11(2), 2022, 31-43 DOI: 10.23960/jppk.v11.i2.2022.04
**Jurnal Pendidikan dan Pembelajaran Kimia**
**e-ISSN: 2714-9595 | p-ISSN: 2302-1772**
http://jurnal.fkip.unila.ac.id/index.php/JPK/index

# The Effectiveness of Guided Inquiry Learning Model with Virtual Laboratory Assistance on Student Learning Outcomes on Acid-Base Materials

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*Received: July 22th, 2022 Accepted: August 26th, 2022 Online Published: August 29th, 2022*

**Abstract: The Effectiveness of Guided Inquiry Learning Model with Virtual Laboratory Assistance on Student Learning Outcomes on Acid-Base Materials.** This study aims to describe the effectiveness of the guided inquiry model using a virtual laboratory on student learning outcomes on acid-base material. The population were students of class XI science at SMA Negeri 14 Bandarlampung 2021/2022, totaling 179 students. Sampling was carried out using technique of purposive sampling obtained the class of control was XI IPA 4 and the class of experimental was XI IPA 5. The research method used is Quasi Experiment with Non Equivalent Control Group Design. Student learning outcomes are obtained from cognitive learning outcomes and affective learning outcomes. Based on Hake's (1998) criteria, the results showed that the mean n-gain of students' cognitive learning outcomes for the class of control was 0.38 in the medium category and the class of experimental was 0.67 in the medium category, and based on Arikunto's (2006) criteria the average percentage of students' affective learning outcomes for the class of control is 61.13% in the high category and the class of experimental is 66.81% in the high category. Based on the results of hypothesis testing, it was obtained that the mean n-gain score of cognitive learning outcomes and the average percentage of students' affective learning outcomes in the class of experimental was higher than the mean n-gain score of cognitive learning outcomes and the average percentage of participants' affective learning outcomes. students in the class of control, so it can be concluded that the guided inquiry model using a virtual laboratory is effective in improving student learning outcomes on acid-base material.

**Keywords:** Acid Base, Learning Outcomes, Guided Inquiry, Virtual Laboratory.

***Abstrak: Efektivitas Model Pembelajaran Inkuiri Terbimbing dengan Bantuan Laboratorium Virtual terhadap Hasil Belajar Peserta Didik pada Materi Asam Basa.*** *Penelitian ini bertujuan untuk mendeskripsikan efektivitas model pembelajaran inkuiri terbimbing dengan bantuan laboratorium virtual terhadap hasil belajar peserta didik pada materi asam basa. Populasinya adalah peserta didik kelas XI IPA SMA Negeri 14 Bandarlampung 2021/2022 yang berjumlah 179 peserta didik. Pengambilan sampel dilakukan menggunakan teknik purposive sampling dan didapat kelas kontrol yaitu XI IPA 4 dan kelas eksperimen yaitu XI IPA 5. Metode penelitian yang digunakan dalam penelitian ii adalah Quasi Experiment dengan Non Equivalent Control Group Design. Hasil belajar peserta didik diperoleh dari hasil belajar kognitif dan hasil belajar afektif. Berdasarkan kriteria Hake (1998), hasil penelitian didapat bahwa rata-rata n-Gain hasil belajar kognitif peserta didik untuk kelas kontrol adalah 0,38 memiliki kategori sedang, sedangkan kelas eksperimen adalah 0,67 memiliki kategori sedang, serta berdasarkan kriteria Arikunto (2006) presentase rata-rata hasil belajar afektif peserta didik untuk kelas kontrol adalah 61.13% dengan kategori tinggi dan kelas eksperimen adalah 66,81% dengan kategori tinggi. Berdasarkan hasil pengujian hipotesis diperoleh bahwa rata-rata n-Gain hasil belajar kognitif dan persentase rata-rata hasil belajar afektif peserta didik pada kelas eksperimen lebih tinggi dibandingkan rata-rata nilai n-Gain hasil* *belajar kognitif dan persentase rata-rata hasil belajar afektif peserta didik pada kelas kontrol, sehingga dapat disimpulkan bahwa model pembelajaran inkuiri terbimbing dengan bantuan laboratorium virtual efektif meningkatkan hasil belajar peserta didik pada materi asam basa.*

***Kata Kunci:*** *Asam Basa, Hasil Belajar, Inkuiri Terbimbing, Laboratorium Virtual*

- **INTRODUCTION**

In 2020, the whole world experienced an outbreak, namely the Covid-19 pandemic, as a virus that originally attacked China, which was discovered in November 2019 to be exact in Wuhan City. The Covid-19 pandemic is a health crisis that has hit almost every corners of the world (Purwanto et al., 2020). The Ministry of Education and Culture has issued Circular Number 4 of 2020 on the implementation of education policies during the emergency of the spread of the coronavirus disease (Covid-19), one of which is learning at home through distance learning or online activities. As time goes by, in 2021, schools will gradually begin to implement PTMT (Limited Face-to-face Learning) that means schools are carried out offline and online.

The limited application of face-to-face learning during this pandemic also ausing educators to reflect on the models and methods of learning that will be used. Initially, an educator has prepared a learning model that will be used and then the learning model needs to be changed (Siahaan, 2020). In the world of education, one of the internal factors that determine the success or failure of the teaching and process of learning is the improvement of student learning outcomes. Learning outcomes are the results achieved by a person after going through the process of learning by only receiving an assessment after the learning process is complete. Learning outcomes allow teachers to know whether students have achieved the specified competencies. Learning outcomes can be in the form of behavioral changes that include the cognitive, affective and psychomotor domains. Usually learning outcomes are expressed in the form of numbers. The high and low learning outcomes indicate the success of the teacher in providing material in the process of learning (Safitri et al., 2020).

The use of the Internet and multimedia technology is believed to have the potential to change the way education is provided and as an alternative to classroom learning if face-to-face learning has been carried out normally. In accordance with 21st century education that integrates cognitive, affective, and psychomotor skills, as well as mastery of ICT. Currently, education is in the knowledge age with an extraordinary acceleration of knowledge growth. This accelerated increase in knowledge is supported by the use of media and digital technology, the so-called information highway (Gates et al., 1996). These requirements make teachers and learners aware of online media that can support them as a substitute for direct learning in the classroom without reducing the quality of the learning materials and learning outcomes. (Siahan, 2020). The development and use of learning media, supported by the latest digital technologies, are increasingly used for research in the field of education, not least in the field of science education (Prasetyo et al., 2015).

Based on the results of interviews with chemistry educators for class XI science at SMA Negeri 14 Bandarlampung, it appears that during the PTMT (Limited Face-to-face Learning) period the class is divided into two sessions that will take turns, for example XI IPA 4 sessions 1 offline on Mondays and online on Tuesday, while XI IPA 4 session 2 is online on Monday and offline on Tuesday, and so on. In chemistry learning, educators use Telegram groups when online, to provide teaching materials that will be explained when the class session is carried out offline. The offline learning process is very limited so that only the deepening of the material with conventional models and practice questions in LKPD is carried out. Students are rarely given the opportunity to discuss to find and solve problems, even though chemistry learning should form an understanding of chemistry through solving problems that exist in everyday life so as to build concepts independently, so that the learning outcomes obtained are quite low. In addition, educators never train students to experiment, even though the material requires experimentation due to very limited offline time.

According to Wati (2014), chemistry is a high school subject that is considered difficult, because students encounter difficulties that can stem from difficulties in understanding terms, difficulties with numbers, and difficulties in understanding chemical concepts. To overcome this, chemistry lessons need to be shown in a more concrete form, for example through experiments or certain media. The learning material for acid-base solutions includes the theory of acid-base and the concepts of pH, pOH, and pKw. In addition to presenting in the form of theory, acid-base solution material must also be supported by practical activities in the laboratory, this is based on the basic competencies of the 2013 SMA/MA curriculum. (Siregar, 2015).

Practical activities in real laboratories are very important to support student learning outcomes, but in practice they are rarely carried out. This is due to several obstacles that make practicum in the laboratory cannot be carried out, such as the high cost of tools and practicum materials, as well as the limitations of the laboratory or equipment limiting educators to do practicum (Nurrokhmah, 2013). In carrying out the practicum, students can experiment not only in the laboratory but also in a virtual laboratory (Hamida et al., 2013). Virtual laboratories certainly cannot be used to replace practicum activities in real laboratories, because practicum activities can train students' process skills which will only be obtained from practical activities. However, this virtual laboratory can be used as a learning medium that can help students understand the material presented (Nurrokhmah, 2013).

In addition to choosing the right learning media, it is also necessary to have the right learning model so that the achievement of competence can be maximized, researchers want to apply a guided inquiry model using a virtual laboratory. In the syntax of the guided inquiry learning model, namely identifying problems, making hypotheses, collecting data, analyzing data, and making conclusions (Trianto, 2010). This is done by students under the guidance of educators when learning takes place. The advantage of the guided inquiry model is that the teacher does not just let go of student activities, so that students who think slowly or have low intelligence can follow the activities carried out, and students who have high thinking skills do not monopolize these activities (A'yunin et al., 2016) .

The relevant research with this problem is the research conducted by Maretasari, Subali, & Hartono (2012) which states that the laboratory-based guided inquiry model has a positive and significant influence on learning outcomes and scientific attitudes of students. In addition, Azizaturredha (2019) stated that there was a significant effect using a guided inquiry model with virtual laboratory media (PhET) on the subject of elasticity on student learning outcomes.

Conventional learning has different characteristics from learning using a guided inquiry model using a virtual laboratory. However, it has not been revealed how far the effectiveness of the guided inquiry model using a virtual laboratory is on student learning outcomes on acid-base material. Therefore, the researcher wants to raise this problem into a study entitled "The Effectiveness of Guided Inquiry Learning Models With Virtual Laboratory Assistance on Student Learning Outcomes on Acid-Base Materials".

- **METHOD**

The research method used in this research is Quasi **Experiment with Non** The research method used in this research is Quasi Experiment with Non Equivalent Control Group Design. The purpose of this study, namely to describe the effectiveness of the guided inquiry model using a virtual laboratory on student learning outcomes on acid-base material. This research was conducted at SMA Negeri 14 Bandarlampung, class XI IPA for the academic year 2021/2022. This research was conducted from January 3, 2022 to January 27, 2022 in the odd semester of the 2021/2022 academic year.

The population in this study XI IPA SMA Negeri 14 Bandarlampung for the academic year 2021/2022, totaling 179 and spread over five classes. The research sample will be taken from two classes of class XI IPA, namely XI IPA 4 as the class of experimental and XI IPA 5 as the class of control. Sampling was done by using purposive sampling technique.

**Data Analysis Techniques**

Data analysis in this study includes several stages including:

**Validation Test**

Validity is a measure that shows the level of validity or validity of a test instrument (Arikunto, 2006). The validity test was carried out using the product moment formula with rough numbers proposed by Pearson where in this case the analysis was carried out using SPSS 25.0 statistics. The instrument that was tested for validity and reliability in this study was a test instrument. The question is said to be valid if $r_{count} \geq r_{table}$ with a significant level of 5%.

**Reliability Test**

The instrument reliability test in this study used the Cronbach Alpha formula. The test instrument is said to be reliable if $r_{11} \geq r_{table}$. Reliability test can be done using SPSS Statistics 25.0 software. The criteria for instrument reliability are presented in Table 1.

**Table 1.** Reliability Criteria

| Range | Criteria |
|---|---|
| 0,800 – 1,000 | Very high |
| 0,600 – 0,800 | High |
| 0,400 – 0,600 | Enough |
| 0,200 – 0,400 | Low |
| 0,000 – 0,200 | Very low |

(Riduwan & Kuncoro, 2017)

**Data Analysis of Learning Implementation Using a Guided inquiry model using virtual laboratory**

Counting the number of scores given by the observer for each aspect of the observation, then the percentage of achievement is calculated using the following formula:

$$\%Ji = \frac{\Sigma Ji}{N} \times 100\% \qquad \text{(Sudjana, 2005)}$$

Where %Ji is the percentage of achievement of the ideal score for each aspect of the observation at the 1st meeting, ΣJi is the total score of each aspect of the observation given by the observer at the 1st meeting, and N is the sum of the maximum scores for each aspect of the observation. Then calculate the average percentage of achievement for each aspect of the observation from two observers. Interpreting learning implementation data using a virtual laboratory with the price interpretation of the percentage of learning implementation achievement as shown in Table 2.

**Table 2.** Criteria for Achievement Level of Learning Implementation

| Percentage | Criteria |
|---|---|
| 80,1% - 100% | Very high |
| 60,1% - 80% | High |

| | |
|---|---|
| 40,1% - 60% | Enough |
| 20,1% - 40% | Low |
| 0,0% - 20% | Very low |

(Arikunto, 2006)

**`Analysis of the Affective Domain Observation Sheet**

Counting the number of scores given by the observer for each aspect of the observation, then the percentage of achievement is calculated using the following formula:

$$\%\boldsymbol{Ji} = \frac{\sum \boldsymbol{Ji}}{\boldsymbol{N}} \times \mathbf{100}\% \qquad \text{(Sudjana, 2005)}$$

Then calculate the average percentage of achievement for each aspect of the observation from two observers.

**Data Analysis of Cognitive Learning Outcomes**

The data obtained in this study are the test scores for learning outcomes before the application of learning (pretest) and test scores for learning outcomes after the application of learning (posttest). Then the data obtained is done by calculating the n-Gain. Next, calculate the average of the class of experimental and the class of control. The calculation of n-Gain is carried out using the Hake (1998) formula with the criteria in Table 3.

**Table 3.** Criteria of n-Gain

| Mean n-gain | Criteria |
|---|---|
| $g \geq 0{,}7$ | High |
| $0{,}7 > g \geq 0{,}3$ | Medium |
| $g \leq 0{,}3$ | Low |

**Hypothesis Testing**

Hypothesis testing is done to prove the hypothesis proposed in the study. Hypothesis testing to prove the effect of learning using virtual laboratories on student learning outcomes on acid-base material is carried out by normality test, homogeneity test, difference test of two averages, and effect size.

Test for normality and homogeneity first to determine whether the sample comes from a normally distributed and homogeneous population using the SPSS statistic 25.0 application. Then the data test of the difference between these two averages is calculated by means of the Independent Samples T-Test test using the SPSS statistic 25.0. The test criteria in this study is to accept $H_0$ if the score of Sig. (2-tailed) > 0.05, i.e. the mean n-gain learning outcomes of students in the class of experimental is lower or equal to the mean n-gain learning outcomes of students in the class of control. and reject $H_0$ if the score of Sig. (2-tailed) < 0.05, i.e. the mean n-gain learning outcomes of students in the class of experimental is higher than the mean n-gain learning outcomes of students in the class of control.

Based on the t-count score obtained from the Independent Samples T-Test test, then calculations are carried out to find out how much influence the guided inquiry model using virtual laboratory has on student learning outcomes, then the effect size test is carried out with the formula:

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

Where, is the effect size, t = t count from the t-test, and df = degrees of freedom. The data obtained are grouped according to the effect size criteria according to Dyncer (2015).

- **RESULT AND DISCUSSION**

**Instrument Validity and Reliability Test**

In this research, the test instrument in the form of pretest/posttest consisting of five questions was tested first with 15 respondents. The test of this instrument was conducted to determine the validity and reliability of each item on the test instrument. The results of the validity test of the cognitive learning outcomes instrument are presented in Table 4.

**Table 4.** The Results of the Cognitive Learning Outcomes Instruments Validity Test

| **Question Item** | ***Corrected Item-Total Correlation*** | $r_{tabel}$ | **Information** |
|---|---|---|---|
| 1 | 0,739 | 0,514 | Valid |
| 2 | 0,697 | 0,514 | Valid |
| 3 | 0,608 | 0,514 | Valid |
| 4 | 0,723 | 0,514 | Valid |
| 5 | 0,832 | 0,514 | Valid |

Based on Table 4, it can be seen that $r_{count} > r_{table}$. This shows that the test instrument for cognitive learning outcomes of students on acid-base material is declared valid. The reliability of the test instrument was determined using the Cronbach's Alpha formula by comparing the scores of $r_{11}$ and $r_{table}$, and was said to be reliable if $r_{11}$ > rtable. The results of the calculation of the reliability of the test instrument obtained by Cronbach's Alpha of 0.750 while the $r_{table}$ of 0.514. This shows that Cronbach's Alpha > $r_{table}$, so the test instrument for cognitive learning outcomes is declared reliable with the "High" criterion. Based on the results of the validity and reliability tests, the test instrument was declared feasible to measure the cognitive learning outcomes of students on acid-base material.

The validity analysis of affective learning outcomes instrument was tested for theoretical validity and reliability. The theoretical validity analysis was carried out by conducting a validity test by an expert validator, namely Mrs. Emmawaty Sofya, S.Si., M.Si. as Advisor I. Based on the results of the validator test stated that the instrument of affective learning outcomes was feasible to use.

**Data Analysis of Students' Cognitive Learning Outcomes**

The results of the test of the effect of using a guided inquiry model using a virtual laboratory on student learning outcomes can be seen from the average score of the pretest, the average score of the posttest, and n-Gain. The average pretest and posttest scores of students' cognitive learning outcomes in the class of control and class of experimental are shown in Figure 1.

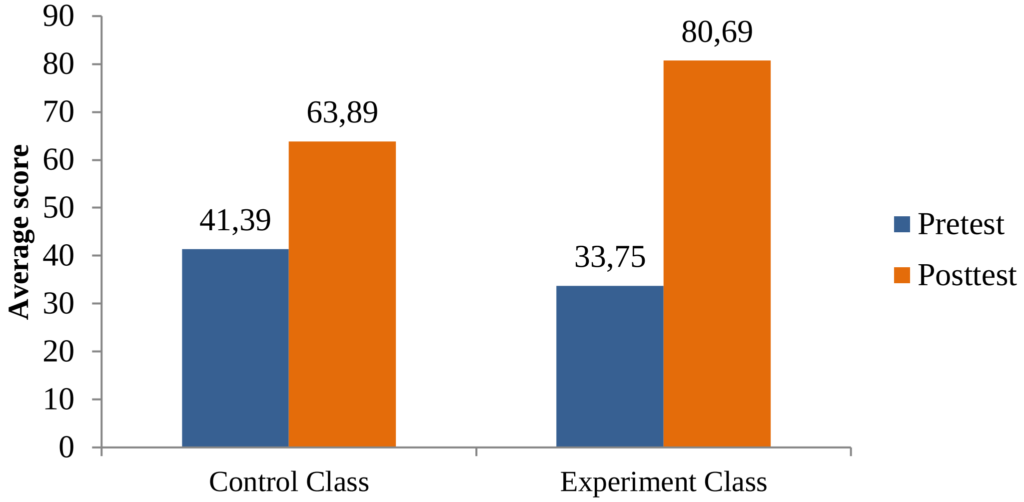


**Figure 1.** Diagram of the Average of Pretest and Posttest

In Figure 1, it can be seen that the average pretest score for cognitive learning outcomes for students in the class of control is 41.39 and the class of experimental is 33.75. This shows that the mean score of the class of control pretest is higher than the class of experimental. After learning the two classes with different treatments, then the posttest results are obtained which can be compared with the pretest results to see the increase in students' cognitive learning outcomes.

In Figure 1, it can be seen that the average post-test score for students' cognitive learning outcomes in the class of control is 63.89 and the class of experimental is 80.69. This shows that the mean score of the class of control pretest is lower than the class of experimental. The increase in students' cognitive learning outcomes can be seen from the n-Gain. The mean n-gain for the control and class of experimentales is presented in Figure 2.

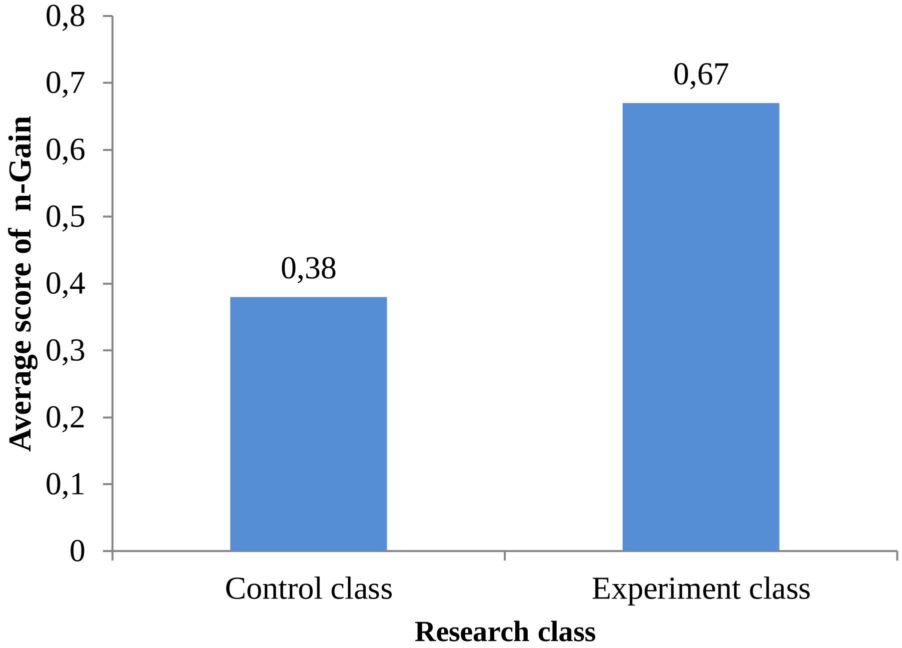


**Figure 2.** Average Score of n-Gain

In Figure 2, it can be seen that the mean n-gain in the class of control is lower than the class of experimental. Based on Hake's (1998) criteria, the n-Gain score for the class of control, which is 0.38, is in the 'medium' category and the n-Gain score for the class of experimental, which is 0.67, is in the 'medium' category. This shows that the increase in cognitive learning outcomes of students in the class of experimental is better than the class of control. These results can also state that the use of a guided inquiry model using a virtual laboratory is effective in improving students' cognitive learning outcomes on acid-base material.

**Data Analysis of Affective Domain Learning Outcomes**

Data analysis of learning outcomes in the affective domain was measured through an assessment of the affective students during the learning process which was assessed by two observers. Indicators of learning outcomes in the affective domain of students in this study, namely discipline, cooperation, and respect for educators. The following are the average learning outcomes of the affective domain of students at each meeting, which are presented in Figure 3.

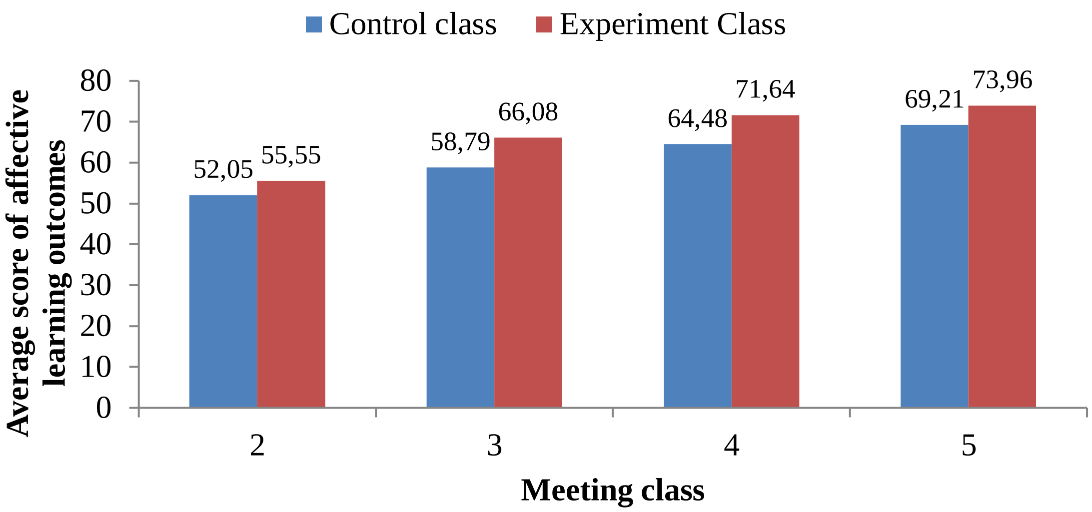


**Figure 3.** Average of Affective Domain Learning Outcomes

Based on Figure 3, we can conclude that the affective learning outcomes of the class of experimental students using the guided inquiry model using a virtual laboratory are higher than the class of control with conventional learning at each meeting. Based on Arikunto's (2006) criteria, the average acquisition of affective learning outcomes for the two class of controles was 52.05 in the 'enough' category and the affective learning outcomes average in the class of experimental, which was 55.55, in the 'enough' category. At the third meeting the class of control, which was 58.79, had the 'enough' category and the average affective learning outcomes of the class of experimental, which was 66.08, had the 'high' category. At the fourth meeting the class of control, which is 64.48 has a 'high' category and the average affective learning outcome of the class of experimental, which is 71.64 has a 'high' category. At the fifth meeting the class of control, which is 69.21, has a 'high' category and the average affective learning outcomes of the class of experimental, which is 73.96, has a 'high' category. This shows that the increase in the affective learning outcomes of the class of experimental students is better than the class of control. These results can also state that the use of a guided inquiry learning model using virtual laboratory is effective in improving students' affective learning outcomes on acid-base material.

**Data Analysis of the Implementation of Guided Inquiry Learning With the Help of a Virtual Laboratory**

The implementation of the guided inquiry model using a virtual laboratory was measured through an assessment of the implementation of the lesson plans in the form of an observation sheet and filled out by two observers. The results of the observer's observations on the implementation of guided inquiry learning models with the help of a virtual laboratory on acid-base materials can be seen in Table 5.

**Table 5.** Data on the Implementation of Guided Inquiry Learning with the Help of a Virtual Laboratory

| Student worksheet (LKPD) | Observation Aspect | Achievement Percentage (%) of Experiment Class |
|---|---|---|
| 1 | Preliminary Activities | 95,835% |
| | Propose a Problem or Question | 76,56% |
| | Make a Hypothesis | 81,25% |
| | Collecting Data | 81,25% |
| | Data Analysis | 75% |
| | Draw Conclusions | 84,375% |
| | Closing | 81,25% |
| | Time Management | 79,165% |
| | **Average** | **81,836%** |
| 2 | Preliminary Activities | 91,67% |
| | Propose a Problem or Question | 76,56% |
| | Make a hypothesis | 81,25% |
| | Collecting Data | 89,585% |
| | Data Analysis | 75% |
| | Draw Conclusions | 84,375% |
| | Closing | 81,25% |
| | Time Management | 83,33% |
| | **Average** | **82,878%** |
| **Average of All Meetings** | | **82,577%** |
| **Category** | | **Very high** |

From Table 5 it can be seen that the average percentage of implementation of the guided inquiry model using virtual laboratory on acid-base material is in the "very high" category, so it can be concluded that the Learning Implementation Plan (RPP) in the guided inquiry model learning using virtual laboratory was carried out well.

**Hypothesis Testing**

Hypothesis testing conducted by researchers to prove the hypothesis proposed in the study, namely to prove the effect of guided inquiry learning model using virtual laboratory on student learning outcomes on acid-base material.

**Normality Test**

The normality test in this study was carried out with the help of SPSS software version 25.0 by looking at the sig score. Shapiro Wilk obtained. This normality test is conducted to determine whether the sample used is from a population that is normally distributed or not. The results of the normality test of student learning outcomes in the class of control and class of experimental are presented in Table 6.

**Table 6.** The Results of n-Gain Normality Test Student Learning Outcomes

| Class | Mean n-gain | N | Information | |
|---|---|---|---|---|
| | | | **Nilai *sig.*** | **Criteria** |
| Control | 0,38 | 36 | 0,399 | *Sig.* > 0,05 |
| Experiment | 0,67 | 36 | 0,112 | *Sig.* > 0,05 |

From Table 6 it can be seen that the results of the normality test of student learning outcomes data have a score of Sig. > 0.05, therefore, the test decision is to accept $H_0$ and reject $H_1$, which means that the research sample is from a normally distributed population.

**Homogeneity Test**

After the normality test was done, the homogeneity test was then carried out. The homogeneity test in this study was carried out using SPSS version 25.0 software. This homogeneity test was conducted to determine whether the sample used came from a population that had a homogeneous variant. The results of the homogeneity test of student learning outcomes in the control and class of experimentales are presented in Table 7.

**Table 7.** The Results of n-Gain Homogeneity Test Student Learning Outcomes

| Class | Mean n-gain | N | Information | |
|---|---|---|---|---|
| | | | **Nilai *sig.*** | **Criteria** |
| Control | 0,38 | 36 | 0,171 | *Sig.* > 0,05 |
| Experiment | 0,67 | 36 | | |

From Table 7 it can be seen that the results of the homogeneity test that have been carried out on the acquisition of student learning outcomes data have a score of Sig. > 0.05, therefore, the test decision is to accept $H_0$ and reject $H_1$ which means that the research obtained is from a homogeneous variance.

Based on the normality test and homogeneity test, it was found that the n-Gain score of the students' learning outcomes in both classes was normally distributed and homogeneous, so that further tests could be carried out on the difference between the two averages on the mean n-gain score.

**The Two-Mean Difference Test**

The two-mean difference test was performed to determine whether the mean n-gain score of students' learning outcomes in the class of experimental was higher than the mean n-gain score of students' learning outcomes in the class of control. This test uses SPSS software version 25.0, which is using the Independent Sample T-test. The results of the difference test of the two average score of n-Gain learning outcomes of students in the control and class of experimental are presented in Table 8.

**Table 8.** The Results of *Independent Sample T-test*

| Class | Mean n-gain | N | Information | |
|---|---|---|---|---|
| | | | ***Sig. (2-tailed)*** | **Kriteria Uji** |
| **Control** | 0,38 | 36 | 0,000 | *Sig. (2-tailed)* > 0,05 |
| **Experiment** | 0,67 | 36 | | |

From Table 8, it can be seen that the score of sig. (2-tailed) < 0.05. Reject test criteria $H_0$ if the score of sig. 2-tailed < 0.05, so the test results of the mean n-gain for the class of control and the class of experimental received $H_1$ which means there is a significant difference in the mean n-gain score for the two classes. Based on these results, a decision can be made to reject $H_0$ and accept $H_1$.

### Effect Size

The effect size test in this research was conducted to determine the magnitude of the effect of learning on the experimental and class of controles. The results of the calculation of the effect size test ($\mu$) are presented in Table 9.

**Table 9.** Effect Size Test Results

| Class | T | $t^2$ | *df* | $\mu$ | Criteria |
|---|---|---|---|---|---|
| **Control** | -7,953 | 63,24291 | 70 | 0,6889 | Medium effect |
| **Experiment** | -10,193 | 103,896 | 70 | 0,7729 | Large effect |

In Table 9, it can be seen that the effect size of student learning outcomes obtained for the class of control is 0.6889 the 'medium effect' criteria, while the class of experimental is 0.7729 in the 'large effect' criteria. Based on Dyncer's (2015) statement, the effect size obtained shows that 68.89% of learning outcomes are influenced by learning of conventional, and 77.29% of increased learning outcomes are influenced by learning using a guided inquiry model using a virtual laboratory. From these results, it is known that the effect size of the class of experimental is larger than the class of control. Therefore, the existence of learning using a guided inquiry model using a virtual laboratory has a "big" influence in improving student learning outcomes.

The "large" criteria in the class of experimental is interpreted as a large positive category, meaning that the learning process in the classroom using a guided inquiry model using virtual laboratory makes students more dominant in learning. This happens because in the guided inquiry model using virtual laboratory there are phases of identifying problems, making hypotheses, collecting data, analyzing data, making conclusions so that students are actively involved in learning and make student learning outcomes increase as a result of giving treatment, namely the application of guided inquiry model using virtual laboratory. The presentation shows that the applying the guided inquiry model using virtual laboratory is very effective to improve student learning outcomes. This is consistent with Oktaviana, Widodo, and Kasmui (2020) that the application of the guided inquiry learning model is effective and can improve student learning outcomes and learning activities.

Learning with a guided inquiry model using virtual laboratory in the class of experimental can improve student learning outcomes with the effect size level on the "large" criterion, which is 0.779. This shows that the guided inquiry model using a virtual laboratory has a high increase in student learning outcomes on acid-base material by 77.29%. In line with the research results of Hermansyah, Gunawan, and Harjono (2018) that the use of virtual laboratories in the guided inquiry learning model has an effect on students' cognitive learning outcomes.

## CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that learning using a guided inquiry model using virtual laboratory is effective in improving student learning outcomes on acid-base material. This is indicated by the significant difference between the n-Gain score of the cognitive learning outcomes of students in the class of experimental and the class of control, where the class of experimental has a mean n-gain learning outcome greater than the class of control, and is indicated by the average affective learning outcomes class of experimental students and class of control, where the class of experimental has a mean student affective learning outcomes greater than the class of control.

Learning using the guided inquiry model in the class of experimental can improve student learning outcomes with the effect size level on the "large" criterion, which is 0.779. This shows that the guided inquiry model using a virtual laboratory has a high increase in student learning outcomes on acid-base material by 77.29%.

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