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The Effectiveness of Guided Blended-Inquiry Learning Model in Improving Students' Cognitive Learning Outcomes on Acid-Base Materials

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Abstract: The Effectiveness of Guided Blended-Inquiry Learning Model in Improving Students' Cognitive Learning Outcomes on Acid-Base Materials. This study aims to obtain information on the effectiveness of the guided blended-inquiry learning model in improving students' cognitive learning outcomes on acid-base class XI material. This study used a quasi-experimental method with a pretest-posttest control group design. The population used is all class XI MIPA SMAN 15 Bandar Lampung in the even semester of the 2021/2022 academic year. Sampling in this study was done by simple random sampling and obtained class XI MIPA 1 as the experimental class and XI MIPA 2 as the control class. The effectiveness of the guided inquiry learning model was analyzed using the two-average difference test on n-Gain and the effect size test on student learning outcomes between the experimental class and the control class. The results showed that the average n-Gain in the experimental class was 0.66 while in the control class it was 0.45. The effect size test results show that the guided blended-inquiry model has a "big" effect in improving student learning outcomes with an effect size of 92%. In this study, it was concluded that the guided blended-inquiry learning model was effective in improving students' cognitive learning outcomes on acid-base material.

Keywords: Acid-Base, Learning Outcomes, Blended-Inquiry Guided Learning Model

Abstrak: Efektivitas Model Pembelajaran Blended-Inkuiri Terbimbing dalam Meningkatkan Hasil Belajar Kognitif Peserta Didik Pada Materi Asam Basa Kelas XI. Penelitian ini bertujuan untuk mendapatkan informasi mengenai efektivitas model pembelajaran blended-inkuiri terbimbing dalam meningkatkan hasil belajar kognitif peserta didik pada materi asam basa kelas XI. Penelitian ini menggunakan metode kuasi eksperimen dengan pretest-posttest control group design. Populasi yang digunakan yaitu seluruh kelas XI MIPA SMAN 15 Bandar Lampung semester genap tahun ajaran 2021/2022. Pengambilan sampel pada penelitian ini dilakukan dengan cara simple random sampling dan diperoleh kelas XI MIPA 1 sebagai kelas eksperimen dan XI MIPA 2 sebagai kelas kontrol. Efektivitas model pembelajaran inkuiri terbimbing di analisis menggunakan uji perbedaan dua rata-rata pada n-Gain dan uji effect size terhadap hasil belajar peserta didik antara kelas eksperimen dan kelas kontrol. Hasil penelitian menunjukkan bahwa rata-rata n-Gain pada kelas eksperimen sebesar 0,66 sedangkan pada kelas kontrol sebesar 0,45. Hasil uji effect size menunjukkan bahwa model blended-inkuiri terbimbing memiliki pengaruh “besar” dalam meningkatkan hasil belajar peserta didik dengan effect size sebesar 92%. Pada penelitian ini diperoleh kesimpulan bahwa model pembelajaran blended-inkuiri terbimbing efektif untuk meningkatkan hasil belajar kognitif peserta didik pada materi asam basa.

Kata kunci : Asam Basa, Hasil Belajar, Model Pembelajaran *Blended*-Inkuiri Terbimbing

▪INTRODUCTION

In December 2019, the world was shocked by the presence of a virus that originated in the city of Wuhan, China. The virus is known as Covid-19 which is caused by a corona virus called SARS-CoV-2. The virus can be contagious as well as deadly. One of the efforts made by the government in the education sector to minimize the spread of the corona virus is the implementation of limited face-to-face learning and/or distance learning based on the Joint Decree of the Minister of Education and Culture, Minister of Religion, Minister of Health and Minister of Home Affairs Number 03/KB/202l , Number 384 of 2021, Number HK.01.08/MENKES/4242/2021, Number 440-717 of 2021 concerning Guidelines for the Implementation of Learning during the Pandemic Coronavirus Disease 2019 (COVID-19). Based on the government's recommendation regarding health protocols, the public is advised to keep their distance and students are advised to study from home or learn online. Online learning needs to be balanced with face-to-face learning to confirm students' understanding gained from online learning (Fitriyani, Haryani, and Susatyo, 2017). Therefore, there is a need for blended learning. Blended means a good mix or combination. Blended learning is one of the learning methods by combining face-to-face learning with virtual/virtual or online (Husamah, 2014). Blended learning requires creativity in the learning process. One of the learning media that can be used in blended learning is live worksheet-based e-LKPD. Live Worksheets are one of the electronic media-assisted media in which there are more effective text, images, animations, and videos so that students don't get bored quickly in learning (Khikmiyah, 2021). The application of blended learning needs to be integrated with learning models with a scientific approach recommended in the 2013 Curriculum. The learning model in question is a guided inquiry learning model. This is in accordance with research conducted by Susmariani et al., (2022) that using a guided inquiry learning model based on blended learning can improve student learning outcomes than using conventional learning models.

Based on the results of interviews conducted with one of the chemistry subject teachers at SMA Negeri 15 Bandar Lampung, it is known that acid-base learning is difficult to achieve because online learning is difficult to invite students to construct. In addition, in the learning process using the lecture method, students' activities tend to be passive because students do not have an active role in the learning process, students only listen to explanations from the teacher. Therefore, the researcher wants to apply the guided inquiry learning model to the acid-base material. Acid-base material is an even semester XI material contained in Basic Competence (KD) 3.10 2013 curriculum which is to analyze the properties of solutions based on the concept of acid-base and/or pH of the solution and K.D 4.10 propose ideas/ideas about the use of appropriate indicators to determine acidity/base or acid/base titration.

One important component in the learning process is learning outcomes. Learning outcomes describe the knowledge and skills that have been obtained after participating in learning activities. Learning outcomes are a benchmark for achieving or not learning objectives (Mahajan & Sigh, 2017). The learning outcomes of students in Indonesia are currently experiencing a decline. One of them is the result of studying chemistry. Based on the results of the PISA (Program for International Student Assessment) survey

organized by the Organization for Economic Cooperation and Development (OECD) in evaluating reading, math, and science literacy skills in 2018, it was found that the average score in the field of science was 396, with a score of 396. OECD average of 489 (OECD, 2018). To overcome this problem, the researcher wants to apply a guided inquiry learning model during the teaching and learning process. By using the guided inquiry learning model, students are trained to be actively involved in the learning process so that they can develop their skills. Through the stages in the guided inquiry model, students are given the opportunity to experience firsthand how scientists find concepts (Fitriyani et al., 2017). Thus, the use of the guided inquiry learning model in the learning process is expected to improve students' cognitive learning outcomes on acid-base material. In addition, in another study conducted by Wardani & Firdaus (2019) entitled "The Influence of Blended Learning-Based Guided Inquiry Models on Cognitive-Psychomotor Ability in Buffer Solution Material", the results of data analysis obtained are the average cognitive ability test results of students the experimental class is 71.14 and the control class is 67.35. While the average achievement of the psychomotor domain based on the experimental class practicum observation sheet is 79.9% and the control class is 74.43%. From these data it can be concluded that there is an effect using a guided inquiry model based on blended learning on the buffer solution material, which can improve the cognitive and psychomotor abilities of students. Waleulu, Muharram, and Sugiarti (2019) in their research said that the guided inquiry learning model had an effect on critical thinking skills and student learning outcomes on the subject matter of chemical bonds.

Based on the problems and explanations as well as existing research, researchers are interested in conducting research using the guided inquiry model as a learning medium in the COVID-2019 pandemic in improving students' cognitive learning outcomes, a research will be conducted with the title "Effectiveness of the Guided Inquiry Blended Learning Model in Improving Students' Cognitive Learning Outcomes on Acid-Base Materials"

METHOD

Population and Sample

The population in this study were all students of class XI MIPA at SMA Negeri 15 Bandar Lampung for the academic year 2021/2022, totaling 136 students spread into four classes. This study uses a sampling technique that is simple random sampling. The samples used in this study were class XI MIPA 1 and XI MIPA 2, each of which consisted of 33 students and 34 students.

Data Types and Sources

The type of data used in this study is primary data. Primary data in the form of pretest and posttest scores on acid-base learning of all experimental class students and all control class students, as well as scores on the results of the assessment of the implementation of chemistry learning.

Research Methods and Design

This study uses a quasi-experimental method with a pretest-posttest control group design type (Fraenkel, Wallen, and Hyun, 2012).

Research variable

The independent variable in this study is learning using the blended-inquiry guided learning model and the conventional learning model. While the dependent variable is cognitive learning outcomes.

Learning Tools and Research Instruments

The learning tools used in this study were the syllabus, Learning Implementation Plans (RPP), Electronic Student Worksheets (e-LKPD) based on live worksheets that were used, totaling five e-LKPDs modified from Haniska Virginia Pitaloka (2020) and Siti Rohmah (2020). While the research instruments used in this study were the pretest and posttest grids, pretest and posttest rubrics, pretest and posttest questions, in the form of a description of 5 questions, and an observation sheet on the implementation of chemistry learning in the form of an observation sheet on the implementation of chemistry learning.

Data Analysis Techniques and Hypothesis Testing

Before the learning was carried out, the students in the two research classes were asked to work on the pretest questions, then after the learning was done the students were asked to work on the posttest questions. Then do the calculation of n-Gain for both classes. The purpose of calculating the n-Gain is to determine the increase in the pretest and posttest scores of the two classes. The n-Gain formula proposed by Hake (1998) is as follows:

$$\text{n-Gain} = \frac{\%\,posttes - \%\,prettes}{100 - \%\,prettes}$$

The results of the calculation of the average n-Gain are then interpreted using Hake's (1998) classification as follows:

1. Learning with a "high" n-Gain score, if the gain is 0.7;
2. Learning with a "medium" n-Gain score, if the gain is between 0.7 > gain 0.3;
3. Learning with a "low" n-Gain score if the gain < 0.3

The difference test of the two averages was carried out using the SPSS Statistics 25.0 program, namely through the Independent Samples Test, with the acceptance test criteria H0 if the sign value (2-tailed) < 0.05.

Percentage of Educators' Ability in Managing Learning

Data analysis of the ability of educators to manage learning using the blended-guided inquiry learning model, carried out the following steps.

a. Counting the number of scores given by observers for each aspect of observation, then the percentage of educators' abilities is calculated using the following formula:

$$\% \text{ Ji} = \left(\frac{\Sigma \text{Ji}}{\text{N}}\right) \text{ x } 100\% \text{ (Sudijono, 2004)}$$

Information :

%Ji = the percentage of the ideal score for each aspect of the observation at the i-th meeting

ΣJi = the number of scores for each aspect of the observation given by the observer at the i-th meeting

N = maximum score (ideal score)

b. Calculating the average percentage of educators' abilities for each aspect of observation and interpreting the data by interpreting the price of the percentage of educators' abilities as shown in the table below:

Table 1. Criteria for the level of educators' ability to manage learning

Percentage	Criteria
80,1% - 100%	Very high
60,1% – 80%	High
40,1 % - 60%	Currently
20,1% - 40%	Low
0,0% - 20%	Very low

(Sunyono, 2012).

Effect Size Test

The effect size test was conducted to find out how much influence the guided inquiry blended learning model had in improving student learning outcomes, with the following formula:

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

Information:

μ = effect size

t = t count from t-test

df = degrees of freedom

The following is a table of criteria for according to Dincer (2015):

Table 2. Criteria μ (effect size)

Criteria	Effect
$\mu \leq 0{,}15$	Ignored (very small)
$0{,}15 < \mu \leq 0{,}40$	Small
$0{,}40 < \mu \leq 0{,}75$	Currently
$0{,}75 < \mu \leq 1{,}10$	Big
$\mu > 1{,}10$	Very large

RESULTS AND DISCUSSION

Based on the research that has been conducted on two treatment classes, namely class XI MIPA 1 and X MIPA 2 at SMA Negeri 15 Bandar Lampung, the results obtained are in the form of pretest posttest data and data on the implementation of chemistry learning. The data that has been obtained from the research is then processed with the help of Microsoft Office Excel and SPSS 25.0 Software for Windows.

The average score of pretest and posttest

The effectiveness of the guided inquiry learning model can be seen from the average n-Gain value obtained between the control class and the experimental class. Before getting the mean value of n-Gain, first the average value of pretest and posttest was calculated in two classes. The average pretest and posttest scores are presented in Figure 1.

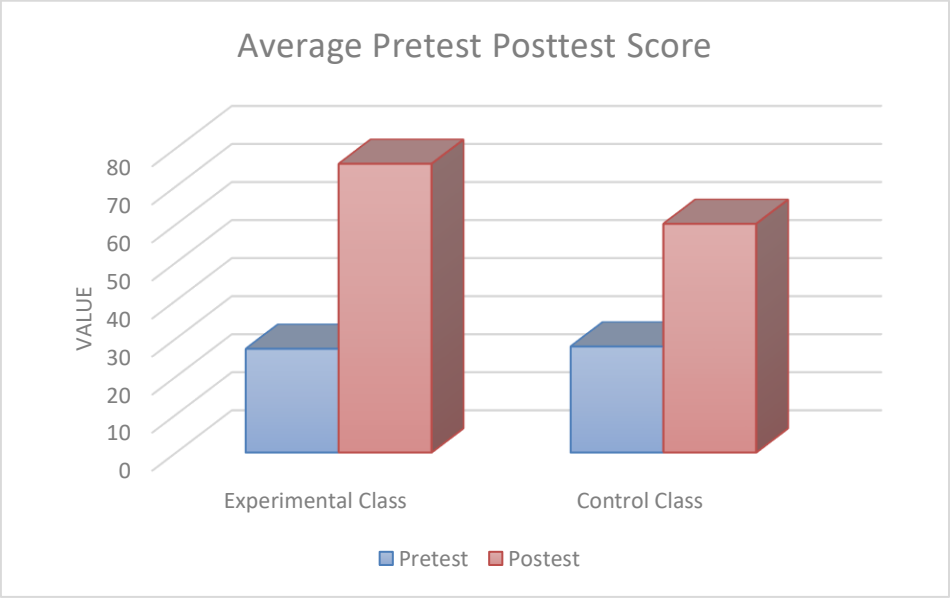

Figure 1. Average pretest and posttest scores in the experimental class and control class

Average n-Gain

Based on the research conducted, the following are the results of the average n-Gain for the experimental class and the control class

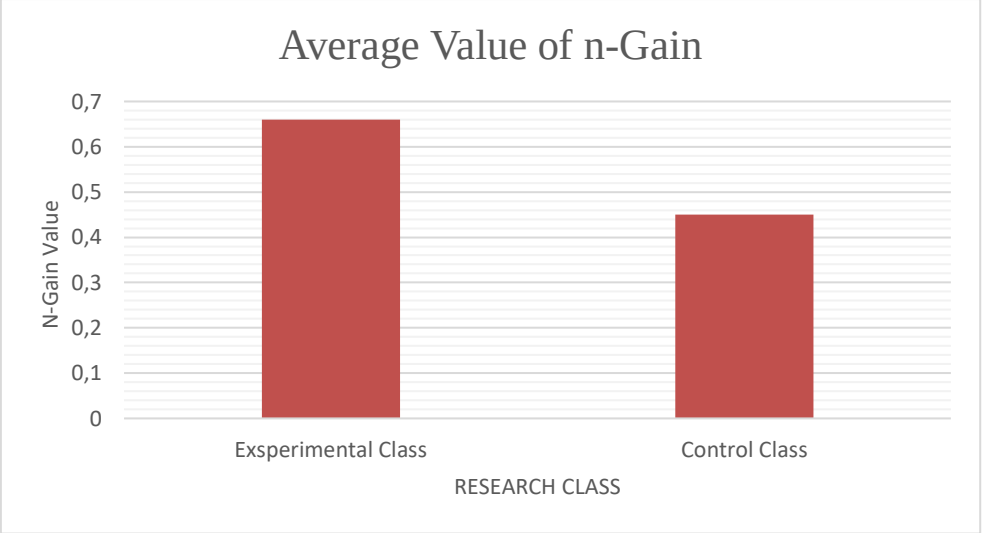

Figure 2 Average n-Gain Value of Student Learning Outcomes

From Figure 2 above, it shows the average value of n-Gain in the experimental class is 0.66 and in the control class is 0.45. based on Hake's (1998) criteria, the n-Gain criteria in the experimental and control classes are the same, namely "medium". However, based on these data, the increase in learning outcomes of the experimental class students was better than the control class. These results can also state that the use of the guided-inquiry blended learning model is effective in improving students' cognitive learning outcomes on acid-base material.

Test the difference of two mean n-Gain

Before testing the difference between the two averages of n-Gain, normality test and homogeneity test were carried out first. Normality test was performed using the Kolmogrov-Smirnov test with a significance level of > 0.05. The output results of SPSS version 25.0 are presented in Table 3.

Table 3. The results of the n-Gain normality test of students' cognitive learning outcomes

Class	N	Average n-Gain	Information		Decision Test
			sig value.	Test Criteria	
Experiment	33	0,66	0,200	Sig > 0,05	Normal
Control	34	0,45	0,079	Sig > 0,05	Normal

Based on Table 3, the results of the normality test that have been carried out on the average n-Gain acquisition of cognitive learning outcomes for experimental and

control class students can be seen that the significance value is > 0.05 for both classes so that the decision to accept H0 and reject H1 means the data The research obtained is normally distributed. The homogeneity test of the sample was carried out using the SPSS Statistics 23.0 program by looking at the One Way ANOVA value by looking at the Sig value. The output is displayed in the SPSS Statistics 25.0 program. The test criteria is to accept H0 if the value is Sig. >0.05 and reject H0 if the value is Sig. <0.05

Table 4. The results of the n-Gain homogeneity test of students' cognitive learning outcomes

Class	N	Average n-Gain	Information		Decision Test
			Sig Value.	Test Criteria	
Experiment	33	0,66	0,583	Sig > 0,05	Homogeneous
Control	34	0,45			

Based on Table 4, it can be seen that the results of the homogeneity test that have been carried out on the acquisition of the average n-Gain of the two classes, namely the experimental class and the control class, have a sig value > 0.05, so the test decision is to accept H0 and reject H1 which means that both samples have a value homogeneous or uniform variance. Because the data obtained are normal and homogeneous, the test for the difference between the two n-Gain averages is carried out using parametric statistical tests, namely by using the T-test to be precise, the Independent Sample T-test.

Table 5. The results of the two-average n-Gain test of students' cognitive learning outcomes

Class	N	Average n-Gain	Uji t	
			Sig Value.(*2-tailed*)	Decision Test
Experiment	33	0,66	0,00	sig.(*2-tailed*) < 0,05
Control	34	0,45		

Based on Table 5, it can be seen that the sig (2-tailed) value of the experimental class and the control class is 0.00, so the test decision is to accept H0 and reject H1 which means there is a significant difference in the average n-Gain value of the experimental class and the control class. The difference test of the two averages was carried out on the results of the pretest and posttest to obtain the t-value used in the effect size test using the blended-inquiry guided learning model in learning in the experimental class. The effect size test in this study was conducted to determine the magnitude of the effect of learning on the experimental and control classes. The results of the effect size test (μ) are presented in Table 10

Table 6 Test results of the effect size of cognitive learning outcomes

Class	N	df	t_{hitung}	t^2	μ	Criteria
Experiment	33	64	-19,102	364,886	0,92	Big effect
Control	34	66	-12,754	162,664	0,84	Big effect

Based on Table 6, it can be seen that the effect size value in the experimental class is 0.92 and the control class is 0.84, where the value lies in the range of 0.75 < 1.10 which according to Dincer's (2015) criteria is a category " big effect." This shows that the increase in student learning outcomes on acid-base material in the experimental class by 92% is influenced by learning using the guided blended-inquiry model.

Chemistry Learning Implementation Data Analysis

The implementation of chemistry learning was measured using an observation sheet. The results of an observer's observation of the implementation of learning using the guided blended-inquiry model, the average percentage of each meeting experienced a significant increase. Based on the data analysis conducted, the criteria for the average percentage of teachers' abilities in managing learning are "very high".

The criteria for the average percentage of teachers' abilities in managing learning at each meeting are shown in Figure 3 below:

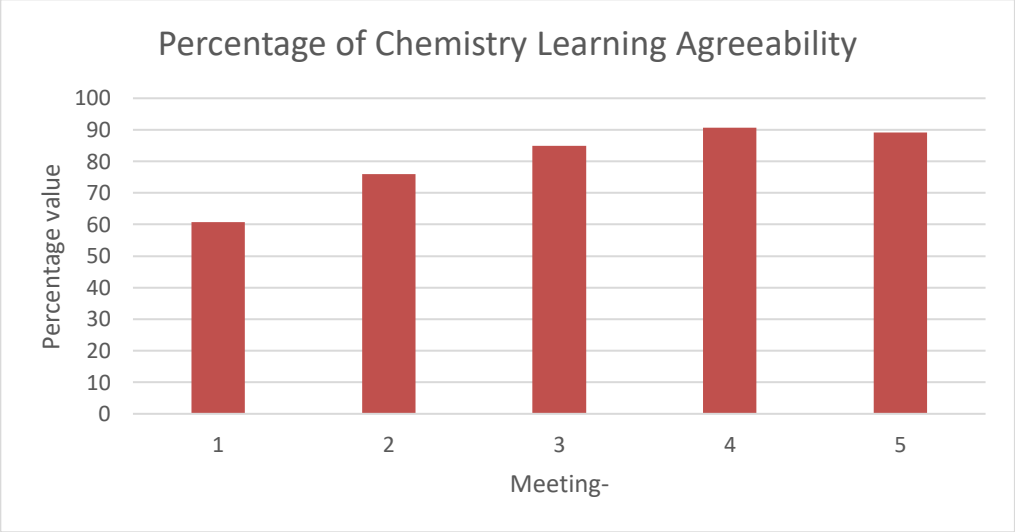

Figure 3 Average percentage of chemistry learning implementation

Based on Figure 4, it is known that the average percentage of learning implementation with the guided blended-ikuiri model on acid-base material at the first meeting is 60.73%, the second meeting is 76.04%, the third meeting is 84.89%, the fourth meeting is 90 ,62%, and the fifth meeting was 89.16%, from the data it was found that the average percentage of learning implementation using the guided blended-inquiry learning model from the first, second, third, fourth and fifth meetings experienced a significant increase, although at the first, second, third, fourth and fifth meetings Fifth there is a slight decrease.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that; Model Guided inquiry blended learning model is effective in improving students' cognitive learning outcomes on acid-base material, which is indicated by a significant difference between the n-Gain value of students' learning outcomes in the experimental class and the control class, where the experimental class has an average of n- The gain is greater than the control class. The guided inquiry-blended learning model has a "big" effect size in improving students' cognitive learning outcomes on acid-base material.

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