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STUDENTS' PERCEPTIONS AND ATTITUDES: IMPLEMENTATION OF VIRTUAL LABORATORY PHYSICS APPLICATIONS (PVL) DURING THE COVID-19 PANDEMIC

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ABSTRACT

The coronavirus outbreak from 2019 had a significant impact on all sectors in Indonesia, especially the education sector, which requires learning from home. It provides a change in students' learning style to make educators change online-based learning using various platforms, one of which is the Physics Virtual Lab (PVL). This application is in a simulation designed explicitly physics practicum, accessed using a mobile phone. This study aims to determine how effective the use of PVL in fulfilling practicum activities is in terms of perceptions and competencies of students' attitudes. The research method is descriptive research to obtain an overview of PVL applications in physics practicum using domestic used materials. The subjects in this study were students of the first-semester science education study program who took the Basic Physics course—collecting data using perception questionnaires and attitude assessment sheets. The average student perception score is 4.22. Then, the students' attitude competence results obtained an average score of 80.88 integrity; independence 74.89; confidence 75.17 and responsibility 84.89. It shows that the implementation of PVL builds students' integrity and responsibility.

Keyword: ***Physics virtual laboratory, Preceptions, Attitudes***

[1] Nindha Ayu Berlianti

Introduction

The outbreak of the coronavirus or commonly called Covid-19, at the end of 2019 shocked the whole world. A new type of virus was first discovered in Wuhan, which eventually spread to all corners except in Indonesia. In mid-March 2020, several major cities in Indonesia were infected with the Covid-19 virus. The virus continues to spread to the public. In early April, the government issued a policy to implement social distancing and lockdown in several areas such as Jakarta and Surabaya, which are the center points of the spread of the coronavirus in Indonesia. In addition, the government also issued a decree instructing all educational institutions to conduct online learning.

The term comes online, composed of two words: on means life and line mean channel (Marti et al., 2016). Understanding online is a situation that is currently using a network, connected in a network, one device with other connected devices to communicate with each other. Online learning itself can be said to be distance learning through virtual activities. In online learning, lecturers and students can use various applications to support the learning. The application is provided by the Learning Management System (LMS). This LMS is a software application used for online activities and electronic learning programs (e-learning programs). These applications are Phypox, Phet, Physics Virtual Laboratory, Edmodo, Classroom, Meet, WebEx, Zoom, etc. In previous research, the Phet application applied to the study of static electricity showed that during online lectures, the application had a good display design, exciting material content followed student needs, and increased interest in learning during the pandemic.

The selection of applications based on their functions and uses, such as the Physics Virtual Lab (PVL), is a platform that contains physics practicum content and is applied to an Android-based smartphone and does not require the internet to operate. The use of these learning-based applications provides convenience in obtaining the broadest possible information for the benefit of learning (Nkonko et al., 2019).

Students are faced with theoretical material and are required to carry out practical activities to fulfill these obligations; lecturers who support courses use the PVL application with the help of supporting applications such as zoom and Google classroom on primary physics material to fulfill these practical activities. A virtual laboratory is a form of the laboratory with indirect observation activities with the help of software, all the equipment needed by a laboratory is contained in the software (Alfarizi K et al., 2020).

The use of the PVL application is used in basic physics practicum. Various measurement tools such as Vernier Caliper, Ruler, and Micrometer Screws are presented in the application. Besides that, the use of practicum materials is chosen by utilizing used goods that are easily obtained in the surrounding environment, such as bottle caps, markers, cardboard paper, and nails. The selection of these materials must also be based on the usability function of the materials used in practicum activities, namely measuring the thickness and diameter of the predetermined used materials. The measurement method is by placing the used material on the cellphone screen and then measuring the object's thickness by sliding up / down according to the calculation rules of the measuring instrument used. Saputro stated that practicum activities carried out at home during the COVID-19 pandemic using tools and materials available in the surrounding environment could provide a good experience regarding skills, attitudes, and knowledge (Saputro et al., 2020).

The importance of practicum activities during the pandemic is that it is necessary to develop technology supported by waste. The goal is that student competencies, namely the competence of attitudes, knowledge, and skills, can be appropriately achieved. For these three competencies to continue to run well, it is necessary to balance giving theory and implementing practicum. It is necessary to conduct an attitude competency assessment that includes integrity, independence, confidence, and responsibility. Then through the PVL application, it is hoped that students will be more motivated to make observations and physics experiments to use the application to find physics concepts that are more fun and can be visualized. Therefore, it is necessary to know students' perceptions of PVL applications in basic physics practicum.

This study aims to determine how effective the use of PVL is in fulfilling practical activities when viewed from student perceptions and student attitude competencies. After this research, we hope that students will remain motivated and enthusiastic in online learning using learning facilities (PVL) to continue learning and practicum activities during the Covid-19 pandemic.

Research Method

This type of research is descriptive research, a research method that describes phenomena/events that exist and take place at present or in the past. The researcher uses this type of research because it is not to test a hypothesis but rather to get an overview of the use of physics virtual lab applications in physics practicum using domestic materials. The object of this research is the first-semester science study program students who take the Basic Physics course as many as 25 students. Assessment of attitude competence generally uses a non-test form of assessment (Sole & Anggraeni, 2017), with assessment techniques often used such as observation, interviews, distributing questionnaires, and documentation.

The instruments in this study were the student perception questionnaire assessed at the end of the lesson, and the attitude assessment observation sheet, which was observed during the practicum activity. Questionnaires are distributed in the form of a google form containing questions that students must fill out. Then for the observation sheet in the form of an assessment sheet which includes four aspects of the assessment, namely integrity, independence, self-confidence, responsibility and, is filled in by the lecturer in a row for four meetings when the practicum activity takes place.

The data obtained from the instrument for assessing students' attitudes and perceptions were analyzed by calculating the average score based on the provisions of the Likert scale. According to Sugiyono's opinion, the Likert scale measures attitudes, opinions, and perceptions about social phenomena (Sugiyono, 2017). The research diagram is presented in figure 1.

Result and Discussion

After the research was conducted, data were obtained from student responses and attitude competency data. The response data consisted of 13 multiple choice questions containing student perceptions of using a virtual physics lab with the help of used materials in practicum activities. Then the attitude competency data was obtained from the assessment conducted by the lecturer based on each indicator and described in the form of a graph.

Student Response

Hasil survei deskriptif diperoleh rata-rata 4,224 dari 5 kriteria penilaian skala likert, sehingga dapat diartikan bahwa rata-rata mahasiswa setuju terhadap penggunaan aplikasi physics virtual lab dengan berbantukan bahan bekas domestik dalam mendukung kegiatan pratikum fisika dasar selama pandemi covid-19 berlangsung. Yusuf & Widyaningsih, 2020 stated that e-learning-based virtual laboratories could improve the quality of learning and develop students' abilities, especially metacognitive skills, in physics practicum. So that the use of virtual laboratory media is one of the effective solutions in overcoming the limitations of facilities and infrastructure as support for the implementation of practical activities; besides that, the importance of practicum activities can provide conceptual understanding to students, especially in theoretical physics, which consists of natural phenomena and is associated with everyday life. The use of domestic used goods as practicum materials was chosen as an alternative to support practicum activities. Due to the limitations of tools and materials, students must creatively determine the suitability of the practicum materials with the practicum theme to be carried out.

Students can look for options to replace tools and materials commonly used in the lab with tools and materials around the house, which have almost the same function and working mechanism (Hendriyani & Novi, 2020). In implementing practicum activities, students will be motivated and open to new ideas, besides creative thinking skills and scientific attitudes will begin to form in producing reports and results of practicum activities (Azhar, 2020). In addition, oral communication skills will be formed when students make videos of the practicum implementation. In its application, video media has high potential and effectively conveys information (Warsita, 2011). A virtual laboratory and increasing competence are also supported to improve student competence in all aspects, including cognitive, psychomotor, and character/student attitudes (Jaya, 2013).

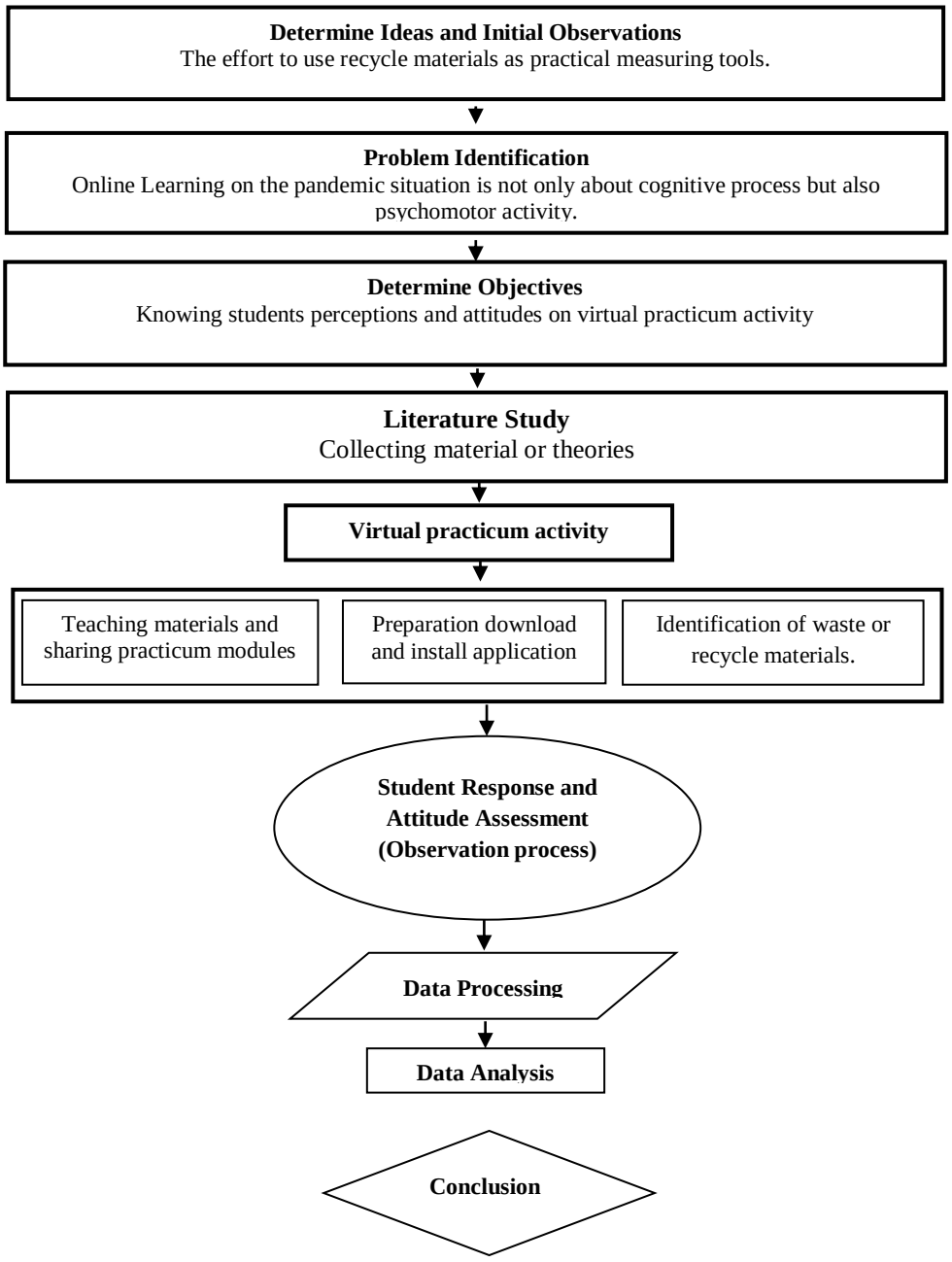

Figure 1. Research Flowchart

Tabel 2. Tanggapan mahasiswa terhadap penggunaan *physics virtual lab* dalam kegiatan praktikum

No	Statement	1	2	3	4	5	Average
1	Physics Virtual Lab app is easy to learn	0 0%	0 0%	0 0%	6 50%	6 50%	4,500
2	The appearance of the Physics Virtual Lab application is evident and easy to understand	0 0%	0 0%	3 25%	5 41,7%	4 33,3%	4,083
3	With the Physics Virtual Lab application, it is easier for me to obtain data during the practicum	0 0%	1 8,3%	1 8,3%	4 33,3%	6 50 %	4,250
4	The Physics Virtual Lab application is handy to use during the covid-19 pandemic	0 0%	0 0%	1 8,3%	3 25%	8 66,7%	4,583
5	It is effortless for me to use Physics Virtual Lab App	1 8,3%	1 8,3%	3 25%	4 33,3%	3 25 %	3,583
6	Compiling a practicum report and making a video of the implementation of the practicum is not essential, in my opinion	9 75%	3 25%	0 0%	0 0%	0 0 %	4,750
7	I use the media of materials/used goods in carrying out the measuring instrument practice.	0 0%	0 0%	2 16,7%	2 16,7%	8 66,7%	4,500

No	Statement	1	2	3	4	5	Average
	(such as bottle caps, marker caps, unused books, and others) that I can easily find around the environment						
8	The use of these used materials/materials makes it easier for me to do practical measuring instruments and can be an alternative option during the covid-19 pandemic	0 0%	0 0%	0 0%	4 33,3%	8 66,7%	4,667
9	Remote practicum activity keeps me motivated in participating in basic physics learning	0 0%	0 0%	2 16,7%	4 33,3%	6 50%	4,333
10	Easy interaction between lecturers and students during practical measuring instruments using the Physics Virtual Lab Application	0 0%	1 8,3%	3 25%	3 25%	5 41,7%	4,000
11	How interested are you in online learning during the Covid-19 pandemic?	0 0%	0 0%	3 25%	3 25%	6 50%	4,250
12	The quality of teaching/teaching materials presented in learning using the online system during the covid-19 pandemic can be well received	0 0%	0 0%	5 41,7%	4 33,3%	3 25%	3,833
13	During the Covid 19 pandemic, all learning activities were carried out well (structured, on schedule, coordinated)	0 0%	0 0%	7 58,3%	3 25%	2 16,7%	3,583
	Total						4,224

Notes :
Strongly Disagree = 1
Disagree = 2
Disagree = 3
Agree = 4
Strongly Agree = 5

Student Attitude Competence

The first indicator assessment regarding integrity is that students do not copy data from other student data. The average competency attitude of integrity during the activity can be seen in Figure 1.

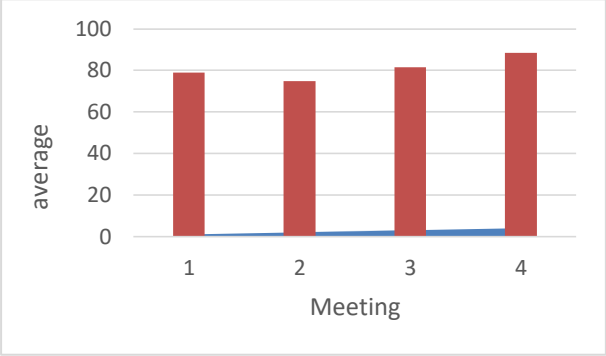

Figure 1. Graph of Student Integrity Attitude Competence

Overall, it shows that the average score of the dominant class is good, with a score between 78.96 - 88.33 at meetings 1-4. The second indicator assessment, namely independence, is determined by the readiness of each individual to solve problems without involving other people. In this case, students must be ready and able to determine the materials used to carry out virtual practicum activities independently. The average value of student independence is presented in Figure 2.

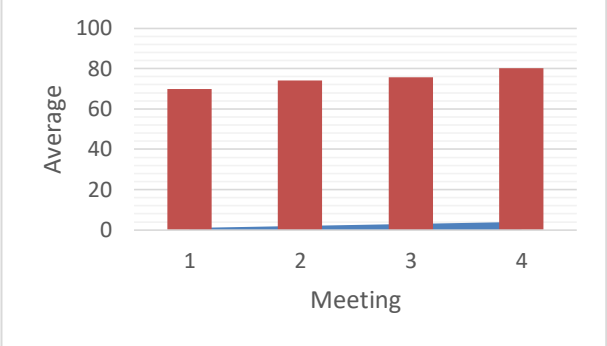

Figure 2. Graph of Student Independence Attitude Competence

The graph shows good results with the acquisition of a score of 69.79 - 80.21 for four weeks of basic physics practicum activities. Then the third assessment indicator is self-confidence, marked by confidence in the abilities that exist in each individual in asking questions and answering questions given during practicum activities. Besides, students do not feel anxious and have the freedom to do practicums—materials obtained around the home environment under their use. The average value of student self-confidence can be observed in Figure 3.

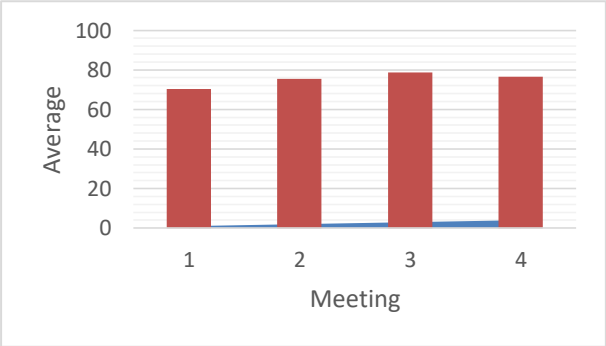

Figure 3. Graph of Student Self-Confidence Competence

Observed in the graph shows the average value of the class is quite good with the acquisition of a score of 70.21 – 76.46 for several weeks, which is assessed using the attitude competency observation sheet. The last attitude assessment indicator, namely responsibility, is marked by individual success in completing practicum assignments correctly and on time. The average value of student responsibility attitudes can be seen in Figure 4.

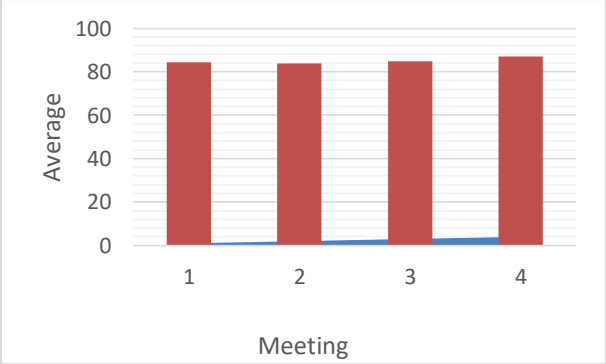

Figure 4. Graph of Student Responsibility Attitude Competence

Based on Figure 4, there is no improvement in each meeting, this is because students are already accustomed to completing assignments correctly and on time, but the formation of this attitude needs to be continuously accustomed to practicum activities and the learning process so that each individual has an obligation that must be completed for the given task. In this case, attitudes are permanent and closely related to the cognitive, affective, and behavioral components (attitudes). Cognitive components can be in the form of facts, knowledge, and beliefs about objects that a person has. In contrast, the affective component is related to a person's emotions and feelings towards the behavior object. Then the attitude component tends to be related to the behavior that is in him. So that there needs to be a balance between components, so that attitude competence in students is still formed.

The indicators in the attitude competency assessment experience significant changes at each meeting and tend to increase. (Olasehinde & Olatoye, 2014) suggests that a person has a scientific attitude if he has an attitude of curiosity, rationality, willingness to delay decisions, openness, critical thinking, objective, honest, independent, responsible, and accepts the opinions of others (humble). Attitude competence in responsible and independent aspects is closely related to the formation of scientific attitudes in the affective domain as a determinant of one's learning success (Dinatha, 2017). Attitude is one factor that influences learning outcomes because attitudinal competence strongly influences student behavior and learning in experiencing their world, which can help explain their world. (Sukino, 2015).

This attitude competence is undoubtedly valuable for physics practicum and increases student learning achievement (Wahyudi & Lestari, 2019). So that students will continue to be motivated to consistently excel and have a solid commitment to achieving success and excellence. (Harso et al., 2014).

Conclusion

Implementing the Physics Virtual Lab application with the help of domestic used materials makes a positive contribution in supporting Basic Physics Practicum activities during the Covid-19 Pandemic Period. Based on the questionnaire results, survey responses/perceptions of students obtained an average score of 4.22 out of 5 Likert scale assessment criteria, so it can be interpreted that the average student agrees to the use of the physics virtual lab application. Then for the results of student attitude competence, obtained from observations using observation sheets and the overall analysis results, students experienced many changes to aspects of attitude competency assessment, including an average score of 80.88 integrity; independence 74.89; confidence 75.17, and responsibility 84.89. So it can be conveyed that the indicators in the attitude competency assessment experience many changes at each meeting and tend to increase.

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