

Analysis of increasing creative thinking skills in the use of local materials i

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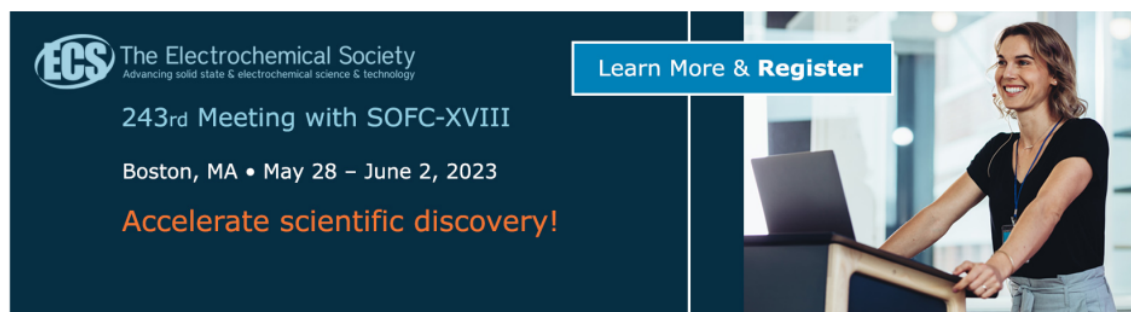
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1 Analysis of increasing creative thinking skills in the use of local materials in project qualitative biochemical analysis practicum

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Abstract. The purpose of this study was to analyze creative thinking skills in the use of local materials as reagents in qualitative biochemical practices. The use of local material reagents can improve students' creative thinking skills. This research method is quasi-experimental design with pre-test post-test group design. The research instrument consisted of pre-test and post-test questions using tests of creative thinking skills in the form of descriptions and student questionnaires. Data analysis was performed using the SPSS 22.0 program and the percentage of student responses to the practicum was carried out. The results showed that the average claim score of the experimental group was 59.95 and the post-test score was 80.00 with N_Gain 0.50 in the moderate category. In the control group the average pretest score was 38.70 and the posttest score was 44.80 with the lowest category N_Gain 0.09. Further analysis was carried out on each indicator of creative thinking skills which reached 23.16% fluency, 40.28% flexibility, 17.50% originality and 19.06% elaboration. It can be concluded that the use of local materials as reagents in the project-based qualitative biochemical analysis laboratory can improve students' creative thinking skills, especially in terms of originality and elaboration.

Keywords: Creative Thinking Skills, Project-Based Practicum

1. Introduction

Creativity is just as important in education and is included in education as a fundamental life skill that will enable future generations to survive and thrive in the 21st century [1]. Furthermore Daud et.al.[2] Creativity is a complex mental activity, but very important to human life. Creativity should be built through lectures in theory and practicum.

Science learning in which there are practicum activities is a tool to develop creativity [3-7]. Other research also reveals that learning that involves the environment can increase creativity and creative thinking [8]. Bakir and Öztekin revealed that creative thinking skills have become an important part of our daily lives [9]. Creative individuals are individuals who can deal with problems encountered with new and unique discoveries.

Creative thinking skills require standards and indicators as a reference for assessment. Türkmen & Sertkahya [10] revealed indicators of skills creative thinking are flexible, fluent, unique and unusual thinking in a variety of different situations. Based on some definitions and indicators of creative thinking in study this using skills assessment standards creative thinking according Torrance [11] include: fluency is an assessment of the ability to generate ideas, flexibility is an assessment of the ability to express variety a of solution or approaches to problems, originality is an assessment of the ability to spark ideas in ways that are original and elaboration is an assessment of the ability to describe in detail.



The previous research did not mention the learning model used in developing student creativity. The results of the analysis of several studies, the project-based learning model is student-centered learning [12]. Project-based learning also makes students more creative [13]. Furthermore project-based learning can make students associate practicum activities with daily life [14-16].

Previous research preliminary has revealed that in the practice of quantitative analysis of protein based on new projects, training skills in creative thinking have not yet reached the creativity of students [17]. Sari et al has designed a project-based Biochemistry practicum with local material (PjBLLM) by not leaving the verification practicum [18].

PjBLLM models was designed student-centered learning and linking with the environment. The Biochemistry Practicum that has been so far conducted is divided into three major topics, namely qualitative analysis, quantitative analysis and kinetics enzyme. During this time the three of them are very dependent on the existence of the main ingredients in the laboratory. Practicums are often hampered when the main ingredients are limited or even not available, for example the high price of reagents synthetic.

Utilization of local materials as practicum materials will make Biochemistry practicum interesting for students to understand further. Gustina defines local materials is practicum material that can be found in everyday life where a person is located [19]. Ramel-galima, et. Aa develop local and local materials as a substitute for commercial chemicals in acid-base chemistry practicum [20]. Prajoko et.al concluded that local materials have the potential developed into tools and materials [21]. Sari et.al. using materials in daily life for quantitative analysis for protein as a local material. Local materials can be obtained from environments close to daily life [17]. Local material is expected to be a solution to the obstacles that a rise so far without reducing the essence of the practicum itself. The local material in this study was not only used as a practicum but as a reaction reagent chemical. Reagents are substances or compounds that are added to the system in carrying reactions chemical to see the reaction.

The Biochemical Practicum PjBLLM in qualitative analysis generally identifies proteins through the deposition test Pb, Hopkinn-Cole, and Ninhidrin [22-24]. Qualitative analysis of carbohydrates generally by using iodine and Millon tests [25,26]. Previous research proves the use of local materials in analysis qualitative of proteins can improve students' creative thinking skills [27]. So far has been there no further research that discusses in detail what creative thinking skills can be trained in the analysis practice project-based qualitative of biochemical. Researchers interested in seeing how the profile of each indicator of creative thinking skills of students on the -based qualitative analysis of biochemistry project with local material as a reagent?

2. Method

This research method is a study quasi-experimental with pre-test post-test control group design.

2.1. Research procedures

In the practical control group analysis was Biochemical qualitative carried out by verification following the practicum handbook. The group experimental carried out lectures on the Biochemical qualitative analysis of PjBLLM in groups with several stages of learning. The learning process trains students creative thinking skills at each stage of learning. The implementation of all stages of learning PjBLLM can increase creativity student both in thinking skills creative with all four indicators (ie fluency, flexibility, originality and elaboration). In this study activities practicum using local materials that have been optimized as reagents. The use of local materials as reagents reduces the use of synthetic chemicals which are expensive and difficult to obtain. At the beginning of the meeting a pretest and post-test were conducted at the end of the practicum. The test is given in the form of a description to test the students' creative thinking skills in practicum.

2.2. Data Collection Instruments

In this study quantitative and qualitative data are used together in the study. Quantitative data were obtained through pre-post-tests of students' creative thinking skills. The test used is able to measure

skills students' creative thinking before and after practicum activities. The questionnaire was used to obtain qualitative data responses on student to the practicum implementation.

2.3. Data Processing

Data is processed using the program SPSS 22.0. The improvement in learning outcomes is seen through the value of Ngain Hake's formula [28].

3. Results and Discussion

The results of tests of creative thinking skills practicum in Biochemical qualitative analysis with PjBLLM can be seen in Table 1. The average score *pretest* was 59.95, after implementation the score *posttest* was 80.00. The improvement in thinking skills test results is creative shown by the average $\langle g \rangle$ value of 0.50 with a moderate category. In the group the control test increase was 0.09.

Table 1. Student Test Results in the control and experimental group Biochemical Qualitative Analysis

No	Group	Score		
		<i>Pretest</i>	<i>Posttest</i>	$\langle g \rangle$
1	Control	38.70	44.80	0.09
2	Experiment	59.95	80.00	0.50

The results of the study provide information that lectures on Biochemical Practicum PjBLLM can develop creative thinking skills. Increasing students' creative thinking skills is equivalent to achieving an average value of $\langle g \rangle$ of 0.50 with the medium category. In this research practice, the activities developed in the learning process include practicum activities for students. The creative thinking skills obtained by students in this study are also caused by the use of local materials. Several studies have shown that project-based learning allows students to connect learning with the environment of students' daily lives [14-16].

The achievement of the value of each indicator produced by students in the experimental group is shown in Table 2.

Table 2. Achievement of Value Every indicator in the experiment group

Score for each indicator (%)	Indicator	<i>Pretest</i>	<i>Posttest</i>
	<i>Fluency</i>	28.73	23.16
	<i>Flexibility</i>	52.71	40.28
	<i>originality</i>	12.72	17.50
	<i>elaboration</i>	5.84	19.06

Table 2 shows the achievement of student scores for each indicator in the project-based qualitative biochemical analysis practicum with local materials. Pretest results showed students reached 28.73% fluency, 52.71% flexibility, 12.72% originality and 5.84% elaboration. Before the implementation of the dominant creative thinking skills that exist in students is fluency and flexibility. Different things were shown in the posttest results of students which included the smoothness of 23.16%, flexibility of 40.28%, originality of 17.50%, and 19.06% elaboration. The posttest results showed that a project-based qualitative biochemical analysis practicum with local materials could develop creative thinking skills for the four indicators namely fluency, flexibility, originality and elaboration.

Another finding on the achievement of creative thinking skills for each indicator (Table 2) is the increase in the percentage of indicators of originality and elaboration in the post-test results of the PjBLLM qualitative analysis. It can be concluded that using local materials in PjBLLM Biochemical qualitative analysis practicum can train creative thinking skills especially on indicators of originality

and elaboration. Indicators of originality are trained when students use local materials as practicum materials, choose procedures according to local materials and make preparations on local materials. Students are able to modify the practicum in accordance with the selected local material. While the elaboration indicator is obtained when students can explain the steps of practicum done in accordance with the selected local material. No prior research has revealed which indicators are more dominant than creative thinking skills developed in project-based learning. Şener et.al. revealed that project-based lectures only practice creative thinking skills with indicators of fluency, flexibility and authenticity [29]. Much earlier, Bjorner et.al also concluded that project-based learning fosters creative attitudes in students [13].

4. Conclusion

From the research that has been done, it can be concluded that the use of local materials as reagents in project-based Biochemistry practicum can improve creative thinking skills, especially on indicators of originality and elaboration. Using local materials could make Biochemistry laboratory still work with limited chemicals.

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