

The Importance of Verification Practicum before Project Based Practicum based on Local Material in Science Education- 2020

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The Importance of Verification Practicum before Project Based Practicum based on Local Material in Science Education

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Abstract. Practical activities cannot be separated from science education. Various kinds of practical models have been developed in science education. This research was conducted to see the importance of the verification practicum carried out before the project-based practicum with local material. Implementation of research using a mixed method with embedded design. The effectiveness of the program is measured by pre-post test design. Topics implementation were done on a qualitative analysis of protein, a qualitative analysis of lipids and a quantitative analysis of proteins for verification practicum. Topics were done on a quantitative analysis of proteins, carbohydrates qualitative analysis, quantitative analysis of carbohydrates and enzyme kinetics for laboratory project based local material. The research instrument is a matter of pre-tests and post-tests that use creative thinking skills tests in the form of a description. Quantitative data analysis performed using SPSS 22.0 to see the significance of normality, the value of N-Gain. Qualitative data analysis is done through a questionnaire scale attitude. The results of the study showed that the verification practicum that was carried out before the project-based practicum with local materials had made students prepare themselves to be ready to do practical activities.

1. Introduction

In learning science, practicum is an inseparable part. Science consists of processes and products, where for science as a process, learning through practicum can increase the critical, creative and scientific attitude of students [1], [2]. Practicum will give students the opportunity to test scientific phenomena based on concepts or theories that exist in science itself. In schools, practicum is incorporated into subjects while practicum colleges will become a separate subject that supports theoretical courses [3].

Millar and Abraham [4] revealed that practicum is an essential part of science. In science lessons, we seek to expand students' knowledge of the natural world and develop their understanding of ideas, theories and models that scientists have discovered. Teaching science naturally involves students, or places them in situations where they can see with themselves.

Hofstein and Mamlok-Naaman [5] stated that practicum can develop students' skills such as: asking questions that are scientifically oriented, forming hypotheses, designing and conducting scientific investigations, formulating and revising scientific explanations, and communicating. Previously Hofstein and Lunetta [6] defined practicum as laboratory activities or practical work carried out in a laboratory.

Various learning models have been used in practicum activities such as verification, inquiry, problem based learning, project based learning or others with their weaknesses and strengths. Wenning [7] revealed that the verification model is the lowest achieving practice. In the verification



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model **students** are required to have a minimum ability and not make students achieve a creative and independent attitude at the time of practicum.

Learning outcomes in Biochemical practicum lectures, one of which is greatly influenced by the lecture model used during learning. Many lecture models on practicum activities that have been applied to previous research include, inquiry [8], [9], problem-based learning and project-based learning [10]. Based on the results of the research practicum held basically must accommodate the process of self-discovery by students which as much as possible involves thinking and motor skills.

Hsieh, Lou, and Shih [11] also Lou et al revealed that project-based lectures provide opportunities for students to do teamwork, stimulate creativity and design ideas, and in solving problems. Furthermore Cord et al. (in Wena) suggested that project-based learning is an innovative learning model, and emphasizes more on contextual learning through complex activities. The focus of learning lies in the core principles and concepts of scientific disciplines, involving students in investigating problem solving and other meaningful tasks, giving students the opportunity to work autonomously in constructing their own knowledge, and reaching its peak to produce tangible products.

In this study, researchers used a verification practicum used before a project-based practicum with local material in the Biochemistry practicum course. Combining the two practicum models is expected to be able to maximize the learning achievement of practicum subjects. Furthermore, we will see how the role of the verification practicum used before the project-based practicum with local materials in the Biochemistry practicum?

2. Method

This research method is a mixed method research [12] with the embedded design. Stages of the research include the preparation, implementation, and interpretation. Program implementation effectiveness through increased student creativity investigated by using pretest - posttest control group design [13]. Subjects of the research were 40 students who attended lectures of Biochemistry practical works. These 40 students were divided into 6 groups.

2.1. Procedure study

The biochemistry laboratory project is divided into two, first by using a verification practice and then using a project-based practicum with local materials. This research used mixed method design of embedded experimental. Stages in this study, including Preparation, at this stage, field studies, literature, design development programs of lectures Biochemistry lab-based projects with local materials, and a limited trial. Implementation Phase, at this stage using a quasi-experimental design that equivalent control group pretest-posttest design. All instruments and biochemistry lab lecture programs that have been arranged implementation class. At this stage the information obtained about the effectiveness of the program of lectures Biochemistry lab-based projects with local materials to improve student learning outcomes.

2.2. Instrument of data collecting

Quantitative and qualitative data collected Instruments of quantitative and qualitative data were used together in this study. Student learning outcomes can be seen from the tests of creativity students for the quantitative data. The instruments were 7 items of the written test in the form of descriptive items. The test was used to measure the students' creativity before and after the lectures. Each question represented the indicators of creative thinking skills, which included fluency, flexibility, novelty, and elaboration [14] within the students. The qualitative data was obtained through analysis of student responses to the implementation of the project based learning.

2.3. Data Analysis

The data was processed using SPSS 22.0 to find out if it was normally distributed. The test of creativity was calculated by finding out the value of N gain by the formula of Hake [15] of the average / mean of the pretest and posttest to see student learning outcomes.

3. Result And Discussion

3.1. Design Biochemistry laboratory

The biochemistry laboratory project in this study was designed to develop students' learning outcomes seen from the creativity test. The program includes lectures developed the syllabus and SAP for Biochemistry practicum courses, student worksheets, test evaluation tools are written in the narrative form that is used to measure mastery of concepts and creative thinking skills, creative thinking skills indicators and creative products.

Biochemistry laboratory lectures designed it has the burden of 200 minutes with the number of meetings 12 times. The topic is divided into two parts, namely the three topics to do with the model verification lab and the four topics were the implementation of project-based learning using local materials. Topics of lectures were presented namely lipid qualitative analysis, quantitative analysis of lipids, protein qualitative analysis, quantitative analysis of proteins, carbohydrates qualitative analysis, qualitative analysis of carbohydrates, carbohydrate quantitative analysis, and enzyme kinetics.

3.2. Implementation Program of Biochemistry lab lecture

Biochemistry lab lecture programs that have been designed and then further implemented. Biochemistry lab lecture program contains seven topics do with the model verification lab and lab-based model of the project with local materials. Summary of the implementation of the program of lectures Biochemistry lab work can be seen in Table 1.

Table 1. Implementation of Biochemistry Laboratorium

	Verification Lab	Project based with local materials lab
Learning Model	Verification	Project-based learning with local materials
Lab materials	Laboratory materials from distributor	Local materials
Procedure used	The procedure in this guide (cookbook)	The procedure is designed students through the study of literature
Topics	Qualitative analyses of lipids Quantitative analysis of lipids Qualitative analyses of protein	Quantitative analysis of protein Qualitative analyses of carbohydrates Quantitative analysis of carbohydrates Enzyme kinetics

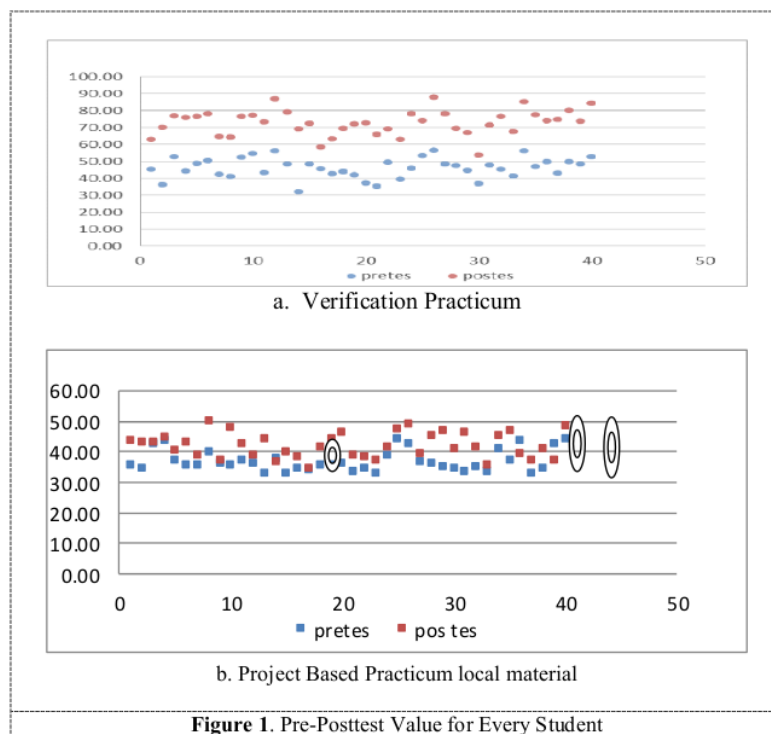
In the model verification lab, students just followed the practical guide. The title, purpose, tool materials and procedures are contained in the guidebook. Different things can be seen on the model of project-based practicum with local materials, where the title, purpose, lab materials, and procedures designed by the students. Lab materials used come from local materials around the student [16].

Furthermore, the effectiveness of PjBLLM's Biochemistry practicum lecture program can be seen from the results of student learning after the implementation phase. Measurement of student learning outcomes after the PjBLLM Biochemistry practicum lectures is done through the pre-posttest results of creative thinking skills. The results of the study provide information that lectures on Biochemical Practicum PjBLLM can improve student learning outcomes. In the PjBLLM Biochemical practicum lecture, the average pretest score was 46.21 while the posttest average score was 74.84. Increasing

student learning outcomes is equivalent to achieving an average value of $\langle g \rangle$ of 0.53 with the medium category.

Different things can be seen in the Biochemistry practicum with the verification model. The average score of students' creative thinking skills pretest was 37.25 while the average value of posttest was 42.30. The average value of $\langle g \rangle$ for the subject of the practicum with the verification model is 0.08 with a low category. This is something that can be accepted, students can answer well if during practice creative thinking skills have been trained or developed. The pre-posttest results of each student in the PjBLLM Biochemical practicum and the Biochemistry verification practicum can be seen in Figure 1.

Figure 1 provides information about the pre-posttest value of creative thinking skills obtained by each student in both practicum models. The PjBLLM Biochemical Practicum (Figure 1.a) showed a significant increase in the posttest score. PjBLLM Biochemistry practicum is able to build student learning outcomes not only in high category students but in all categories of students. This is consistent with the opinion of Şener, Türk, and Taş [17] who concluded that activities involving hands-on activities can improve learning outcomes that also develop creative thinking skills. In this research practicum activities developed in the learning process involve hands-on activities for students. The creative thinking skills acquired by students in this study are also caused by the use of local materials. Several studies have revealed that project based learning allows students to link learning to the environment of everyday life of students [18].



The Biochemistry Practicum verification (Figure 1.b) also shows an increase in the pre-posttest scores achieved by each student, but the improvement achieved seems insignificant. This can be seen from the $\langle g \rangle$ value of 0.08 with the low category. It can be concluded that although the verification model of practicum students are not trained in creative thinking skills, students also experience a slight

increase in posttest scores. This is in line with what was revealed by Wenning [4] that practicum activities using the cook book method do not develop creative thinking skills so they cannot make students achieve maximum creative and independent attitudes at the time of practicum. Other information that can be seen in Figure 1 is that the verification practice has made students prepare for the practicum. This can be seen from the value of the pretest in the Biochemical Practicum PjBLLM (46.21) which is greater than the average posttest value in the verification practicum (42.30).

4. Conclusion

Verification practicum has made students prepare themselves to face the practicum. This can be seen from the value of the pretest in the Biochemical Practicum PjBLLM (46.21) which is greater than the average posttest value in the verification practicum (42.30).

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