

[Research Article]

Application of Virtual Practicum Media Based on Everycircuit in Discovery Learning in Basic Electronics Course Students Physics Education Program Class of 2022

Andi Jusriana, Suarga, Sri Wahyuni, Ihfa Indira Nurnaifah, Suarti

Physics Education, Faculty of Tarbiyah and Keguruan, State Islamic University of Alauddin
Makassar, Indonesia

E-mail: andi.jusriana@uin-alauddin.ac.id

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ABSTRACT

A practicum is a learning activity that involves observing an experiment or testing a concept inside or outside the laboratory. A virtual practicum is a practicum activity that is carried out virtually. The use of learning models in practicum also affects the activeness of students. One virtual practicum that can be used is Everycircuit, which uses discovery learning. The research objectives are to determine the learning outcomes of physics education study program students class of 2022 before using Everycircuit-based virtual practicum media in discovery learning in Basic Electronics courses, to determine the learning outcomes of physics education study program students class of 2022 after using Everycircuit-based virtual practicum media in discovery learning in Basic Electronics courses, and to determine the increase in learning outcomes of physics education study program students class of 2022 after using Everycircuit-based virtual practicum media in discovery learning in Basic Electronics courses. The type of research used is pre-experimental research with a one-group pretest-posttest research design. The results showed that the average value of student learning outcomes in introductory electronics courses before using Everycircuit-based virtual practicum media in discovery learning is 65.42, while the average value of student learning outcomes in introductory electronics courses after being taught using Everycircuit-based virtual practicum media in discovery learning is 90.27. The results of the N-gain test calculation obtained 0.62 with a moderate category, so it can be concluded that there is an increase in student learning outcomes in introductory electronics courses after being taught using Everycircuit-based virtual practicum media in discovery learning.

Keywords: *Everycircuit, learning outcomes, and Discovery Learning*

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1. INTRODUCTION

Practicum is a learning activity that involves observing an experiment or testing a concept inside or outside the laboratory. Practical activities are critical because they can give students an accurate picture of what is obtained

in theory. In addition, students are not just observing directly but must be responsible for the results obtained, so applying a practical learning approach can increase students' understanding of the subject matter. According to (Bahri S, 1996), the practicum is very important to implement because it can arouse

students' learning motivation and develop essential skills through the practicum.

A virtual practicum is a practicum activity carried out virtually. Laboratory tools are interactive multimedia-based software that simulates laboratory activities like in an actual laboratory. Virtual practicum has the advantages of reducing time constraints and geographical and economic barriers, improving the quality of experiments, and increasing learning effectiveness. In addition, using learning models in practicum also affects students' activeness. One of the virtual practicums that can be used is *Everycircuit*, which uses *discovery learning*.

Based on some previous research on *Everycircuit* media, most of the earlier studies used the *Everycircuit* application to develop modules and see the effect of *Everycircuit* media without using *discovery learning*. In addition, the difference between previous research and the research to be carried out is that researchers will examine the application of *Everycircuit-based virtual* practicum media in *discovery learning* to improve student learning outcomes. The research subjects are the Physics Education Study Program Batch 2022 students on dynamic electricity material. The purpose of the study was to determine the learning outcomes of physics education study program students class of 2022 before using *Everycircuit-based virtual* practicum media in *discovery learning* in Basic Electronics courses, to determine the learning outcomes of physics education study program students class of 2022 after using *Everycircuit-based virtual* practicum media in *discovery learning* in Basic Electronics courses and to determine the increase in *learning* outcomes of physics education study program students' class of 2022 after using *Everycircuit-based virtual* practicum media in *discovery learning* in Basic Electronics courses.

The word media comes from Latin and is the plural form of medium, which means intermediary or introducer. Media is an intermediary or messenger from the sender to the message's recipient (Ramli, 2012). Learning media is a teaching and learning process that tends to be defined as graphic, photographic, or electronic tools used to capture, process, and

organize visual or verbal information. (Sukiman, 2012).

Media can be classified into three main phases, namely input, process, and output. The process phase focuses on student learning activities where the content of teaching materials, methods, and learning resources play an important role in determining the effectiveness of learning. Media as an important component in the learning process needs to be developed in the context of learning and student characteristics (Sriadhi, et.al, 2022). The delivery of learning needs media because students can understand abstract concepts. Media as a means of sharing information and media used in learning varies according to the characteristics of the subject (Bulkani, et.al, 2022).

Educators should consider conducting practical learning activities in a virtual way amid this pandemic. Virtual learning should be fun and well-designed. To keep students interested and focused on the educator's explanation, create a relaxed, comfortable, and media-friendly atmosphere. In addition, virtual laboratories in virtual practicum can improve learning activities by conducting simulation experiments (Sasmito, 2022).

Everycircuit is a popular app used to design and simulate electronic circuits. The app is helpful for students, hobbyists, and electronics professionals to visualize and understand how circuits work interactively. Developed with features that allow real-time simulation, Everycircuit is a highly effective tool for education and prototype design (Horowitz, P., & Hill, 2015).

Learning can be defined as an effort or activity that aims to change a person, including changes in behaviour, attitudes, habits, knowledge, skills, and so on. One priority for teachers in learning is generating interest in students in the material taught by the teacher and the methods they use (Karmila, N., & Anggereni, 2017).

2. METHOD

The type of research used is pre-experimental research with a one-group pretest-posttest

research design. This research was conducted at the Physics Education Study Program, Campus 2 UIN Alauddin Makassar and the research time was planned for April-May 2024. The subjects in this study were students of the Physics Education Study Program Batch 2022, with 30 students. The sampling technique that will be used in this study is purposive sampling. The research procedure consists of the preparation, implementation, and evaluation stages. In addition, there are also instruments used in this study, namely learning outcomes tests and observation sheets. The learning tools in this study are semester learning plans and worksheets.

3. RESULTS AND DISCUSSION

RESEARCH RESULTS

3.1 Results of Descriptive Analysis of Student Learning Outcomes in Basic Electronics Course using Everycircuit-Based Virtual Practicum Media in Discovery Learning Learning

3.1.1 Description of student learning outcomes in basic electronics courses before being given treatment (pretest)

Based on the results of the *pretest* that researchers gave to students to determine learning outcomes in basic electronics courses before applying *Everycircuit-based* virtual practicum media in *discovery learning*, the following data were obtained:

Table 1 Frequency Distribution of *Pretest* Learning Outcomes

<i>PRETEST</i>	
Xi	Fi
53	2
60	10
67	8
73	4
80	1
87	1

Based on the table above, it is shown that student learning outcomes in the basic electronics course before the application of *Everycircuit-based* virtual practicum media in

discovery learning obtained data from two students who scored 53, ten students who scored 60, eight students who scored 67, four students scored 73, and one student who scored 80 and 87. Thus, from the distribution table, descriptive statistical data is obtained, which is shown in the following table:

Table 2 Descriptive Statistics of *Pretest* Learning Outcomes

Descriptive Statistics	Pretest
Number of samples	26
Maximum score	87
Minimum score	53
Average	65.42
Standard deviation	7.2
Variance	61.21

Table 2 shows that the sample amount is twenty-six students. The maximum value is 87, the minimum value is 53, and the average value is 65.42. Thus, the standard deviation obtained is 7.8, and the variance is 61.21. The results of the analysis were analyzed manually using *Microsoft Excel*.

The following is the categorization of student learning outcomes in basic electronics courses before treatment:

Table 3 Categorization of *Pretest* Learning Outcomes

Value Range	Category	Fi
87,75-100	Very High	0
71,25-87,50	High	6
54,50-71,00	Medium	18
37,75-54,25	Low	2
0-37,50	Very Low	0

3.1.1 Description of student learning outcomes in basic electronics courses after being given treatment (posttest)

Based on the results of the *posttest* that researchers gave to students to determine learning outcomes in basic electronics courses after applying *Everycircuit-based* virtual practicum media using the *discovery learning* model, the following data were obtained:

Table 4 *Posttest* frequencies learning outcomes

POSTTEST	
Xi	Fi
87	13
93	12
100	1

Table 4 shows students' learning outcomes in the basic electronics course after being given treatment. Data was obtained thirteen students who scored 87, twelve who scored 93, and one who scored 100. So, from the distribution table, descriptive statistical data is obtained, which is shown in the following table:

Table 5 Descriptive Statistics of *Posttest* Learning Outcomes

Descriptive Statistics	Posttest
Number of samples	26
Maximum score	100
Minimum score	87
Average	90,27
Standard deviation	3,60
Variance	12,92

Table 5 shows that the sample amount is twenty-six students. The maximum value is 100, the minimum value is 87, and the average value is 90.27. Thus, the standard deviation obtained is 3.60, and the variance is 12.92. The results of the analysis were analyzed manually using Microsoft Excel.

The following is the categorization of student learning outcomes after treatment:

Table 6 *Posttest* Categorization of Learning Outcomes

Value Range	Category	Fi
87,75-100	Very High	13
71,25-87,50	High	13
54,50-71,00	Medium	0
37,75-54,25	Low	0
0-37,50	Very Low	0

3.1.2 N-Gain Test Score

Based on the data from the *pretest* and *posttest* analysis results, researchers used the *N-Gain score* formula to know the improvement of student learning outcomes in basic electronics courses before and after applying *Everycircuit-based* virtual practicum media in *discovery learning*. After conducting the N-Gain test manually using Microsoft *Excel*, the following data was obtained:

Table 7 N-Gain Test Results of Learning Outcomes

No.	N-Gain Score	Category
1	0,74	High
2	0,74	High
3	0,82	High
4	0,67	Medium
5	0,78	High
6	0	Low
7	1	High
8	0,85	High
9	0,60	Medium
10	0,78	High
11	0,60	Medium
12	0,67	Medium
13	0,74	High
14	0,82	High
15	0,67	Medium
16	0,67	Medium
17	0,60	Medium
18	0,67	Medium
19	0,78	High
20	0,67	Medium
21	0,78	High
22	0,67	Medium
23	0,74	High
24	0,60	Medium
25	0,82	High
26	0,72	High
Average	0,62	Medium
Min	0	Low
Max	0,85	High

The results of the N-Gain test calculation in Table 7 show that the average value of the N-Gain score of student learning outcomes is 0.70, with a moderate category. The data that has been obtained in Table 7 becomes a benchmark for determining the N-Gain score of student learning outcomes shown in the following table:

Table 8 N-Gain Categorization of Learning Outcomes

Category	Fi	Percentage (%)
Low	1	4

Medium	11	42
High	14	54

Based on Table 8, the N-Gain test of student learning outcomes in basic electronics courses obtained one student in the low category, eleven in the medium category, and fourteen in the high category. So, it can be concluded that the increase in student *learning* outcomes in basic electronics courses before and after applying *Everycircuit-based* virtual practicum media in *discovery learning* is in the moderate category based on the N-gain average.

DISCUSSION

3.2 Student Learning Outcomes in Basic Electronics Course before applying *Everycircuit-based* Virtual Practicum Media in *Discovery Learning Learning*

Based on the results of the above research, the learning outcomes of students in the basic electronics course class of 2022 before the application of *Everycircuit-based virtual* practicum media in *discovery learning* have been illustrated in descriptive analysis. The average obtained from descriptive analysis can be one of the references for knowing the learning outcomes of 2022 batch students in basic electronics courses. Data analysis of the learning outcomes of 2022 batch students in basic electronics courses before applying *Everycircuit-based* virtual practicum media in *discovery learning learning learning* obtained an average value of 65.42, where two students were in the low category, eighteen students were in the medium category, and six students were in the high category.

The low student learning outcomes in basic electronics courses before the application of *Everycircuit-based* virtual practicum media in *discovery learning* are caused by several factors. One of them is the lack of motivation and interest in learning. According to (Parwati, 2018), internal and external factors affect student learning outcomes. One internal factor affecting student learning outcomes is psychological factors, including motivation, interest, attitude, and student confidence-external factors centre on the teaching method of lecturers who use the lecture method.

Learning methods used by lecturers that are not appropriate will cause students to tend to be passive when participating in learning and are dominated by lecturers. Lecturers who apply conventional learning models with lecture methods so that students become bored, sleepy, passive, and only take notes. This is in line with the results of research conducted by (Khauro et al., 2020), which states that the lecture method is less effective in learning because it will affect students' understanding of learning materials. As a result, student learning outcomes do not reach the minimum completeness criteria.

Low student learning outcomes are also influenced by the lack of learning media, both in class and during practicum. (Tobamba et. al, 2019) revealed that media use is very helpful in the learning process, arouses learning motivation, and improves learning outcomes.

Learning media greatly supports the learning process because it can organize an effective relationship between the two main parties, namely lecturers and students. Learning media can facilitate lecturers' delivery of learning materials and generate student interest in learning. According to (Sumiharsono, 2017), the press has benefits for learning. Namely, it can encourage people's desire to know something, overcome the limitations of space, time, energy, and sensory power, and help them recall the understanding of something that has been obtained.

Other research shows that one factor that influences student learning outcomes is the use of media in learning. Learning can be done by using multiple senses, namely, the sense of sight and the sense of hearing. Students will be more passive if the subject matter is presented only with auditory stimulus. Comparison of the acquisition of student learning outcomes through the sense of sight and the sense of hearing is very different. Approximately 90% of a person's learning outcomes are obtained through the sense of sight, only about 5% are received from the sense of hearing, and 5% from other senses. (Nur, 2017).

In addition, educators' limited laboratory equipment can be utilized in virtual practicum

media because it can encourage students' desire to know and explore more about the material being studied. (Asnita W, 2021) stated that virtual laboratory media can attract student attention; this interest can increase understanding of concepts and student independence during virtual practicum.

3.3 Student Learning Outcomes in Basic Electronics Course after applying Everycircuit-based Virtual Practicum Media in Discovery Learning Learning

Based on the results of descriptive analysis, student learning outcomes in the basic electronics course class of 2022 after applying Everycircuit-based virtual practicum media in discovery learning have an average value of 90.27. Thirteen students in the high and very high categories. So, it can be concluded that student learning outcomes in basic electronics courses after applying Everycircuit-based virtual practicum media in discovery learning have increased from before and are in the high category. The average difference between the test results on the pretest and posttest is significant; this can be seen from the categorization of learning outcomes.

The difference in the value of student learning outcomes in basic electronics courses after applying Everycircuit-based virtual practicum media in discovery learning is due to the virtual practicum being able to be used anytime and anywhere so that students can learn even though they are not in the laboratory. According to (Purwanti, 2020), practicum objectives are as follows: (1) To arouse and maintain interest, attitude, satisfaction, open-mindedness, and curiosity about science. (2) To develop critical thinking skills and problem-solving skills.

In addition, the learning model used also affects student learning outcomes. This research applies Everycircuit-based virtual practicum media to discovery learning. Discovery learning also influences student learning outcomes because discovery learning is a learning model that directs students to discover concepts through various information or data obtained through observation or experimentation. Thus, students are more active in learning. This is in line with research conducted by (Dinata S,

2016), which states that the use of the discovery learning model makes students more active in learning so that it can improve student learning outcomes.

Practical learning activities in a virtual way are a compelling choice for educators. Educators must design this virtual-based learning well and create a relaxed, comfortable, and media-friendly atmosphere so students can learn anywhere. The virtual practicum will be able to improve student learning outcomes. This aligns with research by (Dwiyanti A.N, & Riwanto M.A, 2019), which states that virtual practicum can improve student learning outcomes by improving student skills and understanding of the material.

Students are very enthusiastic about participating in learning using virtual practicum. Students follow the teacher's orders when given directions to conduct a virtual practicum using the Everycircuit application. This learning builds cooperation between students; students who were previously passive become active and motivated to participate in learning because they can do practicum even though they are not in the laboratory room.

Practicum can allow students to form their concepts by learning so that they can develop their creativity in the end. The use of virtual practicum media certainly needs to be applied because it can save costs and minimize practicum tools and materials. In addition, virtual practicum media based on Everycircuit can increase student learning motivation and outcomes. This aligns with research conducted by (Erfan, 2017), which states that Everycircuit media influences student motivation and ability to analyze.

3.4 Differences in Student Learning Outcomes in Basic Electronics Course before and after applying Everycircuit-based Virtual Practicum Media on Discovery Learning Learning

Based on the analysis results, the learning outcomes of 2022 physics education study program students in the basic electronics course before and after applying Everycircuit-based

virtual practicum media in discovery learning have differences. This can be seen from the average value obtained before the application of Everycircuit-based virtual practicum media in discovery learning, which has an average value of 65.42. After applying Everycircuit-based virtual practicum media in discovery, learning increased to 90.27. This shows that the learning outcomes of physics education study program students in the class of 2022 in the basic electronics course have increased significantly. In addition, based on the results of the n-gain test calculation, 0.70 was obtained in the moderate category.

The significant difference between the results of the physics education study program students class of 2022 in the basic electronics course before and after applying the Everycircuit-based virtual practicum media in discovery learning can be influenced by several factors. Factors that affect this include the lack of utilization of virtual practicum media by students, so their understanding and knowledge of the material being taught is lacking, and the learning methods used by educators are not appropriate, so students tend to be passive in participating in learning.

The difference in student learning outcomes is also influenced by differences in the treatment given. Where, before the pretest still uses ordinary learning without doing practicum. Meanwhile, in the posttest, Everycircuit-based virtual practicum media has been applied to discovery learning. In addition, the treatment applied by researchers requires students to be actively involved during the learning process and the practicum is done virtually so that students understand the material being studied better.

Before applying Everycircuit-based virtual practicum media in discovery learning, educators used conventional learning models with lecture methods. This method emphasizes the activeness of educators rather than students, so students are less enthusiastic about participating in learning. (Patonah R, 2019) argues that in the learning process using the lecture method, students are less active in learning and pay more attention and listen

because educators are the source of lessons and convey subject information directly.

Researchers apply virtual practicum media based on Everycircuit in discovery learning. They use a discovery learning model that makes students more active in the learning process. The discovery learning model can train students' ability to analyze and develop independence in learning because it emphasizes the ability of students to find knowledge, improving student learning outcomes.

This is in line with research conducted by (Fitriyah, A. M. & Warti, 2017), which states that discovery learning can improve student learning outcomes because it helps students form effective ways to share information and find concepts. In addition, research conducted by (Islami, 2020) states that Everycircuit media in discovery learning also affects students' ability to analyze.

Practicum is a comparison activity between theory and the results obtained from practicum. With the virtual practicum, students will understand the learning material better because they can learn whenever possible. (Nisa, 2017) revealed that practicum can improve students' understanding and learning outcomes because practicum makes students more active, motivated, and eager to learn. In addition, students make direct observations, prove, understand, and observe what they know.

Practicum tools often constrain practicum in actual laboratories. Therefore, virtual practicum can be an alternative because it saves costs and can be used by students independently. Virtual practicum can increase student enthusiasm for learning and increase activeness in learning. (Muzana & Hasanah, 2018) revealed that virtual practicum can improve student learning outcomes because it makes it easier for students to do practicum directly with their respective groups and increases student activeness and attractiveness to learning. Besides that, students are more innovative, and they improve the efficiency of teaching and learning effectiveness at school regarding the use of time, funds, and facilities.

Based on the exposure of several students, when learning using virtual practicum media based on Everycircuit, students tend to understand and understand learning and more often ask questions quickly. Students feel that learning using virtual practicum media based on Everycircuit is exciting because students are more active in group learning. In addition, this media is straightforward to use and can be accessed anytime so students can learn independently.

Based on the description above, student learning outcomes in basic electronics courses have increased after applying Everycircuit-based virtual practicum media in discovery learning. Thus, this can answer the problem in this study, where there is an increase in the learning outcomes of physics education study program students in the class of 2022 in basic electronics courses before and after being taught using Everycircuit-based virtual practicum media in discovery learning.

4. CONCLUSIONS

Based on the data that has been obtained in this study, the following conclusions can be drawn:

- a. The learning outcomes of physics education study program students in the class of 2022 in the basic electronics course before using *Everycircuit-based* virtual practicum media in *discovery learning* are in the medium category.
- b. The learning outcomes of the 2022 physics education study program students in the basic electronics course after using *Everycircuit-based* virtual practicum media in *discovery learning* are in the high category.
- c. There is an increase in the learning outcomes of physics education study program students in the class of 2022 in the basic electronics course after using *Everycircuit-based* virtual practicum media in *discovery learning*. The results of the N-Gain calculation are 0.70 and are in the medium category. In addition, the *pretest* results are in the medium category, while the *posttest* results are in the high category.

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