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Describing the Ability of Science Processes in Basic Physics Practicum II Material of Ice Melting Heat Using E-Modules

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ABSTRACT

Purpose of the study: The purpose of this study was to determine the level of students' science process skills and to determine the effect of using e-modules in the Basic Physics II practicum with the material melting heat of ice.

Methodology: This research is a type of quantitative research with descriptive methods. The subjects in this study were 40 second semester students of Physics Education at Jambi University. The data collection instrument used was an observation sheet of science process skills that had been validated previously to assess students' science process skills in carrying out practicums. Data collection was carried out with the help of an observer who observed each student and the data was analyzed using statistical analysis.

Main Findings: Based on the results of data analysis, it shows that the use of e-modules is effective in carrying out practicums and the average student science skill level is in the SB category (very good).

Novelty/Originality of this study: The novelty of the research can be seen from the results of the research that has been done. It is evident that the E-module, apart from being easy to access and easy to carry around, also contains detailed information regarding practicum material. This is because the e-module is packaged in a web form that students can access anywhere and anytime, whereas using a conventional guide will result in a lack of efficiency because the more material is included, the heavier it will be and the more paper used to print the guide.

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1. INTRODUCTION

Natural science is literally referred to as the science of nature or the study of events that occur in nature [1]. Science deals with how to find out about nature systematically, so that learning science is a process of experiencing and resulting in the acquisition of knowledge in the form of understanding of concepts [2]. This makes physics conceptually justified as a difficult subject, both to be learned and taught [3]. Science learning is directed at discovering and doing so that it can help students gain a deeper understanding of the natural world around them.

One branch of natural science is physics. Physics is one of the subjects which discusses real phenomena and symptoms [4]. Physics is learning with science that discusses the symptoms and properties of objects that are in nature [5][6]. In essence, science is built on the basis of scientific products, scientific processes and student attitudes [7]. The uniqueness of physics lies in the presence of abstract concepts and requires idealization

through mathematical modeling [8]. As a science, Physics has an important role in the knowledge of phenomena in the universe, and physics education continues to change and develop in accordance with the world's conditions[9][10].

Learning physics is considered important to learn, so that in tertiary institutions there is further education about physics, namely the existence of a special physics education study program [11]. Particularly, teacher education programs are intended to develop student teachers' knowledge, skills, and characters in order to prepare them to educate students effectively and professionally at schools [12]. One of the subjects in the Physics Education Study Program at the University of Jambi is Basic II which includes practical activities. Physics requires an investigation to prove the concept into law, or to get theory and principle which can be carried out by practical activities [13].

Science learning is inseparable from experimental activities in an effort to find answers to the questions what, why, and how natural phenomena occur so that they can be generalized into a concept [14]. Learning physics is not enough to just teach students knowledge, physics must also be taught as a process, where students have the opportunity to conduct experiments [15]. Practicum in physics learning can be used as a medium to develop cooperative skills, discipline, and group work. Practicum provides meaningful learning for students [16].

Students with high science process skills are able to do experiments well. students with high science process skills will have better cognitive achievement than students with low science process skills [17]. Science process skills consist of basic science process skills and integrated process skills [18][19]. Basic process skills include observing, classifying, communicating, measuring, summing up, predicting. Science process skills consist of observation, hypothesis formulation, prediction, investigation, the data interpretation, inference and result communication included by scientific process' activities [20]. Integrated process skills consist of designing investigations identifying variables, conducting experiments, analyzing investigations, constructing data tables, constructing graphs, collecting and processing data [21].

The success of the learning process is a goal to be achieved which is influenced by several important components [22]. In line with practicum being carried out to develop process skills, a medium is needed to be used as a guide in carrying out practicum activities which is referred to as a guide (module). Media is anything that can convey and distribute messages from sources in a planned manner so as to create a conducive learning environment where recipients can carry out the learning process efficiently and effectively [23]. The function of the practicum guide is teaching materials that can minimize the role of the lecturer, make students more active and gain meaningful knowledge, make students acquire creative thinking and hands-on skills so that it makes it easier for educators to carry out teaching in the laboratory. Practicum guides are not only very helpful in the practicum implementation process, but can also train student or practitioner process skills [24].

Along with the current developments that have an impact on the world of education is the emergence of e-learning as a learning medium [25]. E-learning is an approach to teaching and learning based on the use of electronic media and devices as tools for improving access to training [26]. The practicum guide is essential in the process of developing students' science skills, so there is a need for development in this determination. Therefore, all the deficiencies that exist in the practicum must be corrected. Hard copy based practicum guides are not very effective and efficient [24]. Apart from the wasteful use of paper, guides are also difficult to carry around. The solution to the above problems is to create e-learning-based guides that are implemented in the form of mobile learning, namely e-modules. The main activity in mobile learning is distributing learning materials to students so that they can be accessed using portable communication devices such as mobile phones or smart phones.

Based on the explanation above, the researcher feels the need to look at the ability of the science processes of Physics Education students at the University of Jambi in the Basic Physics II practicum and see the effect of using the e-module used on the course of the practicum in the framework of developing student science processes.

2. RESEARCH METHOD

This research is a quantitative research with a descriptive approach. The data processing technique uses descriptive statistics. The research subjects were 40 semester 2 students of Physics Education at Jambi University who used the e-module as a guide in conducting practicum on the heat of melting of ice material. The instrument used in this study was observation sheets of science process skills that had been validated previously. Where, in this observation sheet four scales apply, namely: Very Good is given a score of 4; Good is given a score of 3; Not Good is given a score of 2; and Very Not Good was given a score of 1. Data collection was carried out with the help of observers who observed students doing practicum.

Table 1. Science Process Skills Scores

Indicator	Interval	Category
Conclusion	7 – 12.75	Very not good
	12.26 – 17.5	Not good
	17.51 – 22.75	Good
	22.76 – 28	Very good
Classification	1 – 1.75	Very not good
	1.76 – 2.5	Not good
	2.51 – 3.25	Good
	3.26 – 4	Very good
Creating Tables, Collecting and Organizing Data	4 – 6	Very not good
	6.1 – 8	Not good
	8.1 – 10	Good
	10.1 – 12	Very good

In this research, the researcher discusses two indicators of basic KPS and two indicators of integrated KPS. In Basic KPS, the researcher discussed the conclusion indicators which consisted of 6 statements and for the classification indicators consisted of 1 statement. For integrated KPS, the researcher discusses indicators of making a table which consists of 3 statements, and indicators of collecting and organizing data which also consists of 3 statements. After the data is collected, the data is processed with statistical analysis with the help of IBM SPSS Statistics 25.

3. RESULTS AND DISCUSSION

Based on statistical analysis tests carried out with the help of IBM Statistics 25 for students' basic science process abilities with indicators of conclusions and classification, the following results were obtained:

Table 2. Basic KPS Analyst Results

Indicator	Score	Category	f	%	Mean	Me	Mo	Max	Min
Conclusion	7 – 12.75	Very not good	0	0	23,8	23,5	21,0	28,0	20,0
	12.26 – 17.5	Not good	0	0					
	17.51 – 22.75	Good	17	42.5					
	2276 – 28	Very good	23	57.5					
	Total		40	100					
Classification	1 – 1.75	Very not good	0	0	3,55	3,0	4,0	4,0	3,0
	1.76 – 2.5	Not good	0	0					
	2.51 – 3.25	Good	18	45					
	3.26 – 4	Very good	22	55					
	Total		40	100					

From the table above it can be seen that the conclusion indicator which consists of 6 statements obtained an average of 23.8 with a median value of 23.5 and a maximum value of 21.0. The highest score is 28.0 and the lowest is 20.0. After being categorized, there were no students who fell into the Very Bad and Not Good categories. There were 17 students in the Good category with a percentage of 42.5%, and 23 students in the Very Good category with a percentage of 57.5%.

For a classification indicator consisting of 1 statement, an average of 3.55 is obtained with a median value of 3.0 and the highest value is 4.0. The highest score obtained is 4.0 and the lowest is 3.0. After being categorized, there were no students who were included in the STB and TB categories, as many as 18 students were in the Good category with a percentage of 45%, and as many as 22 students were included in the Very Good category with a percentage of 55%.

Furthermore, based on statistical analysis tests for students' integrated science process abilities with indicators of making tables and collecting and organizing data, the following data is obtained:

Table 3. Integrated Science Process Skills Analysis Results

Indicator	Score	Category	f	%	Mean	Me	Mo	Max	Min
Creating Tables	4 – 6	Very not good	0	0	10,73	11	12,0	12,0	9,0
	6.1 – 8	Not good	0	0					
	8.1 – 10	Good	17	42.5					
	10.1 – 12	Very good	23	57.5					
	Total		40	100					
Collecting and Organizing Data	4 – 6	Very not good	0	0	10,8	11	12,0	12.0	9,0
	6.1 – 8	Not good	0	0					
	8.1 – 10	Good	16	40					
	10.1 – 12	Very good	24	60					
	Total		40	100					

From the table above it can be seen that the indicators for making a table consisting of 3 statements obtained an average of 10.73 with a median value of 11 and a maximum value of 12.0. The highest score is 12.0 and the lowest is 9.0. After being categorized, there were no students who fell into the Very Bad and Not Good categories, as many as 17 students were included in the Good category with a percentage of 42.5%, and as many as 23 students were included in the Very Good category with a percentage of 57.5%.

For the indicator of collecting and organizing data which consists of 3 statements, an average of 10.8 is obtained with a median value of 11.0 and the highest value is 12.0. The highest score obtained is 12.0 and the lowest is 9.0. After being categorized, there were no students who were in the Very Bad and Not Good categories, there were 16 students who were in the Good category with a percentage of 40%, and as many as 24 students who were in the Very Good category with a percentage of 60%.

From the results obtained, it can be seen that the average student tends to be in the Very Good category in each indicator, both basic KPS and integrated KPS. The learning process is an activity designed to help someone learn a new ability and or value. Based on this, the role of teaching materials is needed in the learning process [27]. The application of mobile learning in the form of an e-module provides convenience because it is more efficient and effective. Mobile learning is learning that can be simplified through the use of mobile devices. Learning that puts students' skills can be developed through the use of mobile learning. Mobile learning is learning which is done when students are not in a predetermined fixed location. Some uses of mobile learning can be used anytime and anywhere, more flexible and time-saving [28]. Based on the explanation above, it can be concluded that the use of e-module minimizes the possibility of being left behind in guides, which is usually a common thing in tutorials in hard copy form. Besides being easy to access and easy to carry anywhere, the e-module also contains detailed information regarding practicum material. This is because the e-module is packaged in a web form that students can access anywhere and anytime, whereas using a conventional guide will result in a lack of efficiency, because the more material is included, the heavier it will be and the more paper used to print the guide.

Based on research conducted by [29] shows that the use of electronic modules is very effective for physics lessons. This is evidenced by the increase in the average sample value of 94.68 compared to before using the module, which was 73.86. This is also supported by research conducted by [24] the highest percentage in the experimental class contained in the communication indicator and the indicator classification. While the highest percentage of grade control contained in the indicator compiles the data table. So it can be said that with the use of guide books effective based on mobile learning is more than the use of printed guide books. Research conducted by [30] concluded that e-modules are more interesting and can provide significant improvements.

As previously explained, apart from being a practicum guide, it is very essential in the ongoing process of carrying out the practicum, but it can also train the process skills of students or practitioners. By using a good guide, the practical science skills will also be good.

4. CONCLUSION

From the research that has been done, it is found that by using the e-module in practicum, the average science process skills of students for Basic KPS with conclusions and classification indicators are in the Good category, while for Integrated KPS with indicators of making tables and organizing and collecting data are in the category Very good. From the statistical results it can be concluded that the use of e-module is more effective and efficient as a practicum guide to improve students' science process skills.

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