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WORKSHOP PENULISAN JURNAL INTERNASIONAL



Correlation of Online Learning Evaluation With Students' Learning Outcomes in the Covid 19 Pandemic

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Abstract—The Covid-19 outbreak greatly impacted the learning process at Universitas Samawa as one of higher education in Indonesia. This causes the learning process to be changed from face-to-face to *online*, including the learning evaluation process. This quantitative descriptive study aims to determine the correlation between the evaluation of *online* learning and student learning outcomes at Universitas Samawa. This research was conducted at Universitas Samawa with a number of respondents as many as 87 students who were selected using purposive sampling technique. The instrument used was a questionnaire with a Likert scale of 1 to 4. The questionnaire contained statements about the correlation of the *online* learning evaluation process with student learning outcomes. The results of this study indicate that there is a positive correlation between the use of *online* learning evaluations and the learning outcomes of students at Universitas Samawa. The learning evaluation process is one of the external factors that have a contribution in influencing and determining student learning outcomes. *Online* learning evaluation could be the best solution that can be applied during the Covid-19 pandemic.

Keywords—*online learning evaluation, learning outcomes*

I. INTRODUCTION

The Covid-19 pandemic in Indonesia has been going on from early 2020 to the present. This pandemic has a significant impact on several important sectors such as the economy and education. This is in line with the statements made by Purwanto, et al [1] that the spread of the corona virus initially had a major impact on the economic and social world, but now the impact is also being felt by the world of education. The teaching and learning process in every school including at the higher education level is one part of the education sector that has been affected by the Covid-19 pandemic. UNESCO estimates that nearly 900 million students have been affected by the closure of educational institutions due to the Covid-19 pandemic [2].

The learning process which was originally carried out face-to-face, has turned into learning that is carried out online to follow the health protocol by applying an interaction pattern

commonly known as social distancing or physical distancing. Every learning process is carried out online, and the learning evaluation stage is no exception.

Learning evaluation is one of the important stages that must be carried out in a teaching and learning process to determine the level of achievement of learning objectives. Learning evaluation is carried out systematically with the main activities, namely measurement and assessment. Evaluation can provide an overview of the level of student mastery of the material, provide an overview of learning difficulties, and provide an overview of their respective positions [3]. Evaluation is the process of determining a program, namely whether a program is planned perfectly, well executed, achieved perfectly, and has a very broad impact [4]. The teaching and learning process at each stage, including the evaluation of learning, must still be carried out during a pandemic like this, this is because learning evaluation is an important part that must be carried out.

The learning evaluation stage is very important because it can be a benchmark for whether learning objectives are achieved or not as seen from the acquisition of student learning outcomes. Student learning outcomes are one of the benchmarks for whether the teaching and learning process and evaluation have gone well or not. If the learning outcomes have been obtained, then actions can be taken to improve or enhance the learning process through evaluation results for the better. A learning evaluation process should be improved after obtaining the results of the analysis that has been carried out through the information received. Bennett [5]; Pellegrino et al. [6] stated that evaluation does not only refer to collecting data systematically and analyzing information about students but also being able to interpret and act on information about their understanding and / or performance in relation to the achievement of learning objectives.

The current evaluation of learning is not carried out as usual such as face-to-face. This is because each higher education unit carries out teaching and learning activities online. This activity is carried out using the home learning method, where students and lecturers remain at home. The

implementation of this activity is carried out using several platforms such as WhatsApp, Zoom, Google Classroom, and Schoology. Online learning evaluation is the most appropriate alternative solution during a pandemic so that lecturers can always get information about student learning outcomes and also it is considered easier and more efficient to obtain data on the level of students' understanding of the material that has been described.

II. METHOD

This type of research was a descriptive study with quantitative techniques. The subjects of this study were students from several study programs at the Universitas Samawa, Sumbawa Region, West Nusa Tenggara. The research sample was 75 students with different levels and were selected using purposive sampling technique. The research instrument used a Likert scale questionnaire with a scale of 1-4, where a scale of 1 indicates disagree, 2 indicates disagreement, 3 indicates agree, and 4 indicates strongly agree. The questionnaire used contains several statements relating to the platform used at the time of the evaluation, the level of accuracy of the online evaluation in measuring student learning outcomes bills, and providing special forms for students to comment on the evaluation process.

Students' learning outcomes data are obtained from the results of the final semester examinations by several lecturers who teach subjects related to the selected respondents. The data analysis technique was carried out by classifying the data, tabulating the data, scoring the respondents' answers, processing the number of respondents' answers, calculating the percentage of questionnaire answers for each statement item, calculating the average percentage of the questionnaire, visualizing the data in the form of images, and interpreting the percentage of questionnaire answers as a whole. The correlation between online learning evaluation and learning outcomes can be determined by analyzing data using SPSS. The data obtained in qualitative form are then quantified using the following equation:

$$\text{value obtained: } N = \frac{\text{the number of scores obtained}}{\text{the maximum number of scores}} \times 10 \quad (1)$$

TABLE I. INTERPRETATION CRITERIA FOR QUESTIONNAIRE SCORES

Scale	Category
100	Strongly Agree
75-99	Agree
50-74	Disagree less
0-49	Disagree

III. RESULTS AND DISCUSSION

Online learning evaluation data collection using a questionnaire with the help of google form has been carried out. In the questionnaire, there are three important statements related to the relationship between online learning evaluation and learning outcomes and student perceptions are obtained as shown in Figure 1.

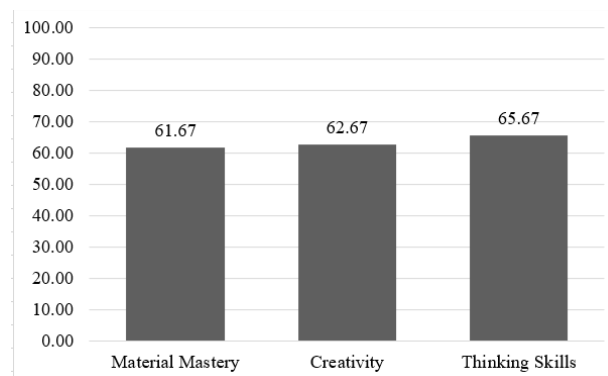


Fig. 1. Students' Responses Regarding the Relationship between Online Learning Evaluation and Learning Outcomes

Figure 1 shows the level of students' perceptions regarding the statements given. Overall, the data shows that students disagree with statements that explain "online evaluations can measure students' mastery of the material being taught, online learning evaluations can increase student creativity, and online learning evaluations can train students' thinking skills". A contradictory statement was conveyed by Setemen [3] which stated that online learning evaluation was well received by students and overall students stated that they strongly agreed with online learning evaluation.

Students give a statement that they do not agree with the statements submitted in the questionnaire. They expressed this for several basic reasons, such as statements related to online evaluation which could measure student mastery, they stated that the questions given were not comparable with the material that was explained during the lecture process. This statement arises because students think that the material given is small, but at the time of evaluation, questions related to material that have not been previously explained appear. This reason is the basis for students to consider online learning evaluations as currently ineffective in measuring student mastery of material.

In the second statement regarding online learning evaluation being able to increase creativity and thinking skills, they assumed that online evaluation was less capable of increasing creativity and thinking skills because it was limited by time and they thought that face-to-face evaluation was better than online. This is because with face-to-face students can more freely explore their creativity because it is not too limited by time and easier in confirming everything they still doubt. This is not in line with the statement of Setemen [3] which states that online learning evaluation does not require a lot of time and money to produce instruments, for scoring and processing scores, to provide feedback to students, and this type of evaluation does not cause anxiety in test taker. Kicken [7] also states that online evaluation can improve students' ability to formulate learning needs, choose meaningful learning activities, and complete learning tasks. Sutopo [8] adds that evaluation of learning that does not use face to face does not require the presence of students and examination supervisors at the specified place and time.

After the evaluation data is obtained, data collection is carried out on student learning outcomes who have provided statements on the online learning evaluation questionnaire. The value of student learning outcomes is obtained from the results of the final semester examinations which are carried

out online. After the student learning outcomes data are obtained, the online learning evaluation data and learning outcomes are analyzed first with SPSS to see whether the two data are normal or not. Normality test data from online learning evaluations and learning outcomes are shown in Table II.

TABLE II. DATA NORMALITY TEST

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Online Learning Evaluation	0.159	75	0.000
Learning outcomes	0.070	75	0.200*

After carrying out the data normality test as shown in Table II, it was found that the significant value of the online learning evaluation was 0,000 and student learning outcomes with a significant value of 0.200. This states that the online learning evaluation data is not normally distributed because the significant value is less than 0.05, while the learning outcome data is in the normally distributed category because the significant value is more than 0.05. The normality test is carried out as a prerequisite test before the correlation test is carried out. After the normality test on both data was carried out, then a correlation test was carried out to determine the level of the relationship between online learning evaluations and student learning outcomes. The results of the correlation test for the two data are presented in Table III.

TABLE III. CORRELATION OF ONLINE LEARNING EVALUATION WITH STUDENTS' LEARNING OUTCOMES

			Online Learning Evaluation	Learning outcomes
Spearman's rho	Online Learning Evaluation	Correlation Coefficient	1.000	-.007
		Sig. (2-tailed)	.	.952
		N	75	75
	Learning outcomes	Correlation Coefficient	-.007	1.000
		Sig. (2-tailed)	.952	.
		N	75	75

Based on the correlation test that has been done, the correlation data obtained between online learning evaluations and student learning outcomes. From Table III, it is known that the correlation coefficient value is 0.007 (negative) and the significance value is 0.952. These data indicate that there is no positive and insignificant relationship between online learning evaluation and student learning outcomes. The data also shows that the relationship or correlation between online learning evaluation and learning outcomes seen from the correlation coefficient value of -0.007 is in the very weak relationship category.

The results of this correlation test are in line with the statements conveyed by students who expressed disagreement with online learning evaluations which can improve learning outcomes. This shows that to see the relationship between online learning evaluation and strong learning outcomes, other variables are needed as moderating variables of the study. Rolisca & Achadiyah [9] state that the potential advantages of

online learning evaluation are direct score reporting, decreased administrative costs on school district personnel, increased safety of testing materials, and more flexible exam scheduling. In many countries, policy makers say they are happy with the potential for efficient measurement of student abilities through the online exam model.

The absence of a relationship between online learning evaluations and learning outcomes here is in terms of whether online learning evaluations can improve learning outcomes. However, from several other aspects, online learning evaluation and learning outcomes have a strong enough relationship, such as students feeling interested in online learning evaluations, feeling motivated, not lazing around, serious in working on questions, and not feeling bored and bored. This has an indirect impact on student learning outcomes.

IV. CONCLUSION

Based on the results of the research that has been done, information was obtained that online learning evaluations during the Covid-19 pandemic has weak correlation with the learning outcomes obtained by students of Universitas Samawa. Thus, it can be concluded that the online learning evaluation variable requires supporting variables to determine students' learning outcomes. The authors suggest that further researchers would use more than two variables to review the correlation which is the aim of the study.

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Using Virtual Laboratory to Improve Pre-service Physics Teachers' Creativity and Problem-Solving Skills on Thermodynamics Concept

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Using Virtual Laboratory to Improve Pre-service Physics Teachers' Creativity and Problem-Solving Skills on Thermodynamics Concept

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Abstract. Virtual laboratories have been developed in this study as an alternative to the limited equipment of physics experiments. This study aims to examine the effectiveness of virtual lab models to improve creativity and problem-solving skills for prospective physics teachers. The research and development have been divided into 3 phases namely, preliminary study, design development, and model testing. Model testing was performed on two groups of thermodynamic courses using a pre-test post-test control group design. The instruments that have been used are creativity tests and problem-solving tests in the form of essays. Instruments of creativity include verbal and figural aspects. Each data was analyzed using t-test and normalized gain score. The results showed that there was an increase in creativity and problem-solving skills in both groups. The creativity of students of the experimental group was higher than the control group. Student problem-solving skills in the two groups differed significantly. The experimental group has a higher problem-solving ability than the control group. This suggested that the developed virtual lab model proved to improve the creativity and problem-solving skills ability of prospective physics teachers.

1. Introduction

Physics is a part of science that consists of facts, concepts, principles, and laws that are verified through a set of experimental activities and quantitative measurements. One of the goals of physics learning is to develop theories to create technology that is capable of assisting human life. Thus, learning physics plays an essential role in educating, cultivating, and developing the potential of learners to become qualified human resources. Afrizon et al. [1] stated that physics learning had contributed a lot to the development of science and technology. Most of the technology used by humans today based on the development of theories of physics.

One of the branches of physics is thermodynamics. Thermodynamics consists of abstract concepts that learn about the relationship between energy and work of a system. Thermodynamics also studies the macroscopic quantities of systems that can be observed and measured in experiments. Microscopic quantities of thermodynamics can be studied in the gases kinetic theory. The concept and theory of thermodynamics have developed many industrial and technological systems in the world. Without



studying thermodynamics well, maybe at this moment, we cannot enjoy the advanced technology that helps our lives.

Learning on thermodynamic concepts needs to be supported by adequate experimental activities to examine the truth and to develop the thermodynamic theories. Experimental activities provide an opportunity for learners to discover their concepts through observation with thinking skills, creativity, and problem-solving skills. Currently, the implementation of experimental activities encountered many obstacles such as laboratory facilities, and infrastructure does not support the experimental activities. In addition, some experimental activities also require a high cost and take a long time to experiment with results as expected. This problem then becomes the main reason why experimental activities are not conducted by educators, thus implicating the low creativity and problem-solving skills of students.

Some of these problems can be solved by developing innovative learning media. The use of supporting media can make learning more productive and able to simplify complex concepts. Many media can be used in physics learning, especially in thermodynamics course. Currently, computer-based media is considered the most appropriate to use. Computer-based media can make students get unlimited information. One of the computer-based media that can support the experimental activity is a virtual laboratory.

A virtual laboratory developed and used to perform experimental activities just like a real laboratory. The virtual laboratory can display text, sound, graphics, video, and animation in an interactive view oriented toward solving real-world problems. Interactive animation such as sub-microscopic media could help students to understand the abstract concept [2]. The virtual laboratory is more accessible for learners to review specific sections and explore ideas more deeply in experimental activities [3]. Experiment activity with virtual laboratory also offers efficiency and help students to experiment repeatedly [4] as well as in real laboratories [5].

One of the aims of learning is to improve students' learning achievement. The current learning process is expected to improve student learning outcomes such as creativity and problem-solving abilities. Problem solving and creativity are essential skills, especially in technology development. Creativity and problem-solving skills are high-level thinking skills that learners need to have to compete in the global competition. Creativity is the ability to discover new things but still in rational ideas. Creativity can help us to do things better. Therefore, everyone needs to act creatively. According to Jackson et al. [6], creativity was defined as a mental process involving the generation of new ideas and new concepts, or new associations between ideas or concepts. From a scientific point of view, the product of creative thinking is usually considered to have originality and conformity. Kandiko [7] reported that creativity is a spontaneous but rational individual action.

In addition to creativity, problem-solving skills are also the most necessary capabilities for the advancement of the younger generation. A person with a reasonable level of problem-solving ability will be able to process information more effectively for his life. Coşkun et al. [8] stated that people who have excellent problem-solving skills could have a better life than others because they are more successful in finding the best solution and knowing how to behave in a problem situation. According to Al-khatib [9], creative thinking ability, especially creative problem solving is essential because it can help someone to face technological change and interact in the globalization era.

Innovation learning media such as virtual laboratory is expected to improve student learning outcomes. Several studies about the use of virtual laboratories have shown a positive impact on learning outcomes. Gunawan et al. [10] revealed that the use of virtual laboratory media could improve the students' conceptual understanding in three different schools. According to Oidov et al. [11], a virtual laboratory contributes to learning, which motivates learners in activities to discover new things so that the learning results also increased. According to Gunawan et al. [12], a virtual laboratory can improve the problem-solving ability of students on the electricity concept. Tüysüz [13] revealed that the use of virtual laboratories could have a positive impact on student learning achievement. Therefore, this study aims to examine the model of the thermodynamic virtual laboratory that has been developed in improving the creativity and problem-solving skills of the pre-service physics teachers.

2. Methods

This research includes development research with three stages namely preliminary study, design development, and testing model. In this research has developed a virtual laboratory for thermodynamics course. Model testing was performed on two groups of students of FKIP Universitas Mataram who were following the thermodynamics course by using a pre-test post-test control group design. The sample was chosen by purposive sampling. The experimental group was treated with the use of virtual laboratory learning model while the control group with conventional learning. The instrument used is the essay test both for creativity and problem-solving ability. The experts have validated the instruments. Creativity instruments include verbal and figural aspects. Each data was analyzed using the t-test. Improved problem-solving skills and prospective physics teacher creativity have been measured using the N-gain formula. N-gain has been used to avoid misinterpretation of increasing scores of each prospective teacher.

3. Results and Discussion

This research used a virtual laboratory to enhance the creativity and problem-solving skills of pre-service physics teachers on thermodynamics course. Creativity and problem-solving skill are part of the high order thinking skill that became the primary goal of education in this century. In this study used experimental groups and control groups to examine the effect of the use of virtual laboratories. The experimental group was treated in the use of virtual laboratory while the control group was treated in the conventional learning. Before treatment, both groups of samples were given pre-test of thermodynamic course. The results showed that both groups have the same ability. After treatment, both groups were given a final test to determine the effect of the thermodynamic virtual laboratory. Furthermore, to reduce misinterpretation of student creativity improvement, N-gain test is also performed. Hypothesis test results on creativity data of both groups are shown in Table 1.

Table 1. Hypothesis Test Results of Creativity in Both Sample Groups.

Mann-Witney	Sig.	Interpretation
Pre-test	.163	There was no initial creativity difference between the two sample groups
Post-test	.036	There was a final creativity difference between the two sample groups
Verbal N-gain	.111	There was no difference in N-gain of verbal creativity between the two sample groups
Figural N-gain	.993	There was no difference in N-gain of figural creativity between the two sample groups
Total N-gain	.167	There was no difference in N-gain creativity between the two sample groups

Based on the data in Table 1, statistically, pre-test data showed that there was no initial creativity difference between the two groups. This means that the level of creativity that students have in both groups is the same. In the post-test, there was a creativity difference between the two groups, in which the experimental group scored higher than the control group. The improvement of creativity of experimental group and control group was not significantly different. Nevertheless, it can conclude that the virtual laboratory used is better enough to develop students' creativity. The results of the study, Gunawan et al. [14] reported that virtual physics laboratories used in cooperative learning could enhance students' creativity, especially on fluency and elaboration indicators. The increase of verbal and figural creativity in both groups was not statistically significant. Comparison of N-gain verbal, N-gain figural, and total N-gain between experimental and control groups are shown in Figure 1.

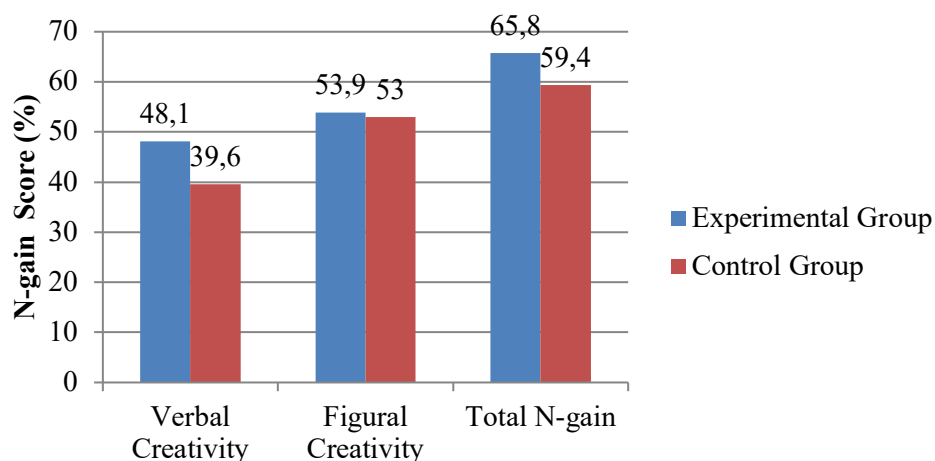


Figure 1. Comparison of Verbal and Figural Creativity in Both Sample Groups

Based on Figure 1 it can be seen that the verbal N-gain of the experimental group is higher than the control group. Therefore, students who have learning with virtual laboratory has sufficiently able to associate their ideas through verbal communication. For the improvement of figural creativity, the experimental and control groups had relatively similar improvements, classified as in the medium category. The data shows that both groups have the same ability to pour ideas through graphs, images, and patterns.

In the experimental group, the acquisition of increased verbal creativity was lower than figural creativity, i.e., 48.1% for verbal creativity and 53.9% for figural creativity. The data showed that the ability of students in pouring ideas through pictures or graphics are better than through verbal communication. Some of the things that are assumed to be the cause of this acquisition are as follows. The virtual laboratory used in this study consist of symbols and images. Also, thermodynamic materials also emphasize much on the graphics that students must understand. The figural creativity of students is better because of this habituation. Students ability to create ideas through graphics and images to be higher than pouring their ideas in verbal. In another study, Gunawan et al. [15] revealed that the project-based learning model with virtual media could improve students' thinking skills in aspects related to fluency, flexibility, and originality rather than ideas associated with patterns or images. In addition, Gunawan et al. [16] stated that virtual laboratories could help students develop their thinking skills by combining ideas verbally. It caused the improvement of verbal creativity was higher than figural creativity.

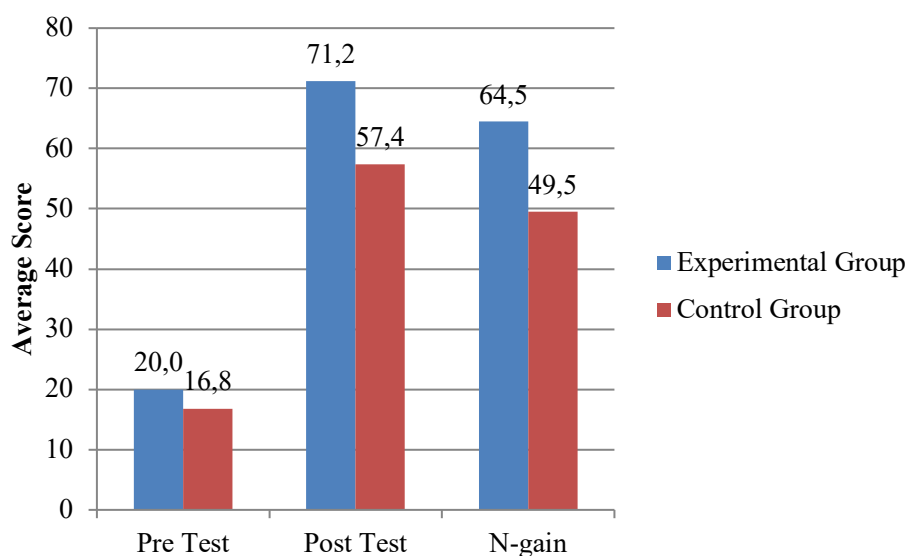
The use of virtual laboratories in this study has had a positive impact on students' thermodynamic learning. The use of virtual laboratories in thermodynamic learning has been proven to help students overcome the difficulties they face in learning and improve their creativity. For example, the difficulty of graphics can be overcome by visualizing graphs and physical variables, such as isobaric, isochoric, isothermic, and adiabatic graphics. Some of the interactive simulations contained in this model also give students an excellent opportunity to learn to make estimates and try to prove for themselves the truth of their estimates. This condition causes students' figural creativity to be higher than verbal creativity. According to Gunawan et al. [17], a laboratory used in electrical concept can significantly enhance students' creativity in verbal and figural aspects.

This study has also examined the effect of virtual laboratory use on problem-solving skills of pre-service physics teachers. Problem-solving ability is one of the higher-order thinking and complex thinking skills that a person can achieve when understanding concepts well. The results of a hypothesis test of problem-solving ability data are shown in Table 2.

Table 2. Hypothesis Test Result of Problem-Solving Ability Data

Mann-Witney	Sig.	Interpretation
Pre-Test	.248	There was no difference in problem-solving skill between the two sample groups
Post-Test	.001	There was a difference between problem-solving skill between the two sample groups
N-gain	.001	There was a difference between N-gain problem-solving skill between the two sample groups

The pre-test hypothesis test showed that there was no difference in students' initial problem-solving skills because students have not received learning and only use the initial knowledge to solve the problem. After being treated, the results of the problem-solving tests of both groups increased. The test results of both groups were statistically significantly different. The experimental group had a significantly higher score than the control group. These results have proven that virtual laboratories have successfully improved students' problem-solving skills. The results of this study have supported previous studies by Oidov et al. [11] who found that virtual experimental activity has helped students perform numerical measurements, evaluating the processes being explored and developing problem-solving skills. Gunawan et al. [18] stated that the virtual laboratory help students to identify the problem and make a plan in solving the problem excellently. In this study, the improved of the problem-solving abilities of pre-service physics teachers are analyzed. Figure 2 shows the results of the pre-test, post-test, and N-gain scores in both groups.

**Figure 2.** Comparison of Students' Problem-Solving Skill in Both Sample Groups

Based on Figure 2, it can be seen that the increase in the experimental group was significantly higher than the control group. Students' problem-solving abilities are proven to be improved through thermodynamic learning with virtual laboratories. According to Herga & Dinevski [19], the use of virtual labs has supported high-level thinking skills, including problem-solving skills. Virtual laboratories can present animation effectively to teach and visualize abstract concepts or difficult things in science [20]. When students have understood the concept of thermodynamics well, problem-solving abilities will also increase. Virtual laboratories can enhance students' understanding of the

basic concepts of data analysis, problem solving, scientific interpretation [21], numerical concept, and verbal communication [22].

Problem-solving skills in physics require the interpretation and application of one or more types of representation, such as algebra, graphics, and numerical [23]. Thermodynamic learning emphasizes abstract concepts that require visualization in the form of graphs and physical variables. The virtual laboratory on thermodynamic concepts clarifies experimental aspects and graphical visualization. Therefore, this virtual laboratory has been able to support students' ability in solving thermodynamic problems that contain many mathematical equations. Paszkiel [24] revealed that virtual media had transformed the real environment into meaningful images in mathematical calculations. Shyr [25] has reported that virtual laboratories allow students to develop their programs and identify problems related to their implementation. This advantage supports the development of problem-solving skills from pre-service physics teachers in thermodynamic courses.

4. Conclusion

Based on the results of data analysis and discussion it can be concluded that the use of virtual laboratories in learning the concept of thermodynamics has been able to increase the creativity and problem-solving skills of physics teacher candidates. Student creativity in the experimental group was higher than the control group, although the difference was not significantly different. Enhancement of creativity in both groups was in the moderate category. Meanwhile, the problem-solving ability of the experimental group was significantly higher than the control group. The results of this study have proven that the use of virtual laboratory on learning the concept of thermodynamics can improve creativity and problem-solving skills of physics teacher candidates. These results also reinforce previous research on the importance of the role of information technology to improve the thinking skills of prospective teachers.

The recommendations that can be given for further research are: (a) The need to familiarize users with the features of the virtual lab program before the research process is carried out. (b) The need for assistance by technicians and research staff, especially at the initial meetings, given the many technical constraints due to the diverse abilities of students. (3) Problems related to the implementation time of learning that must be tightly controlled so that learning takes place by the plans and objectives set.

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