Digital electronics practicum with “Logisim” application with zoom-assisted

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Abstract. The purpose of this study is to describe the quality of digital electronics practicum with “Logisim” application with zoom-assisted. The quality is seen from the effectiveness and response of students to digital electronics practicum with “Logisim” application with zoom-assisted. This research used descriptive research method. The research subjects were 50 Physics Education Students at Universitas Lambung Mangkurat who took Digital Electronics course. The data about quality is seen from the effectiveness and response of students. The effectiveness of digital electronics practicum with “logisim” was obtained from the practicum assessment sheet. Data about student responses were obtained from student response questionnaires with indicators of format, quality, clarity, and interest. The effectiveness of digital electronics practicum with “logisim” shows that there were no students who did not pass the practicum. Student response shows that students have a positive response to practicum activities. Therefore, it was concluded that the digital electronics practicum with logisim application has good quality if its implementation is assisted by Zoom. In the case of online learning due to a pandemic, zoom can be used to facilitate the digital electronics practicum with logisim application. Further research is needed to investigate the quality of the practicum when using other media such as google meet, webex, whatsapp group and others.

Keywords: Digital electronics, Logisim, practicum, zoom.

1. Introduction

The education system in Indonesia is in a state of change due to the co-19 pandemic. Distance education system is one of the solutions to overcome difficulties in learning directly with the existence of social distancing rules [1]. One application of the distance education system is to hold lectures online. Online lectures will bridge the learning process without having to meet face to face [2–4].

Teachers use online learning and teaching in various ways [5]. One application that can be used is Zoom. Zoom is considered more helpful in teaching and learning [6]. Zoom meet is a Conference Face-to-Face Platform where Educators and students can directly interact as they meet face to face [1]. In learning you can use Zoom to collaborate on the preparation and recording of presentations, and although students live in different locations, Zoom makes it easy to make presentations in real-time online[7]. Zoom broadcasts from one source to several passive receivers, either direct or on demand [8]. Audio in Zoom can be heard clearly by all participants [6]. Zoom allows all participants to see and hear and discuss using any device [9,10].

One of the courses taken by students is digital electronics. This course studies and practices various types of digital circuits. Digital circuits are the basis of all digital systems in use today [11]. The logic
circuit is a central concept in understanding how computers and electronics work. There is already a web-based education system for visualizing and building chains [12], besides that there is also some software that is able to both visualize and simulate it. One of them is Logisim. The display of Logisim application is seen in figure 1.

![Figure 1. Display of Logisim Application](image)

Figure 1 shows a view of the Logisim application. Logisim enable students to make series that are more complex and sophisticated than real practice. This is due to the limited number of components available in the physical kit [13]. In the Logisim there is an analysis menu created specifically for the combinational analysis step of the designed circuit. Analysis of the combination of a design, depending on the type of circuit used, boolean expressions are generated, and truth tables are generated for each possible output [14].

During the Covid-19 Pandemic outbreak, the practice of digital electronics would be better if facilitated by communication media. The digital electronics practicum using logisim requires a communication medium that brings together the practitioner and laboratory assistant, one of which is examined in this study is the zoom meeting. It is because of the many benefits of zoom itself, where both the practicum and practicum systems can communicate directly and show what is done so that they can be evaluated directly by the practicum system. In addition, the practitioner can also strengthen the theory that he has through the question and answer process using the zoom media [7].

Based on the analysis of the need for zoom in digital electronic practice with logisim applications, the researcher will examine the quality of the practicum. No previous research has examined this. The purpose of this study was to describe the quality of the Application of Digital Electronics Lab Logisim if carried out with the help of zoom. The quality of the views of the effectiveness and response to digital electronics student practicum with “Logisim” application with the zoom-assisted.

2. Method
This research uses descriptive quantitative research method. As previously explained in the introduction, that digital electronics practicum using logisim requires a communication medium that brings together the practitioner and laboratory assistant, one of which is examined in this study is the zoom meeting. The main objective in this study is to describe the effectiveness and response of students to implementation digital electronics practicum with “Logisim” application with zoom-assisted. Sampling using purposive sampling that is following a digital electronics practicum. The research subjects were 50 Physics Education Students at Lambung Mangkurat University who took Digital Electronics courses. The effectiveness data was obtained from the practicum assessment sheet. The score is obtained from an assessment of the accuracy of writing problem formulations, hypothesis formulations, observational data tables, analysis and drawing conclusions. The effectiveness data will be analysed into letter scales
to determine student graduation. Implementation of digital electronics practicum with “Logisim” application with zoom-assisted will be declared effective if all students graduate (get a minimum grade of C) [15]. Data about student responses were obtained from student response questionnaires with indicators of format, quality, clarity, and interest [16]. The data will be analyzed the percentage of responses from students in accordance with their respective indicators.

3. Results and Discussion

There are 5 titles of digital electronics practicum with “Logisim” application with zoom-assisted. Practicum is carried out by students in groups with 3-4 members. In conducting experiments, the praktikan group will be assisted by a practicum system and monitored by lecturers who support digital electronics courses. The following is one of the screenshots when implementing of digital electronics practicum with “Logisim” application with zoom-assisted. An example of digital electronics display practice with Logisim application (showed by zoom application) is seen in figure 2.

![Figure 2. Digital electronics display practice with “Logisim” application with zoom-assisted](image)

3.1. Effectiveness

Effectiveness can be seen from the total score obtained by students on digital electronics practicum with “Logisim” application with zoom-assisted. The score is obtained from an assessment of the accuracy of writing problem formulations, hypothesis formulations, observational data tables, analysis and drawing conclusions. There are 5 titles of digital electronics practicum with “Logisim” application with zoom-assisted. The results of the accumulation of calculations can be seen in the table 1.

| Table 1. The results of the accumulation of calculations |
|-----------------------------------------------|
| The Highest | The Lowest | Average  |
| A (82.75)  | B (71.00)  | A- (78.24) |

Figure 3 is the distribution of student grades on 5 titles digital electronics practicum with “Logisim” application with zoom-assisted.
Figure 3. Distribution of student grades on 5 practicum titles

Based on the table and figure, all students have the lowest score of students obtaining a B grade with a complete status. Thus, implementation of digital electronics practicum with “Logisim” application with zoom-assisted is effectively used to help smooth student communication in completing Digital Electronics practicum. The results of previous studies indicate that Logisim software 2.7.1 can be implemented to improve students’ competence about the logic gate series in SMK Negeri Situraja [17]. These studies both show that it can improve student learning outcomes.

3.2. Student response
For the continuity of implementation of digital electronics practicum with “Logisim” application with zoom-assisted and evaluating it, it is important to know the students’ response to the implementation of the practicum. Data about student responses were obtained from student response questionnaires with indicators of format, quality, clarity, and interest [16], it is shown in table 2:

Table 2. Results of student responses to implementation of digital electronics practicum with “Logisim” application with zoom-assisted

| Indicator  | Statements                                                                 | Strongly Agree (%) | Agree (%) | Quite Agree (%) | Less Agree (%) | Disagree (%) |
|------------|----------------------------------------------------------------------------|---------------------|-----------|-----------------|----------------|--------------|
| Format     | Digital electronics practicum with “Logisim” application with zoom-assisted in accordance with the objectives of the lecture | 12.00%              | 66.00%    | 20.00%          | 2.00%          | 0.00%        |
|            | Systematic presentation and implementation of practical work is easy to understand | 22.00%              | 48.00%    | 28.00%          | 2.00%          | 0.00%        |
|            | The emphasis of cognitive and psychomotor skills is very clear              | 16.00%              | 50.00%    | 30.00%          | 4.00%          | 0.00%        |
|            | The use of a zoom assisted logisim application is easy to understand        | 12.00%              | 56.00%    | 28.00%          | 4.00%          | 0.00%        |
| Average    |                                                                           | 15.50%              | 55.00%    | 26.50%          | 3.00%          | 0.00%        |
| Quality    | Very interesting practicum                                                 | 36.00%              | 48.00%    | 12.00%          | 4.00%          | 0.00%        |
| Indicator | Statements                                                                                                                                                                                                 | Strongly Agree (%) | Agree (%) | Quite Agree (%) | Less Agree (%) | Disagree (%) |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|-----------------|----------------|---------------|
|           | The use of zoom supports digital electronics labs with Logisim applications                                                                                                                               | 12.00%            | 64.00%    | 18.00%          | 6.00%          | 0.00%         |
| Average   |                                                                                                                                                                                                          | 24.00%            | 56.00%    | 15.00%          | 5.00%          | 0.00%         |
| Clarity   | The material presented and practiced is easy to understand                                                                                                                                                 | 16.00%            | 52.00%    | 30.00%          | 2.00%          | 0.00%         |
|           | Communication using zoom when practicum runs smoothly                                                                                                                                                | 2.00%             | 42.00%    | 44.00%          | 12.00%         | 0.00%         |
| Rata-rata |                                                                                                                                                                                                          | 13.50%            | 53.50%    | 26.75%          | 6.25%          | 0.00%         |
| Interest  | Digital electronics practicum with “Logisim” application becomes easier when assisted with zoom                                                                                                           | 8.00%             | 50.00%    | 40.00%          | 2.00%          | 0.00%         |
|           | Digital electronics practicum with “Logisim” application becomes more interesting when assisted with zoom                                                                                                 | 4.00%             | 44.00%    | 48.00%          | 4.00%          | 0.00%         |
|           | Digital electronics practicum with “Logisim” application becomes more fun when assisted with zoom                                                                                                         | 4.00%             | 50.00%    | 42.00%          | 2.00%          | 2.00%         |
|           | Digital electronics practicum with “Logisim” application become more motivated when with the help of the application zoom                                                                                   | 6.00%             | 48.00%    | 42.00%          | 4.00%          | 0.00%         |
|           | Digital electronics practicum with “Logisim” application with zoom-assisted can help me get to know technology more                                                                                           | 18.00%            | 64.00%    | 16.00%          | 2.00%          | 0.00%         |
| Average   |                                                                                                                                                                                                          | 8.00%             | 51.20%    | 37.60%          | 2.80%          | 0.40%         |

Table 2 shows that in the format aspect most of the students namely 55% agreed that digital electronics practicum with “Logisim” application with zoom-assisted has a good format. In the aspect of quality most of the students namely 56% agree that digital electronics practicum with “Logisim” application with zoom-assisted have good quality. In the aspect of clarity most of the students namely 53.5% agreed that digital electronics practicum with “Logisim” application with zoom-assisted have good clarity. In the aspect of interest most of the students namely 51.2% agreed that digital electronics practicum with “Logisim” application with zoom-assisted make them interested. Thus, most students have a good response to digital electronics practicum with “Logisim” application with zoom-assisted.

This good response is supported by their comments namely Conducting practicum with logisim application is interesting according to them, where it can increase our knowledge about technology, and by using zoom then if we do not fully understand the practicum we can easily ask questions or discuss for the present considering the existence of an epidemic in Indonesia itself, so it really helps students not to fall behind lessons and get new knowledge information. But sometimes due to regional differences with a group of friends, the discussion via zoom is stagnant due to the lack of support in the region. Other comments state that the combination of the Logisim Application which is a logic gate and zoom
simulation which is a video-based telecommunications application is a pretty good idea, zoom makes it easy for assistants and students to carry out practicum well in the midst of this corona pandemic.

Zoom has a low financial cost and offers a good webinar experience Using Zoom makes it possible to write and talk together through the process. The advantages of zoom are (1) The material can be more easily understood because the lecturer directly explains the material presented; (2) Students can ask questions and discuss as freely as during lectures in class; (3) Questions from students can also be directly responded to at that time so that they are more effective and easily understood by students; (4) Students do not feel bored with the material delivered/explained by the lecturer because the learning process was run face to face directly; (5) Student activity can be seen and monitored, so students are encouraged to be more focused and not open other applications during the learning process; (6) The scheduling and recording features, HD quality chat and video features become facilities that support the learning process [1].

Some students also have comments that reveal the weaknesses of the zoom itself. They stated that with this condition, according to students of digital electronics practicum with zoom assistive logisim applications, it was very helpful, but as we all know there must be more and less, the lack of network difficulties so that it becomes an obstacle when online practicum, and also more wasteful quota and also a limited time for not using a premium account. The use of this platform is only effective for about 40 minutes for free, the rest of the account owner must install a premium or paid application [9].

Knowledge of digital circuits is the foundation of various studies and implementation of technology used in everyday life [11,18–20]. The results of previous studies have stated that Logisim have been used to strengthen the theory of digital logic introduced in lectures. In its use, Logisim is used to draw a more abstract set of digital logic if it is carried out in a laboratory [13,21–23]. Logisim is one of the efforts used to improve learning outcomes because it provides different learning variations [17]. Logisim is useful in reinforcing the concept of the sequence received from lectures [11,24–26]. The results of the research carried out indicate that this is relevant to several previous research results. This shows that Logisim Application has good quality if its implementation in the Digital Electronics Practicum.

4. Conclusion
The conclusion from the results of this study is that the Digital Electronics Practicum with Logisim Application has good quality if its implementation is assisted by Zoom. This is supported by effectiveness data showing that students who get a B score that is between 70 - 75 the practicum. Student response shows that students have a positive response to practicum activities. In the case of online learning due to a pandemic, zoom can be used to facilitate the digital electronics practicum with logisim application. Further research is needed to investigate the quality of the practicum when using other media such as google meet, webex, whatsapp group and others.

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