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Evaluation of the Virtual Laboratory Program at Bina Dharma High School

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ABSTRACT

A virtual laboratory is a system used to support a simple practicum system. The virtual laboratory has another name, Virtual Laboratory. The work of a virtual laboratory will provide opportunities for teachers and students, especially in carrying out practicum activities using internet access. Students do not need to meet face to face to take part in practicum activities in the laboratory room. In addition, this study helps determine the psychomotor abilities of students. This study uses a qualitative approach technique with a formative evaluation model that Scriven has developed. This evaluation model is carried out when the program is running and aims to increase program effectiveness. This study focuses on data collection through interviews and direct observation at every practicum activity carried out. After evaluating the program, it can be concluded that the program entered a good category with an acquisition value of 84.21% and got a B award. Therefore, the program can be accepted but must be developed even better by developing software in digital objects. There is no need to provide tools and materials because they are in digital format. Development is needed so that the percentage of success of this program can reach a higher number. Action is required so that the rate of success of this program can get a higher number.

Keywords: Evaluation, Virtual Laboratory, Learning in the pandemic era

INTRODUCTION

Since the beginning of 2020, changes in the education system saw a revolution. Learning that was previously carried out in the form of face-to-face learning must change with learning online at all levels of education, including college. Many education policies are found to prevent the transmission of the corona virus 2019 (Covid-19) [1]. The COVID19 pandemic has caused many educators to teach lessons online suddenly. Schools need opportunities to reshape education, teacher education, and education within the institution [2]. The Information Resource Management Association believes that distance learning is supported by teaching methods that suit the physical isolation of learners and teachers, interaction, and pre-stage teaching activities through printing, mechanical or electronic devices [3]. The school continues to run even though it is done face-to-face with students, carried out in their respective homes. The learning process is still directed by the teacher using interactive online communication media or existing learning applications. While carrying out assignments at home, the teacher still has to guide and provide assessments to achieve the suitable learning targets with the laws and regulations which govern the discipline of students [4] According to Tekdal, distance education as access to education uses tools such as satellite, audiovisual, graphics, computerization, and multimedia, etc. technology. Distance education includes such activities as multimedia-based education, interactive

learning [5]. According to Markova, its application is practical. The success of distance education is strongly influenced by aspects of student readiness, parts of learning management systems, elements of infrastructure support, and institutional commitment [6].

In this pandemic era, it will likely be challenging to measure students' skills because teachers' observations of students are minimal and the communication that is formed. The weakness of experiments carried out directly can be replaced with other types of experiments that students can do in experiments that are not real. An unreal investigation presents an online practicum using a computer. The current development of educational technology can improve the quality of learning in schools [7]. This virtual laboratory will later help students and teachers carry out practicum activities, where practicum activities enhance students' understanding of psychomotor concepts and abilities. So that learning objectives in the pandemic era can be conveyed well and smoothly. Once held practicum by using a virtual laboratory with online training, the researcher wants to evaluate the ongoing program whether it can be continued or developed to be even better.

Virtual laboratory means an interactive and communicative environment to carry out practicum experiment activities. Some of its components consist of simulation programs, tools used on objects, and reference books [8]. Virtual laboratories are also called work systematics used and performed to complement a simple experimental system. This virtual laboratory has another name, Virtual Laboratory. The formation and operation of a virtual laboratory can be helpful and provide the opportunity to conduct experiments that students can do to carry out practicum experiments with all media or applications via the internet so that students do not need to attend practicum at school.

Previous research Hendra Jaya researched by developing a virtual laboratory at SMK for practicum activities and providing facilities for character education. And found the results of learning assessments using virtual practicum forms applied and set in the Digital Electronics subject. Products that have been developed use the LabView application, which is supported by Macromedia Flash 87 software. The development of a virtual laboratory program is used for Experimental activities and facilitates the application of Character education in SMK for trials that can later support practicum activities. The results of developing a laboratory program can be viewed from a computer program and the design of a system.

Virtual-based learning is used in practicum activities at SMK and can reduce the cost budget compared to simple training. The need for equipment and suitable materials is also expensive components of a natural laboratory, or additional equipment used in practical activities can be reduced. The advantage of using practicum with virtual media is that it reduces the length of time practicum in a natural environment, can hold practices when conditions are dangerous (pandemic) and requires careful consumption of electronic devices and equipment, saves costs through the same lab, provides unlimited access to expensive equipment, reduce the cost of traveling to the practicum center, repair /replacement costs of practicum components and equipment and enable SMK students to collaborate, share information and work well.

The research we do has a difference in that we don't do development, but we measure the program's success rate by evaluating the programs that have been made. Sometimes the teacher does not know whether the program is appropriate and only focuses on developing it. The researcher considers so that the program created can be helpful and used.

Assessment is a process to obtain, analyze, and conclude a process and learning outcomes that students have carried out in an orderly manner and are interconnected to get information that has meaningful value about

achieving student competency standards based on predetermined indicator standards. The assessment is carried out in all generals by considering the psychomotor, attitudes, and skills [9]. Authentic assessment is a step in finding and gathering information about the development and achievement of the learning results that students have carried out through various stages of techniques that can discover facts, prove or show precisely that the learning objectives to be achieved have been understood [10].

Teachers must take advantage of the use of application media connected to the internet network to assess and evaluate learning outcomes online. The assessment can take the form of a quiz, online test, assignments given to individuals, or other online assessment forms using the internet [11]. However, there are various kinds of problems that occur to students in online learning, namely difficulties in finding and completing practice questions in the learning process, difficulties in finding information about lessons discussed individually, and difficulties in doing given assignments [12]. Distance learning has other limitations, namely in psychomotor assessment. There are several alternatives, but practicum can help strengthen the concept, so it is necessary to have a simple practicum with a virtual laboratory to overcome these problems. The purpose of the research that Hendra Jaya has done is to develop a virtual laboratory. Still, researchers want to measure the success and accuracy of laboratory use by evaluating the program.

RESEARCH METHODS

This study applies a qualitative approach to Scriven's type of evaluative research, namely evaluation activities carried out during the program and intended to increase program effectiveness [13]. The goal experiment is to find out the application of the virtual laboratory at Bina Dharma High School during this pandemic. This research helps know the psychological abilities of students.

Formative evaluation is carried out when the teacher starts doing practicum and observes to check students' work results. If there is an assessment error, the researcher will evaluate it periodically. Researchers focused on questionnaire data and interviews that have been obtained through interviews [14].

Interviews are carried out as additional techniques to complement data, which is the primary technique of distributing questionnaires along with observation. Researchers conducted interviews with mipa teachers who needed practicum activities where this program was appropriate. Then the teacher made observations in each practicum activity with an online laboratory to test feasibility.

The data analysis technique in this study used the interactive analysis model by Miles & Huberman. The analysis has three stages, namely data reduction, data presentation, and concluding. The first is to reduce all data, and this activity includes summarizing the research results, then selecting some main things and focusing on all the things that are important to find a theme and pattern. The second is data presentation, presented in the form of a descriptive narrative based on categories so that later it can provide a clear and detailed picture. The third is concluding, testing each selected data's suitability, truth, and strength through data validity testing. Thus, the conclusion obtained is a reliable one [15].

Data reduction is the first step in analyzing data. The aim is to make it easier to understand the concept of the collected data. Reducing data means summarizing, selecting some main things, focusing on essential topics, looking for themes and patterns. This experiment was carried out by interview to determine the subject and the most important components present in practicum activities. then the researcher can choose the right indicators to be evaluated.[16]

After the data is reduced, all you have to do is look for data and present data or collect data. Presentation of data has the meaning of rewriting a collection of systematically

organized and categorized data, making it possible to conclude the data. Then the result is to order the success of each indicator by spreading the responses to students. Drawing conclusions is done by analyzing all the data that has been collected, both through questionnaires and interviews and some field notes. Then later, the findings can determine the results of the research.

RESULTS AND DISCUSSION

The virtual laboratory program is used as a substitute for face-to-face laboratories, where this program uses several provisions that are not burdensome for students. The teacher's requirements do not provide a challenging practicum, but a simple practicum where practicum can be done at home but still has a concept.

To determine whether practicum activities are difficult to carry out in the pandemic era and to determine whether laboratory programs are needed in the pandemic era, we conducted interviews with mipa teachers at Bina Dharma High School. The following are the interview results; (A is a researcher and B is a mipa teacher).

A: "According to you, there were obstacles during practicum activities?"

B: "I think there are problems in carrying out assessment activities such as psychomotor assessments."

A: "Do you think there is a way to solve the problem?"

B: "There is the possibility of using a substitute assignment

A: "Do you think virtual laboratory can be used as another alternative?"

B: "I think it can be used as an alternative."

The results of the interviews that have been conducted then form the basis for our research to create a virtual laboratory program that is suitable and applicable at Bina Dharma High School; in the preparation of the program, a further study is carried out of the theory and components needed in programming. Then we conducted a second interview with the mipa teacher to determine what parts and things should be done when creating a program. the following are the results of the interview;

A: "What do you think should be involved in making an e-lab program?"

B: "There must be a communication medium to connect teachers with students."

A: "For this program to be successful, what should the teacher pay attention to?"

B: "Readiness of the necessary tools must be owned by students."

A: "According to you, what forms of observation are used to assess psychomotor activities?"

B: "Can fill in worksheets or practicum documentation."

The results of the second interview resulted in a program where the laboratory program must require communication media and make this program more accessible. The researchers used the help of media quipper as a medium of communication between the teacher and students. Then the teacher also made a practicum program that would be carried out with criteria that were easy to do, namely practicums. Simple and finally, the form of the report so that practicum activities can be observed re-application in the form of experimental videos.

Then the laboratory program periodic evaluations are held for three months. This selection is based on existing assessments in school, namely midterm assessments, based on imaginary report cards containing existing activity or psychomotor values.

The virtual laboratory program uses two software tools, namely YouTube, a place for uploading video results, and a quipper as a medium of liaison between teachers and students.

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The initial stage in designing a practicum using a virtual laboratory is by making a video following the practicum and then uploading it on youtube media.

The second stage is by copying the video link or URL on YouTube, entering the link into the media quipper, and entering the practicum report format.

The last stage is the teacher provides a link from the quipper to spread to the class where the practicum is held, then later it will be read in the quipper media of students.

Evaluation is carried out to measure the program's success rate for every 3 months whether it can measure the level of students' psychomotor skills or increase understanding of the concepts of related subjects. Evaluation of the virtual laboratory program is carried out by distributing a questionnaire consisting of 14 questionnaires using the Likert scale rule. The results will then be accumulated in a percentage form, as shown in the following table.

Table 1. Conversion Of program Achievement Calculation Result

No	Percentage Scale	Value	Predicate
1	$85 \leq FA \leq 100$	A	VERY GOOD
2	$70 \leq FA \leq 85$	B	GOOD
3	$56 \leq FA \leq 70$	C	ENOUGH
4	$FA \leq 56$	D	LESS
5	FA = 0	E	MORE LESS

The study results using a Likert scale with the number of respondents as many as 57 students and 14 questions obtained the following products.

Table 2. Result

No	Result	Vote	Score
1	Very Good (5)	300	1500
2	Good (4)	392	1568
3	Enough (3)	86	258
4	Less (2)	14	28
5	More Less (1)	6	6
	Total		3650

From the calculations above, the total assessment results are obtained result.

$$acquisition\ value = \frac{raw\ score}{maximum\ score} \times 100$$

$$\text{score} = \frac{3350}{3990} \text{ x } 100 = 84{,}21\%$$

So it can be concluded that the evaluation of the virtual laboratory program gets a percentage result of 84.21% and gets a category B value with a good predicate. So it can be said that the program that has been implemented has run smoothly and can be accepted.

Research on the evaluation of virtual laboratory programs gets good predicate results following the understanding. A virtual laboratory is defined as a communicative and interactive environment for conducting simulated experiments, such as a playground for

conducting experiments. It consists of several main objects of a simulation program and an experimental unit called an entity consisting of data files, operating tools, and various reference books [17]. From the questionnaire distribution of 60 students, 54 students stated that the communication service of the virtual laboratory program was excellent. This implies that the virtual laboratory creates an interactive environment.

A virtual environment, commonly called a virtual laboratory, consists of several components such as static web pages that contain video and text to a broader page with a sophisticated and collaborative authoring environment (Emigh & Herring, 2005), video on demand, meeting by way of virtual has many other features. Virtual laboratories can also be done with remote access using video cameras and microphones [18] by using the measurable concept from the laboratory as an alternative solution for distance learning problems. With the evaluation of the virtual laboratory program at SMA Bina Dharma getting a good predicate, it can be attributed that the virtual laboratory program can be used as a substitute for face-to-face practicum.

Previous research on virtual laboratories has been carried out by Hendra Jaya, who developed a virtual laboratory that is useful for practicum activities and has the advantage of being a place for character education in vocational schools, which have similarities where the activities carried out are both using online practicum as an alternative to long-distance learning. Virtual laboratories replace face-to-face practicums, which make it easier for teachers to measure psychomotor abilities. The difference from the research we did was that this study measured the success rate of the program after it was implemented; this evaluation was carried out to find out whether this program was still feasible or effective enough to be carried out while previous research was to develop laboratory programs for practicum activities without measuring the success rate

CONCLUSION

The virtual laboratory provides opportunities for students where students can develop creative thinking skills, with the freedom of practicum with themes and work steps that the teacher has determined and under teacher supervision; of course, students will be more courageous to do practicum.

After evaluating the program, it can be concluded that the program is in a suitable category, and it is said that the program is acceptable. Still, it must be developed even better by developing software in digital objects, which later students do not need to provide tools and materials because they already exist in digital form. Development is needed so that the percentage of success of this program can reach a higher number.

Technological advances for laboratories will also have their threats even though on a small scale, threats that may arise are hacking of sites and viruses that will interfere with learning activities themselves; even though they have not been encountered during implementation, previously it was known that existing virus applications could breastfeed virtual activities.

This study has limitations where the laboratory equipment used in experimenting is

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straightforward according to the students' practicum equipment conditions, so some materials cannot be carried out in practicum.

Suggestions for further research are developing practicum-based simulator software as additional material in online practicum activities by developing simulator-based software that can overcome the limitations of students' tools. Students can understand the concepts that are taught later.

Kesimpulan hanya cukup menjawab permasalahan atau tujuan penelitian. Boleh ditambahkan implikasi atau saran. Sebaiknya dituliskan dalam bentuk paragraf, bukan dalam bentuk *item list/ numbering.*

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