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Student Perceptions of the Application of Practicum Learning Project-Based Medical Instrumentation to Increase Student Creativity

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Abstract. Learning in the Medical Instrumentation course is more focused on the principles of using tools, parts and functions, how to operate and care for tools, the calibration status of laboratory equipment and the concept of calibration of laboratory equipment. Learning like this results in students only being limited in understanding existing theories and having minimal skills or skills. This study aims to describe the perceptions of medical laboratory technology students towards project-based Medical Instrumentation practicum learning. Student perceptions of the learning process are essential because they can be used to implement learning decisions. The research objects were 55 Bachelor of Applied Medical Laboratory Technology Study Program students. Data was collected by questionnaire, which was distributed via a Google form. Percentage shows that respondents have a good perception of applying the PjBL model. With the implementation of the PjBL model of learning, students will become more enthusiastic about studying the Medical Instrumentation Practicum because the PjBL model can eliminate boredom in participating in the learning process.

Keywords: Project Based Learning; Medical Instrumentation; Creativity.

INTRODUCTION

Medical instrumentation is one of the subjects in the Applied Medical Laboratory Technology Undergraduate Study Program, which aims to provide students with knowledge about the working principles of medical devices and how to use them. In this lecture, students are also expected to be able to analyse problems related to medical equipment used to serve patients and innovations in the manufacture of medical devices.

The problems in question include convenience, practicality, effectiveness, and affordability of the tool's price. While making medical devices in question, students can design or modify medical devices. The cost of medical devices is not relatively cheap, so it is hoped that through the Medical Instrumentation course, students of the Applied Medical Laboratory Technology Study Program will not only master existing theory but also be able to make or modify existing medical equipment into usable, accessible, practical medical devices, and affordable without compromising the functionality of these medical devices.

Learning in the Medical Instrumentation course is more focused on the principles of using tools, parts and functions, how to use and care for tools, the calibration status of laboratory equipment and the concept of calibration of laboratory equipment. Learning like this results in students being limited to understanding existing theories and having minimal skills or skills. Research conducted by [1] shows that current learning always emphasises student learning outcomes without paying attention to the learning process, which causes the learning process to seem monotonous. Of course, learning like this must be upgraded to one that helps students understand theory and have skills.

These skills can be trained during the learning process. The skills in question include the ability to communicate (communication), think critically (critical thinking), creativity (creativity), problem-solving (problem-solving), and work together (collaboration). Furthermore, other authors [2] concluded that the core of current learning is to train students to have critical think-

ing skills and creativity. The ability to think critically in health is to think, apply, analyse, synthesise and evaluate situations. Critical thinking skills involve making decisions based on information obtained by analysing, synthesising, and evaluating the information received carefully. Creativity includes the development and creation of new ideas. Critical thinking and creativity are priorities in higher education in modern times. Critical thinking skills must be balanced with creativity [3]. Critical thinking skills and creativity are related, so they must be trained together in the learning process.

To understand these things, we need a learning model that can increase students' interest in learning materials and build their understanding of the interrelationships between each process, as well as improve critical and creative thinking skills so that they can solve problems encountered in everyday life. One of the learning models that can be used is project-based learning (PjBL) or project-based learning.

DefenderProject-based learning aims to involve students in the learning process. Through this learning model, students become more active, and the learning process becomes more effective and efficient [1]. In PjBL, students are trained in collaborative skills and the ability to think when dealing with problems. In addition, they actively collect information from various sources, synthesise it, and analyse it. So inherently, learning becomes meaningful because it is connected to real things [4].

According to [5], there are five characteristics of PjBL: 1) centrality, namely, the project is the core of the teaching strategy, while students learn through projects; 2) directing questions to encourage students to learn the core concepts and principles of learning materials; 3) constructivism inquiry; 4) autonomy, namely prioritising independence, choice, flexible working time, and student responsibilities; and 5) realistic, which involves real-life problems, focuses on authentic problems and their solutions have the potential to be applied in natural conditions. Several studies related to PjBL include research [6] which explains that PjBL can improve students' creative thinking skills in answering fermentation questions. Author [7] states that PjBL learning effectively stimulates and develops the metacognitive awareness of Biology education students. In addition, [3] reports that learning using the PjBL model can develop student creativity in producing mathematical teaching aids. The results of this study indicate that PjBL has a vital role in the three components of the learning system: input, process and output.

Before distributing the questionnaire to students about the application of PjBL in the Medical Instrumentation course in the STr Medical Laboratory Technology Study Program, students were initially given a stimulus in the form of an explanation of PjBL which would be applied to the medical instrumentation course as well as an explanation of projects for making medical devices or innovations/modifications of tools that can be used for disease diagnosis and help with health services. From a series of debriefings on the learning carried out, each student certainly has a different point of view about acquiring knowledge and skills related to this learning. The views or perceptions that are built can affect their ability to accept and absorb the objectives of the practicum. According to [8], students' perceptions of the Medical Instrumentation Practicum course positively impacted their learning outcomes. The research [9] explains that different views or perceptions of students from different generations of the PjBL learning model are applied in making environment-based teaching aids. The results of this study indicate that student perceptions of learning are essential because they can be used as a basis for lecturers to evaluate the knowledge that has been implemented.

METHOD

This research is descriptive and quantitative. The research population was third-semester students of the STr TLM Study Program. The research sample was 50 students. Data collection uses a questionnaire with a Likert scale distributed via Google form. The data is then tabulated and analysed descriptively. The perceived level of student satisfaction with PjBL is determined descriptively (percentage).

RESULTS AND DISCUSSION

Perceptions of TLM Applied Undergraduate Study Program students regarding the PjBL learning model that will be applied to the Medical Instrumentation course are presented in the table below.

Table 1 – Percentage of respondents' answers

No	Statement	Total Answer Score				Criteria
		STS	TS	S	SS	
1	The PJBL learning model allows me to practice my communication skills	1.8	1.8	67.3	29.1	Good
2	Learning using the PjBL model can help lecturers and students be more interactive	1.8	0	60	38.2	Good
3	I am more active in group discussions and completing projects given by lecturers	3.6	9.1	61.8	25.5	Good
4	The PjBL model makes me more active in learning	1.8	0	72.7	25,4	Good
5	The PjBL learning model trains me to be able to study and work in groups	3,6	1,8	56,3	38,1	Good
6	The PjBL learning model trains me to plan and design an activity	3,6	0	65,4	30,9	Good
7	In PjBL learning, each group member can listen to each other's opinions	3,6	0	67,2	29.0	Good
8	The PjBL learning model can eliminate boredom during the teaching and learning process	1,8	7,3	67,3	23,7	Good
9	I feel helped by PjBL's learning model in understanding medical instrumentation.	1,8	0	70,9	27,3	Good
10	PjBL's learning model makes me excited to learn medical instrumentation.	1,8	0	70,9	27,3	Good
11	The PjBL learning model is very suitable for applying to medical instrumentation subjects.	0	1,8	69,1	29,1	Good
12	I feel satisfied if project-based learning (PjBL) is applied	0	3,6	70,9	25.5	Good
13	After learning the PjBL model, I will be able to plan and make simple medical devices	0	3,6	65.5	30,9	Good
14	The PjBL learning model is suitable to be applied to other learning materials that have the same characteristics as the subject matter of medical instrumentation.	1,8	1,8	61.8	34.5	Good
	Average	1,9	2,2	66,2	29,6	

Notes: STS – Strongly Disagree; TS – Disagree; S – Agree; SS – Strongly agree

Data in Table 1 shows that the average respondent's answer is at the level of Strongly Agree (29.6%), Agree (66.2%), Disagree (2.2%), Strongly Disagree (1.9%). This may mean that respondents have a good perception of applying the PjBL model for the Medical Instrumentation course. With the implementation of the PjBL model of learning, students will become more enthusiastic about studying the Medical Instrumentation Practicum because the PjBL model can eliminate boredom in participating in the learning process.

Based on the data in Table 1, several aspects are assessed, namely perceptions of the ability to design activities, the ability to work in groups, the ability to communicate, and the ability to collect and conclude information. The ability to design activities can be seen from the results of students' answers. Choose point 6, namely, planning each process that is passed to obtain information related to the object that has been selected. Each activity plan is discussed in groups monitored by the lecturer. For the plans drawn up to be realised and achieve the goals set, the plans need to be well communicated to equate perceptions among group members. In this process, students practice their ability to communicate and work together in groups. Communication skills are also trained when students have to deal with patients. In this stage, students arrange schedules to interview patients and participate in diagnosing the disease. Any information collected from informants is then studied scientifically through library research, where students are trained to discuss and analyse the information obtained. In every fulfilment of the aspects observed, students can practice their scientific/creative thinking skills by implementing this PjBL. As stated by [10], the

PjBL model develops the ability to think scientifically to solve problems that students face. This skill is obtained through asking, expressing and discussing ideas,

From the results of man's students, the perception of PjBL is that it can develop their interest in learning Medical Instrumentation because they are enthusiastic and learning is not boring. This interest can cause students to learn actively, dig for information, discuss in groups, and communicate. Authors [11] state that some indicators of interest in learning include a sense of interest and pleasure in understanding, active participation, and others. The enthusiasm of students in participating in learning medical instrumentation is because students study not only in class but also in the field by exploring the process of making simple medical devices by modifying existing devices or creating new tools that can be useful for laboratory diagnosis and/or assisting health services. Through this stage, students can practice implementing the innovations they observe in the field. Students build their knowledge about the object being studied based on the stages they take to fulfil the task. This is the characteristic of PjBL.

Through the activities' stages, students will also be able to develop scientific thinking skills because they have to find information about changes in laboratory diagnostic methods. Every change that occurs is examined for its relevance through a literature study. This is done to strengthen knowledge and understanding of how to modify medical devices or innovations. The activities carried out are also a form of proof of theories related to the object of study. Authors [12] state that components needed in developing knowledge through scientific thinking are facts as objects of thinking, senses as organs for absorbing facts, brains that interpret each point, and information to understand facts.

Based on the research results, it is known that students' perceptions of PjBL will improve if the learning medical instrumentation practicum is implemented in PjBL. This is indicated by the percentage of answers that agree and strongly agree. This satisfaction is built because students can absorb the material discussed well and develop abilities such as planning activities, discussing, communicating, solving problems, gathering information and presenting the knowledge gained. With the knowledge gained, students can confidently design or innovate tools individually.

CONCLUSIONS

Students are satisfied with the implementation of PjBL in the Medical Instrumentation Practical Course. By applying this learning model, students can develop an interest in learning the ability to communicate, collaborate, solve problems, and collect and analyse the information obtained. This research is still limited to measuring student perceptions. It would be better if more research were developed to measure the influence of PjBL on the observed aspects.

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