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Effectiveness of Guided Discovery Learning-Based E-LKPD During the Covid-19 Pandemic to Improve Student Learning Outcomes

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Abstract: Effectiveness of Guided Discovery Learning-Based E-LKPD During the Covid-19 Pandemic to Improve Student Learning Outcomes. This study aims to describe the improvement of student learning outcomes through learning using E-LKPD based on guided discovery learning during the Covid-19 pandemic. The population in this study were all students of class XI MIPA at SMA Negeri 13 Bandar Lampung for the academic year 2021/2022. The sample in this study is class XI MIPA 2 as the control class and XI MIPA 4 as the experimental class taken using random sampling technique. The research method used is a quasi-experimental with pretest-posttest control group design. The data analysis technique of student learning outcomes uses the t-test on the n-Gain value of students. Learning outcomes data were processed using Microsoft Office Excel 2019 software and analyzed using SPSS software version 25.0 for Windows. Based on the results of the t-test obtained the value of sig. (2-tailed) 0.000 with H0 rejection test criteria if the sig value <0.05. Therefore, in this study, accept H1 which means that the average learning outcomes of students who use E-LKPD based on guided discovery learning in the experimental class are greater than the control class. The results of the effect size test obtained a value of 0.79 with the criteria of "large". Based on the results of data analysis, it can be concluded that learning using E-LKPD based on guided discovery learning is effective in improving student learning outcomes with great influence.

Keywords: effectiveness, guided discovery learning, cognitive learning outcomes

Abstrak: Efektivitas E-LKPD Berbasis Guided discovery learning di Masa Pandemi Covid-19 Untuk Meningkatkan Hasil Belajar Peserta Didik. Penelitian ini bertujuan untuk mendeskripsikan peningkatan hasil belajar peserta didik melalui pembelajaran menggunakan E-LKPD berbasis guided discovery learning di masa pandemi Covid-19. Populasi dalam penelitian ini adalah seluruh peserta didik kelas XI MIPA di SMA Negeri 13 Bandar Lampung tahun ajaran 2021/2022. Sampel dalam penelitian ini adalah kelas XI MIPA 2 sebagai kelas kontrol dan XI MIPA 4 sebagai kelas eksperimen diambil menggunakan teknik random sampling. Metode penelitian yang digunakan adalah kuasi eksperimen dengan pretest-postest control grup design. Teknik analisis data hasil belajar peserta didik menggunakan uji-t terhadap nilai n-Gain peserta didik. Data hasil belajar diolah menggunakan software Microsoft Office Excel 2019 dan dianalisis menggunakan software SPSS versi 25.0 for Windows. Berdasarkan hasil uji-t didapatkan nilai sig. (2-tailed) 0.000 dengan kriteria uji tolak H_0 apabila nilai sig < 0,05. Oleh karena itu, pada penelitian ini terima H_1 yang berarti rata-rata hasil belajar peserta didik yang menggunakan E-LKPD berbasis guided discovery learning kelas eksperimen lebih besar dibandingkan kelas kontrol. Hasil uji effect size diperoleh nilai sebesar 0,79 dengan kriteria "besar". Berdasarkan hasil analisis data dapat disimpulkan bahwa pembelajaran menggunakan E-LKPD berbasis guided discovery learning efektif untuk meningkatkan hasil belajar peserta didik dengan pengaruh besar.

Kata Kunci: *efektivitas, guided discovery learning, hasil belajar kognitif*

- **INTRODUCTION**

On December 31, 2019 the world was shocked by the emergence of a case similar to an unknown pneumonia in Wuhan, China (Lee, 2020). This disease is spreading rapidly so that it does not only occur in China but throughout the world, including Indonesia. One of the government's efforts to break the chain of spread of Covid-19 is to apply an appeal to the public to carry out physical distancing, namely an appeal to keep the distance between communities, avoid gatherings, and gatherings that involve many people, through the work from home (WFH) policy (Siahaan, 2020).

With the limitation of interaction between communities, to overcome the problem of education in order to keep it running, the government issued a policy through the Circular (SE) of the Minister of Education and Culture No. 4 of 2020 concerning the implementation of distance learning or online learning (Kemendikbud, 2020). Even until the end of 2021 the Covid-19 pandemic has not ended, therefore in an effort to return students to school there are several conditions that must be met by the education unit, including the education unit in the city must have entered the PPKM level 1 to 3 area and staff educators and education staff have vaccinated, then the school is required to provide limited face-to-face options, and also provide distance learning (PJJ) options (Kemendikbud, 2021).

Limited face-to-face learning is face-to-face learning with the number of students in one class limited to a capacity of 50% of the number of students in the class while still implementing health protocols. Students who do not participate in limited face-to-face learning can take part in online learning through hybrid learning or blended learning (Kemendikbud, 2020).

The Smeru research institute stated that during the Covid-19 pandemic, students who were in disadvantaged situations experienced a decrease in learning abilities (learning loss) (Alifia, 2020). Research conducted by Harefa (2021) stated that interest in learning chemistry in online learning during the Covid-19 pandemic decreased. This also resulted in a decrease in student learning outcomes. In line with the results of the interview with the chemistry teacher for class XI at SMA Negeri 13 Bandar Lampung, that the Covid-19 pandemic has reduced students' learning motivation and learning outcomes, because online learning teachers teach only using e-learning from schools with the additional platform of Google Classroom. Students during learning are already using LKPD, but the LKPD used during learning is not interactive, it only contains material and theoretical questions so that students feel bored in learning.

The success or failure of a learning media in improving the quality of students is also determined by the teacher's ability to choose the right media (Mahnun, 2012). One of the learning media that can be used during a pandemic is E-LKPD. One of the websites that can be used to create E-LKPD with multimedia is live worksheets. Liveworksheets is a multimedia-assisted website in which users can input more effective text, images, animations, and videos so that students don't get bored quickly in learning (Khikmiyah, 2021).

One of the basic competencies of class XI chemistry is K.D 3.10 analyzing the properties of solutions based on the concept of acid-base and/or pH of the solution and K.D 4.10 proposing ideas/ideas on the use of appropriate indicators to determine acidity/base or acid/base titration. Based on the results of interviews with chemistry teachers at SMA Negeri 13 Bandar Lampung, these basic competencies are difficult to achieve because online learning is difficult to invite students to construct lessons and also do practical work because of the relatively short time, resulting in decreased student learning outcomes. Therefore, to overcome this problem, an effort is needed to train students to improve learning outcomes, for example by using learning media such as E-LKPD based on discovery learning models. One of the discovery learning models that is suitable for use in current conditions is guided discovery learning. There are 6 stages of the guided discovery learning model, namely providing stimulation, identifying problems, collecting data, processing data, verification, and drawing conclusions (Jen & Lean, 2003). 2016). E-LKPD based on guided discovery learning has the aim of improving student learning outcomes on acid-base material. This article will describe the effectiveness of guided discovery learning-based E-LKPD during the Covid-19 pandemic to improve student learning outcomes.

- **METHOD**

Population dan sample

This research was conducted at SMA Negeri 13 Bandar Lampung. The population in this study were students of class XI MIPA SMA Negeri 13 Bandar Lampung. Sampling in this study was carried out by random sampling technique, so that the XI MIPA 4 class was obtained as the experimental class and the XI MIPA 2 class as the control class.

Research method and design

The research method used is a quasi-experimental with pretest-posttest control group design. (Fraenkel et al, 2012).

Tabel 1. Desain penelitian

Class	Pretest	Treatment	Posttest
Experiment	O_1	X_1	O_2
Control	O_1	C	O_2

Keterangan:

O_1 : Experimental class and control class were given a pretest

X_1 : Experimental class treatment (learning by using E-LKPD) based on guided discovery learning)

C : Control learning in progress (learning using E-LKPD conventional)

O_2 : The experimental class and the control class were given a posttest

Research variable

The independent variables in this study were guided discovery learning-based E-LKPD and conventional E-LKPD, while the dependent variable in this study was student learning outcomes.

Research instrument

The research instruments used were pretest and posttest questions totaling 5 questions and an observation sheet on the implementation of the learning process using guided discovery learning-based E-LKPD.

Data analysis and hypothesis testing

Data on student learning outcomes was processed using Microsoft Office Excel 2019 software and analyzed using SPSS software version 25.0 for Windows. The steps of processing the students' pretest-posttest data are (1) calculating the students' answer scores; (2) calculate the pretest and posttest scores by using the following formula:

$$\text{Value} = \frac{\Sigma \text{ answer score}}{\text{maximum score}} x\ 100$$

(3) calculate the n-Gain value of each student, with the following formula:

$$-gain = \frac{posttest\ score - pretest\ score}{100 - pretest\ score}$$

(4) calculate the average n-Gain value of cognitive learning outcomes from the n-Gain value

of each student with the following formula:

$$<n\text{-}Gain> = \frac{\sum n-Gain\ students}{\text{Number of students}}$$

(5) interpret the criteria for the average value of n-Gain, as follows:

Table 2. Criteria for the value of n-Gain

n-Gain	**Kriteria**
> 0,7	High
0,3 < n-Gain ≤ 0,7	Currently
n-Gain ≤ 0,3	Low

Source: Hake, 2002.

After processing the data, an analysis of the n-Gain values obtained using SPSS version 25.0 was carried out to obtain normality, homogeneity, and the difference between the two average pretest-posttest data of students from the two samples. The normality of the data was tested through the Kolmogorov-Smirnov test with a significant level > 0.05. The homogeneity of the data by looking at the One Way ANOVA value with a significant level > 0.05. The difference test of the two averages was carried out by independent sample t-test of the average n-Gain value of the students' cognitive learning outcomes in the two samples. Effect Size (measure of influence) was conducted to determine how big the size of the influence of guided discovery learning-based E-LKPD to improve students' cognitive learning outcomes. The size of the influence is calculated using the formula:

$$\mu^2 = \frac{t^2}{t^2+df}$$ (Jahjouh, 2014).

Interpreting the effect size criteria as follows:

Table 3. Criteria of Effect Size

Kriteria	**Efek**
μ ≤ 0,15	Effect is negligible (very small)
0,15 < μ ≤ 0,40	Small effect
0,40 < μ ≤ 0,75	Medium effect
0,75 < μ ≤ 1,10	Big effect
μ > 1,10	Huge effect

Source: Dyncer, 2005.

- **RESULT AND DISCUSSION**

Based on the research that has been done, the results obtained are in the form of pretest-posttest score data on cognitive learning outcomes, and data on the implementation of learning using guided discovery learning-based E-LKPD. The test instrument in the form of pretest-posttest pretest questions has been measured for validity and reliability, it is stated that the pretest-posttest questions are valid and reliable with "high" criteria so that the test instrument is declared suitable to be used to measure students' cognitive learning outcomes. Based on the calculation results, the average pretest-posttest scores of the control and experimental classes were obtained as shown in Table 4.

The average pretest-posttest score of students

The average pretest-posttest scores of students are presented in table 5 below.

Table 4. Average pretest-posttest scores in the experimental class and control class

Research Class	Average value		Increase in pretest-posttest
	Pretest	Posttest	
Control	19,63	59,46	39,83
Experiment	19,27	73,48	54,21

Based on Table 4, it can be seen that there is a difference between the average pretest-posttest scores in the experimental class and the control class. It can be seen that there was an increase in the average score of students before (pretest) and after (posttest) the implementation of learning both in the experimental class and the control class. The calculation results show that the average increase in the pretest-posttest scores of the experimental class is higher than that of the control class. The increase in cognitive learning outcomes is shown through the n-Gain value. Based on the average value of n-Gain in the experimental class and control class, it is shown in Table 5.

Table 5. The average value of n-Gain in the control and experimental classes

Research Class	Average n-Gain
Control	0.50
Exsperiment	0,68

Based on Table 5, it can be seen that there is a difference between the average n-Gain value of cognitive learning outcomes in the control class and the experimental class. This shows that the control class and the experimental class have "medium" n-Gain value criteria, but the average n-Gain value of the experimental class is higher than the control class.

Sheet implementation learning

The analysis of the implementation of learning using E-LKPD based on guided discovery learning is as supporting data. This assessment is carried out using an observation sheet which includes syntax, social systems, and teacher behavior. Observations were carried out by two observers. The calculation results are shown in Figure 1.

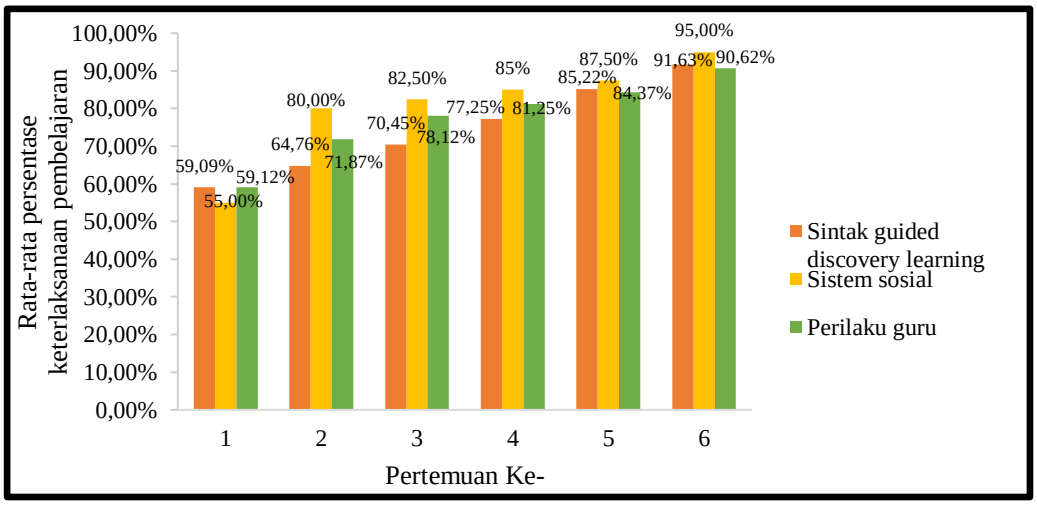

Figure 1. Average percentage of learning implementation using guided discovery learning-based E-LKPD

Based on Figure 1, information is obtained that the average percentage of learning implementation using guided discovery learning-based E-LKPD has increased at each

meeting. The implementation of learning using guided discovery learning-based E-LKPD at the first meeting had the criteria of "medium", the second meeting had the criteria of "high", the third meeting had the criteria of "high", the fourth meeting had the criteria of "very high", the fifth meeting had the criteria of "very high", and the sixth meeting had "very high" criteria.

Hypothesis test

Hypothesis testing is carried out, namely the difference test of the two averages. This test uses the n-Gain value to determine whether there is a difference in the average n-Gain value of the experimental class and control class students' cognitive learning outcomes. Before carrying out the test, a normality test and a homogeneity test must be carried out. The results of normality test can be shown in Table 6.

Table 6. The results of the normality test of the n-Gain value of students' learning Outcomes

Research class	N	*Sig. Test of Normality Kolmogrov-Smirnov*	Test Criteria
Control	35	0,200	*Sig > 0,05*
Exsperiment	33	0,200	

Based on Table 6, it can be seen that the results of the normality test on the average n-Gain value of student learning outcomes in the experimental class and control class show the sig value of Kolmogrov-Smirnov > 0.05 so that the test decision is to accept H_0 and reject H_1 which means the sample comes from normally distributed population. The results of homogeneity test can be shown in Table 7.

Table 7. The results of the homogeneity test of the n-Gain value of students' learning outcomes

Research class	N	Homogeneity Test	
		sig value	Test Criteria
Control	35	0,156	*sig.* > 0,05
Exsperiment	33		

Based on Table 7, it can be seen that the results of the homogeneity test of the two variants of the experimental class and the control class on the n-Gain value of cognitive learning outcomes are 0.156, which means the sig value is > 0.05, so the test decision is to accept H_0 and reject H_1 which means that both classes have homogeneous variances. The results of the two-average difference test can be shown in Table 8.

Table 8. The results of of the two-average difference of the n-Gain value of students' learning outcomes

Research class	N	t-test	
		Sig. *(2-tailed)*	Test Criteria
Control	35	0,000	*sig.* > 0,05
Exsperiment	33		

Based on Table 8, it can be seen that the results of the two-average difference test with independent sample t-test on the average n-Gain cognitive learning outcomes of students in the experimental class and control class show a sig (2-tailed) value of 0.000 < 0.05 so the test decision is accept H1 and reject H0 which means 1x,y < 2x,y means the average n-Gain of students' cognitive learning outcomes who apply learning using guided discovery learning-

based E-LKPD in chemistry learning has a significant difference than the average n-Gain cognitive learning outcomes of students who applied learning using conventional E-LKPD.

After testing the difference between two averages against the average n-Gain, then to find out how much effectiveness E-LKPD based on guided discovery learning is in improving students' cognitive learning outcomes, an effect size test is carried out. sizes. Before calculating the effect size, it is necessary to know in advance the t-count value in the experimental class and control class (t count results) on the pretest-posttest value of cognitive learning outcomes in the experimental class and control class. Next, the effect size is calculated using the formula according to Jahjouh (2014). The results of the effect size calculation show that the experimental class has an effect size value of 0.79 with the "Large" criteria while the control class has an effect size value of 0.66 with the "medium" criteria. Based on this value, it shows that 79% of students' cognitive learning outcomes in the experimental class are influenced by learning using E-LKPD based on guided discovery learning, while 66% of students' cognitive learning outcomes in the control class are influenced by learning using conventional E-LKPD. The experimental class has a criterion of "big" influence on students' cognitive learning outcomes, while the control class has a criterion of "moderate" influence on students' cognitive learning outcomes.

This means that learning using E-LKPD based on guided discovery learning is effective in improving student learning outcomes with great influence. This shows that guided discovery learning-based E-LKPD is effective in improving students' cognitive learning outcomes on acid-base material. This is in line with research conducted by Nilamsari and Indah (2022) which states that Guided discovery-based Electronic LKPD is practical and effective to be applied during the online and offline learning process to train integrated science process skills, research conducted by Nurjanah, Rudibyani, and Sofya (2020) which states that learning using discovery learning-based worksheets is effective for improving collaboration skills and mastery of students' concepts.

▪ CONCLUSION

The conclusion from the results of this study is that learning using E-LKPD based on guided discovery learning can improve students' cognitive learning outcomes on acid-base materials during the Covid-19 pandemic. This is shown based on the analysis of the difference between the two average n-Gain values of student learning outcomes with the "medium" criteria and the effect size test of 0.79 with the "large" criteria.

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