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Virtual Laboratory: Development of Physics Practicum Instruction to Improve Student Skills

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Abstract: This project aims to provide students with lab practice that is completely genuine, to learn about their practice habits, and to inspire them to study after utilizing the created physics lab practice. This study is a type of development utilizing physics lab practice use 4-dimensional learning tools. Utilizing confirmation of reasoning, observation, and questionnaire. The evaluation of the virtual lab yielded the logic validation value 2,78 and they are considered reliable and safe for usage as a trial for development. The development testing revealed that the students work passed muster with the help of the physics virtual laboratory baseds instructions, either on the capacity for observation and note taking or the capacity for interpretation and illustration. The results of the development test showed that the students practicum performance in all practicums, in the aspect of ability to observe and record practicum results, was in the good category with a range between 61.37% and 92.93%, and in the aspect of ability to interpret the results and formulate conclusions, it was categorized as good with a range between 65.15% and 96.97%. The virtual laboratory based physical practicum instructions that were developed obtained validity in the good category and are suitable for use as a guide for physical teachers and students in carrying out practicums.

Keywords: Virtual Laboratory, Physics Practicum, Student Skill

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INTRODUCTION

Physics is a process and product that deals with assessment of the occurrence of natural phenomena. Proses is a project that involves observation, creating hypotheses, planning and carrying out experiments, evaluating the results of data collection, and other activities. Product is the end result of a process that includes fact, principle, rule, theory, and other components (Hamed & Aljanazrah, 2020). Thus, it is not sufficient to learn islamic philosophy of knowledge solely by reading books or listening to lectures from other organizations. Rather, it is necessary to engage in some form of educational program that accommodates any necessary educational program in order to produce the desired result.

Laboratories for physical education can be used to demonstrate theories or physical phenomena so that students can remain still while the task at hand is being carried out (Renshaw et al., 2010). Tool for the physical experiment that was carried out in the lab required the most number of scientists in one class. When laboratory activities are carried out in a group setting, there are eight women involved in each group. In that case, if there are forty (40) sisters in a single class, subsequently there are ten (10) units of tools (Gunawan et al., 2019).

Based on observations and conversations with the sevent grade science teacher at SMP Plus Rahmat, it has been learned that the science textbook that has been used throughout the schools curriculum has been fully integrated into the teaching process. However, because of equipment that the failing school only has on hand for the current courses materials, laboratory activities frequently take place during the courses planning phase. Even if there are not any practice areas like there usually are, any laboratory project can be carried out. This can be accomplished by carrying out a laboratory activity in a virtual environment. Use a particular laboratory to translate abstract concepts into computer aided visualizations. The current SMP Plus Rahmat physical science teacher has previously completed a virtual lab project. However, this project is less effective and efficient than it could be because there is not a clear plan in place for the virtual laboratory work that the students will be doing in their science textbooks. Therefore, the student must exercise caution when carrying out the virtual laboratory project (Verawati et al., 2022).

Developing virtual laboratory based practical instructions is an alternative to overcome the problem of no implementation of practical activities and students lack of motivation in virtual laboratory activities. The key to helping employees execute in a clear and concise manner what is derived from theory is practicum intructions (Pyöriä, 2005). Laboratorium virtual practical instruction is the term for a practitioner who uses a virtual laboratory during their practice sessions (Latumakulita et al., 2022; Saputra et al., 2021). Virtual lab equipment

is in good condition and is operating as intended. In addition, observation and measurement of physical symptoms can be carried out as effectively as possible by utilizing a suitable tool (Revicki et al., 2008). Virtual lab equipment that is in use is operated exclusively with keyboard or computer mouse buttons (Rahmi & Dewi, 2023).

In connection with the foregoing, the primary goal of this study is to develop a virtual laboratory based practicum in physical science that is high quality and suitable for understanding practicum workers work processes and boosting learners motivation for physical science coursework. A good virtual laboratorys use of practical exercises will benefit dance instructors (Lesmono et al., 2012; Parrish, 2016). The benefit for teachers and students is that it can be used as an alternative problem solving in carrying out practical activities so that students can end their learning motivation towards physics lessons (Beichner et al., 2007; Mihardi et al., 2013).

METHOD

Learning devices of development model 4-D is the subject of the design for the instructions for practice in physical modeling based on a virtual laboratory. Model 4-D was chosen as a result of its strengths, which include its suitability for improving learning outcomes across all domains, the presence of expert judgments, and meticulous and systematic attention to every step of execution. The analysis that is being used in this quantitative research study is a deskriptif quantitative analysis. Validity of practical practice as determined by the validators of validity. Based on the results of the analysis, the ratio of the indicator value provided by each validator is determined. Based on a rate-to-rate currency indicator, a rate to rate currency is specified for each aspect of the calculation. Rumors of the avrage as in **Equation 1**.

$$\bar{X} = \frac{\sum x}{n} \text{.....(1)}$$

X is the number of assessment answer scores, n is the number of respondents (validators), $\sum x$ in the validation mean score. Final percentage rate for all criteria to be applied at the time of the interval for evaluating the quality of physical practice is as in **Table 1**.

Table 1. Interval of validation

Interval	Interpretation
2,35 – 3,00	Good
1,68 – 2,34	Enough
1,00 – 1,67	Not Good

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Practicum instructions is stated to have genuine validity if its quality falls within acceptable ranges. Practical performer is presented in its entirety for each of the three sexes and each indicator. Practical Performer to each indicator is hitched as in **Equation 2**.

$$P = \frac{jumlah\ siswa\ yang\ mendapatkan\ skor\ n}{jumlah\ seluruh\ siswa} x\ 100\%$$

Information: n = 1, 2, dan 3 (Yulianing, 2012)

FINDING AND DISCUSSION

Data from three validators were used to validate the logic practicum instructional physics based on a virtual laboratory. Data that are produced are made up of quantitative and qualitative data. Data that is being used is quantitative data analysis up until the validation checks by the validator at the format level of 2.87, the illustration level of 2.75, the language level of 2.72, and the content level of 2.78. Based on the validators quantitative data, it may be concluded that intructions practicum can be used with critical review. To make the text easy to read and understand, it was contradicted. Give a picture to better explain the plan of action. To make it easier for student to understand, the formula was modified even further. Intructions for measuring lenght with a watch or a ruler, and stopwatches are used during timed measurement of the hour. Based on an analysis of the results of the practice that the teacher gave his or her students while using a practice instrument based on a virtual laboratory, it can be understood that a students practice job is determined by two criteria, namely the ability to analyze and record practice results and the ability to understand those results and identify key takeaways for each practice job that falls into a good category.

Last but not least, if every aspect of every practicum is review, the students working conditions may be shown by **Figure 1** and **Figure 2**. Moreover, using a book of practical exercises based on a virtual laboratory for each of the five assessments can produce results from an analysis of the data on the motivation of employees to learn throughout practice.

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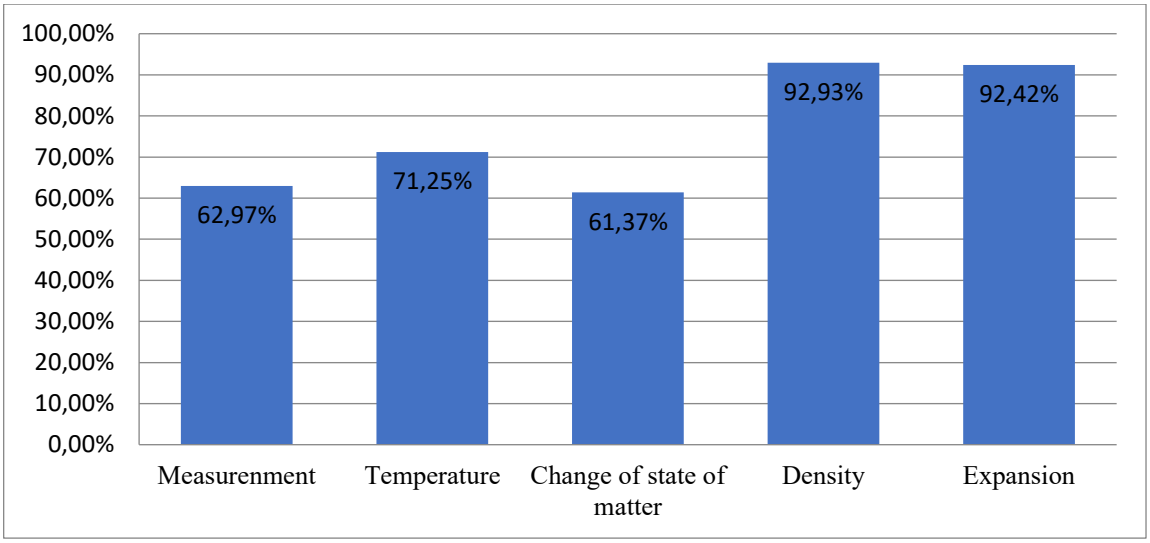


Figure 1. Student practicum performent aspect of abality to observe and record practicum record

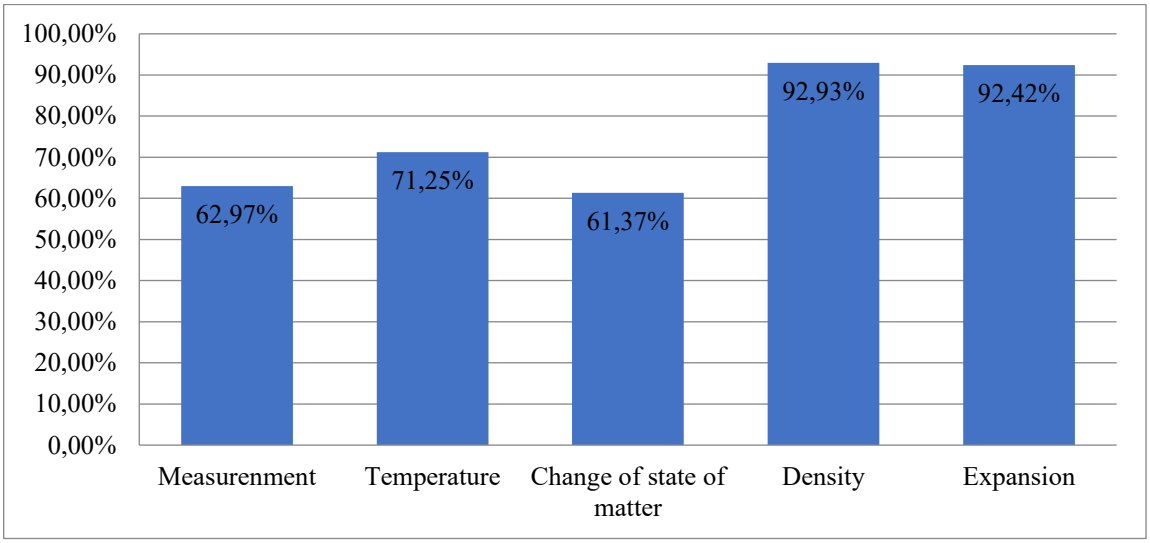


Figure 2. Student practicum performent aspect of abality to interpret results and formulate conclusion

Logic and validation development tests are the two main focuses of the practice guide in physical science based in a virtual laboratory. The assessment result of the validity of the logic of the virtual laboratory based physics practicum instructions was 2.78 so that the practicum instructions were included in the good category and suitable for use as a guide for physics teachers and students in carrying out practicums. Based on an analysis of the results of the practitioners work throughout the practice session while using the practice manual in finance based on a virtual laboratory it can be understood that internship performance is real. Students are reviewed from the second aspect that is from assertiveness to detect and detect the ability aspect of practicum results to interpreting the results and speaking up conclusions for each of the practical values more increasing than the appropriate category.

After the logic validation process, test development is carried out. At the time of the study, an empirical evaluation of the relationship between the practice of teaching and the motivation of teachers of students in grade VII G was conducted using a practical guide based on a virtual laboratory. Based on research conducted on how student interns work during the assessment of their capacity to understand and document their internship results, it is understood that from the pool of these interns work, every single one has reached a presentation rate of at least 60% for work that is deemed to be good.

Based on data analysis, it is concluded that the presence of the highest percentage occurs during mass practice because this occurs prior to doing mass practice. Students have already begun performing practice of mass balance ohauss causing the students to be more lanky in the area of calculating the mass of objects. Meanwhile, practice in the form of substances has changes in practice. Most impressive presentation from the fourth other practice is due to the days events. Practice of the lady was not very thorough in recognizing the form of change that is occurring in paraffin such that if the servant is too telegenic, in analyzing the form of change that is occurring in paraffin such that if the servant is too telegenic, in analyzing the form of change that is occurring when the time has been determined, the student will see one single form of change from paraffin presently and students must from the beginning to the end, so that i'm in need of a long time.

According to research conducted on the work practices of student interns who were tasked with interpreting results and summarizing work products, it was discovered that from the pool of these interns, every single one had reached a presentation score of at least 64% for work that was considered to be good. Based on data analysis, it has been determined that practicing with objects has the highest percentage levels compared to practicing with other objects types. This means that practicing with mass in this manner will make it easier for practitioners to understand how to identify and analyze different types of mass from each object type. Contrarily, the practice of changes has a more impressive presentation than other types of practice because in the virtual laboratory, the practice of changes is less clear (Haryadi & Pujiastuti, 2020; Sinensis & Firdaus, 2023). This results in less accurate data from the students observations and less capability for students to analyze what they are aware of, as well as less understanding of the theory of manifestation of change by the student (Robinson, 2010). In an appropriate tone for an aspect of ability to analyze and communicate practice results and a focus on mastery assess results and consider key points, practice work for women by using the manual practice book based on a virtual laboratory that's safe because of the use of a manual book students practicum will be easier in the future launching a virtual internship and In light of this,

it is also possible for women to carry out projects (Eddy et al., 2015; Rossiter et al., 2018). Laboratory presently and students must do practicum.

CONCLUSION

The virtual laboratory-based physical practicum instructions that were developed obtained a validity of 2.78 in the good category and are suitable for use as a guide for physical teachers and students in carrying out practicums. The results of the development test for class VII G students at Plus Rahmat showed that the students practicum performance in all practicums, in the aspect of ability to observe and record practicum results was in the good category with a range between 61.37% - 92.93% and in the aspect of ability to interpret the results and formulating conclusions is categorized as good with a range between 65.15% - 96.97%. Researchers recommend creating a more effective learning scenario.

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