently with an N-gain of 69.65% in the medium category. The third improvement is original thinking skills with an N-gain value of 69.50 in the medium category. The fourth improvement is the skill of thinking in detail (elaboration) with an N-gain value of 67.37 in the medium category. Finally, the increase in evaluation thinking skills gets an N-gain value of 59.20 in the medium category. Based on the results of the study, it can be concluded that the PBL learning model with the ETNO-STEM approach improves students' creative thinking skills.

Key words: Project Based Learning; Ethno-Stem Approach; Creative Thinking Ability

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INTRODUCTION

The industrial revolution has now entered a new phase namely the industrial revolution 4.0. Facing this great challenge, the world of education is required to change by applying 21st century learning (Wrahatnolo & Munoto, 2018). 21st century learning is expected to bring active and creative students. The Minister of Education and Culture formulated that the 21st century learning paradigm emphasizes the ability of students in several skills, namely creative, critical, productive, independent, collaborative, and communicative (Mendikbud, 2016). The independent curriculum that is currently being echoed plays an important role in the educational paradigm, especially on how is the role of teachers in creating a learning atmosphere that suits the needs of students in the context of independent learning (Culture, 2022). Teachers must be able to create a conducive classroom atmosphere so that the learning achieves its goals and makes students motivated in understanding the material. Teachers must be able to think of the best solutions in solving problems that arise, such as deciding the right model and approach in the learning process, learning strategies, and

assessments that are appropriate with student needs and student learning outcomes that are as expected in terms of attitudes, knowledge, and skills in improving the quality of education. In other words, teachers must be able to implement the learning goals suitable with the needs of students in the current era who are able to think creatively and critically in cultivating independent learning in their classrooms. Teachers are given the freedom to think creatively and critically in determining the right and strategic steps so that they can answer all the challenges and problems of education today. Creative thinking skills can be constructive based on data, information, existing elements, and as a manifestation of perceived problems, resulting in useful solutions (Proctor, 2020) (Palmiero et al., 2020).

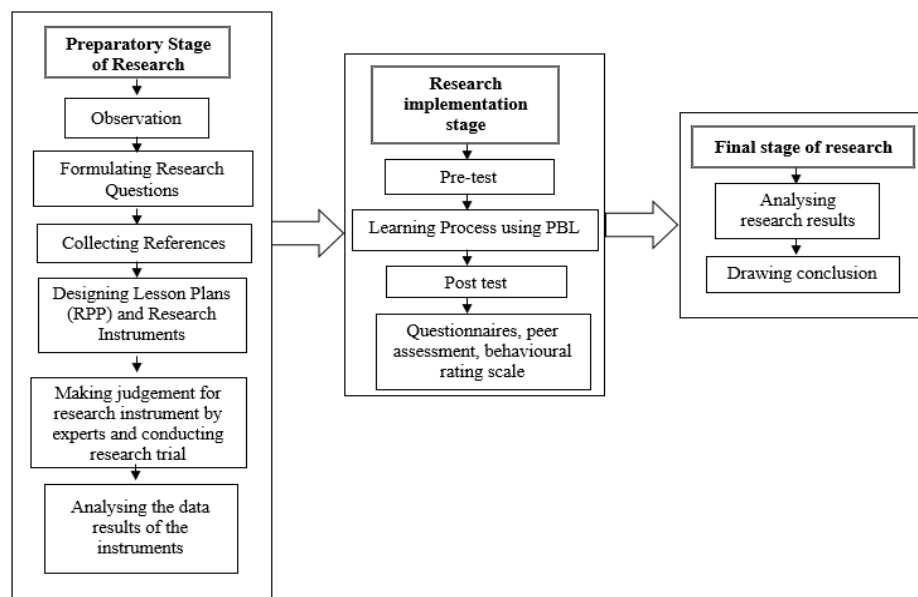
One of the appropriate learning models at vocational high school is the Project Based learning (PBL) learning model, because project based learning is a learner centred learning model to conduct an in-depth investigation of a topic (Sudjimat et al. al., 2020). Students constructively carry out deep learning process using a research-based approach to solve serious, real, and relevant

problems and questions. Project Based learning is a student centred learning model in conducting an investigation of a topic, investigating in solving problems and finding the right solution in producing products that match the talents and interests of students (Dag & Durdu, 2017). In the project based learning model, students explore, assess, interpret, synthesize, and process other information to produce various forms of learning that are very close to real work in the field (Ferreira & Canedo, 2020). These activities are carried out by students collaboratively and creatively. This Project based learning (PBL) learning model can be integrated with the existing culture around the student or school environment. This study applies the PBL model with an Ethno-STEM approach. The selection of the Ethno-STEM approach was based on the popularity and interest in the learning approach through the integration of Ethno-science and Science, Technology, Engineering and Mathematics (STEM) (Agussuryani PH et al., 2020) (Sudarmin

et al., 2019) (Kang & Peters, 2019). The Ethno-STEM approach is a learning approach that uses an interdisciplinary approach where it can be applied through problem-based active learning or project-based learning (Han et al., 2016) (Capraro et al., 2013) (Reffiane et al., 2020).

METHOD

The method used in this research is pre-experimental method and descriptive method. This method is used to describe the impact of implementing the PBL Learning model with the Ethno-STEM approach to improve the creative thinking skills of Medical Vocational High School students. The research design used is The One-Group Pre-test-Post-test Design. The population in this study were all students of class X Health Vocational School in Cirebon Regency for the academic year of 2021-2022. The research sample used in this study was one class from five existing classes, namely class X pharmacy with a total of 35 students by purposive sampling.



Picture 1. Research Procedure

Preparatory Stage of Research

This stage begins with conducting a literature study to obtain an accurate theory regarding the problems. Then curriculum review on the subject matter that would be used as learning material in research was conducted to find out the objectives, competency standards and basic competencies need to be achieved. After that the school would be used as a place for conducting research was determined followed by contacting the school and contacting the Biology subject teacher at the

Health Vocational School in Cirebon. Survey was done to carry out a preliminary study of vocational biology subject teachers in the school where the research was conducted, this was done to determine the condition of students in the school where the research was carried out. The conditions in question are the available facilities and infrastructure, the condition of the learning system and the implementation of learning biology subjects at the school. Additionally, determining the research sample, designing

Lesson Plans (RPP), and developing research instruments were also done in this stage. With regards to the research instrument, consulting and judging research instruments to expert lecturers to measure the validity of the instrument were carried out. Testing research instruments that have been judged to measure the level of difficulty, discriminatory power and reliability of the instrument was also done. Analysing the test results of research instruments, then determining questions that are worthy of being used as research instruments were also performed in this stage. Lastly tools and materials to be used for research were prepared.

Research implementation stage

Firstly, a pre-test in the experimental class was carried out. This aims to determine students' initial creative thinking skills. After that, the experimental class was given a treatment by applying a project based learning model with an Ethno-STEM approach. During the learning process, the observer observed the implementation of the biology learning stages. After that, a post-test was carried out in the experimental class to determine the result of project based learning with the Ethno-STEM approach. Peer assessment questionnaires were conducted to find out the activeness or contribution of the students to their group members during the learning process with criteria for creative thinking skills and group collaboration.

Final stage of research

The results were obtained through the data processing and they were analysed and discussed. Conclusions were drawn based on the results

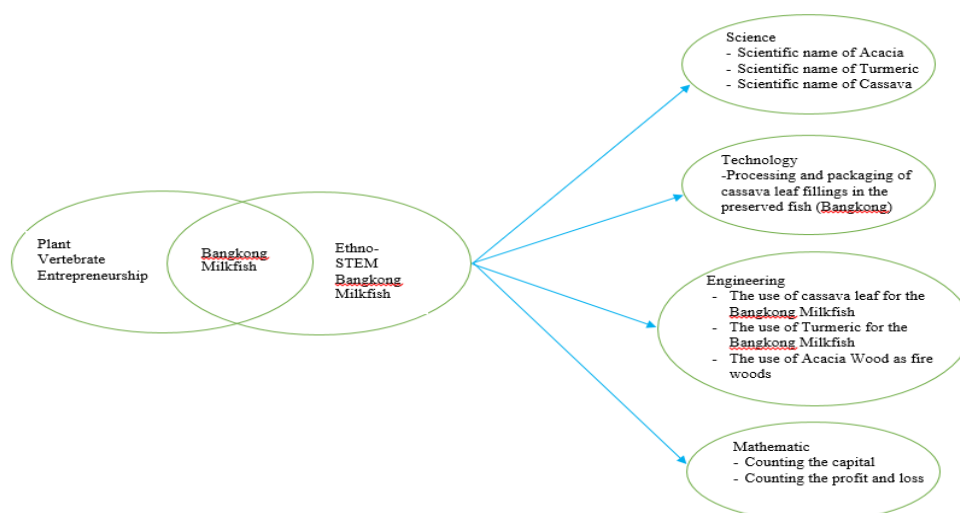
obtained from data processing. After that, conclusions and suggestions for the shortcomings that became obstacles in the implementation of learning were given. Data processing started with measuring the validity, reliability, level of difficulty and distinguishing power of research test instruments was conducted.

RESULTS AND DISCUSSION

PBL with Ethno-STEM Approach

There are many varieties of typical culinary and its modifications in Cirebon. Several villages in Cirebon also have profitable business potential, one of which is Gunungsari village and Mekarsari village. Gunungsari and Mekarsari villages are villages in the Waled sub-district, Cirebon district, West Java province. Based on data from the local village government, of the six thousand residents in Gunungsari and Mekarsari villages, most of these residents are fish processed producers, called the Pindang (preserved fish) producers village as it is the main feature of the village. There is an interesting thing about the Pindang fish which is processed by most people in the village, namely the processing of pindang milkfish filled with cassava leaves called bangkong (milkfish stuffed with cassava leaves). This study was made based on the Ethno-STEM approach, where in the learning process students directly observed the field and to observe the process of making Pindang milkfish filled with cassava leaves (Bangkong) (Reffiane et al., 2021).

Learning integration scheme using Ethno-science and STEM on the Pindang Bangkong theme



Picture 2. Ethno-STEM with the theme of "PINDANG BANGKONG"

There are five indicators of creative thinking skills developed in this study including Fluency thinking skills, flexible thinking skills, original thinking skills, elaboration thinking skills, and evaluation skills. The information needed regarding changes in students' creative thinking skills is an increase in the results of the final test (post-test) compared to the pre-test that has been carried out. The results of the recapitulation of students' creative thinking skills test data obtained the highest pre-test score of 32.18 and the lowest score of 10.11 with an average value of 21.19. Meanwhile, based on the post-test results, the highest score was 95.23 and the lowest score was 49.13. This means that there is an increase in creative thinking skills after learning. It shows that Project Based learning (PBL) with the Ethno-STEM approach has good potential to improve students' creative thinking skills.

The value of the N-gain of flexible thinking skills (Flexibility) is 70.95% in the medium category, the second increase is the ability to think fluently (fluency) with an N-gain of 69.65% in the medium category. The third improvement is original thinking skills with an N-gain value of 69.50 in the medium category. The fourth improvement is the skill of thinking in detail (elaboration) with an N-gain value of 67.37 in the medium category. Finally, the increase in evaluation thinking skills gets an N-gain value of 59.20 in the medium category.

Fluency is used to measure the activity of asking and guessing the consequences of an event. The significance of this increase is due to the fact that students have found and practiced a lot in developing fluent thinking skills during the learning process. Flexibility thinking skills are used to measure activities such as generating ideas, answers and varied questions in finding solutions to a phenomenon that is presented and guessing the causes of a phenomenon that occurs. In project based learning with the Ethno-STEM approach, students are trained to have flexible thinking skills, namely the cultivation of conceptual understanding through experimental activities and making projects in presenting projects. Originality thinking skills are used to review the characteristics of the concept and predict some events. Elaboration thinking skills are used to develop existing products. Evaluation thinking skills are used to provide considerations based on their own point of view about events that will occur and find their own opinions about why a phenomenon can occur. This assessment stage is the lowest indicator because at this stage

project-based learning with the Ethno-STEM approach still gets students who are less cooperative in evaluating the project tasks carried out. Students are sometimes embarrassed and feel bad about expressing their own opinions.

CONCLUSION

The application of project-based learning with the Ethno-STEM approach improves students' creative thinking skills in Biology subjects at health vocational schools, this is indicated by the average gain score that is normalized $\langle g \rangle$ of 0.592 in the medium category.

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