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The Implementation of Guided Inquiry Learning Model with Edmodo to Improve Students' Learning Outcomes on Acid-Based Subject Matter

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Abstract: This study aims to determine whether guided inquiry learning assisted by Edmodo can improve the learning outcomes of high school students on acid-base subject matter. The research method used is a quasi-experiment with a quantitative approach; the research design used is a posttest-only control group design. The research subjects were students of class XI MIPA 5 (experimental group), consisting of 29 students, and class XI MIPA 6 (control group), consisting of 26 students. Data collection techniques used learning outcome tests and observation sheets to implement the learning process. The results of descriptive analysis showed that the experimental class obtained an average value of learning outcomes higher than the control class, which amounted to 81.3 for the experimental class and 71.5 for the control class. The results of inferential statistical analysis of student learning outcomes showed that the data of the two groups were not normally distributed and came from a homogeneous population. Hypothesis testing using the Mann-Whitney test obtained asymp. Sig. < α (0.001 < 0.05) so that H0 is rejected and Ha is accepted. Therefore, guided inquiry learning assisted by Edmodo can improve the learning outcomes of high school students on acid-base subject matter.

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INTRODUCTION

The development of Technology, Information, and Communication (ICT) is increasingly rapid in the current era of globalization. Technology is now influencing aspects of education. Education, according to Law no. 20 of 2003 concerning the National Education System Article 1 states that Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, noble morals, and skills. That is needed by himself, society, and the country. In line with the rapid development of ICT, the education sector now demands the implementation of technology, information, and communication-based learning. This is stated in the contents of the Minister of Education and Culture Regulation No. 65 of 2013, which states the use of information and communication technology to increase the efficiency and effectiveness of learning, as well as the application of information and communication technology in an integrated, systematic and effective manner according to situations and conditions. Thus, the application of ICT in the learning process is indeed important for education in this era of globalization to support the quality and quality of learning.

The most prominent thing about the development of ICT in the learning process is virtual learning, which is carried out using the Internet. Another term that is increasingly popular nowadays is e-learning. According to Lidia (2019), e-learning is a learning process carried out with the help of electronic devices via the internet network, which, in the learning process, can facilitate students independently without having to be accompanied by educators. E-learning makes learning possible during the current pandemic, where the learning process is remotely controlled.

One of the platforms for e-learning is known as Edmodo. Edmodo was developed specifically for students and teachers in a virtual classroom, which can carry out exciting and easy-to-use learning. Edmodo provides a safe way for teachers and students to create learning like a real class where the class can be given assignments, quizzes, and materials; apart from creating interaction between teachers and students, it can also connect with the student's parents, thus creating learning, which can be controlled (Chandrawati, 2010; Arif & Rini, 2019). Edmodo allows users to upload teaching materials and conduct online discussions (Yuliani et al., 2020). Some of the advantages of Edmodo compared to the platforms that educators usually use are that Edmodo is easier to control administratively, such as the assignments and quizzes given can be viewed based on the order of submission, and you can also create groups within groups. Regarding security, Edmodo provides classes with class codes so that they are not easily accessed by other people outside students and teachers (Lidia, 2019). Ratnaningsih et al. (2020) explain that Edmodo-based e-learning in the Blended Learning process succeeded in facilitating student participation in online discussions and assignments and could increase student interest and motivation in improving their learning outcomes.

One of the subjects that can be developed with the Edmodo platform is chemistry. Chemistry is a branch of natural science that is a mandatory subject in the 2013 curriculum in Indonesia. One of the chemistry materials taught in class XI MIPA is acid-base material. This material is one of the materials that is difficult for high school students to understand; this was revealed based on the results of an interview on September 3, 2020, with the chemistry teacher at Kartika XX-1 Makassar High School who stated that this material on acids and bases was classified as difficult because this material was the starting material when schooling started. There was no previous introductory material, and also the use of a learning model was not fully implemented well because the time allocated for the learning process was relatively short, so the learning process ended. However, some students still needed help understanding the material being taught. Also, acid-base material is classified as complex because it requires understanding the concept. According to Cetingul (2011), acid-base chemistry material is a fundamental concept in studying chemistry because, in essence, most of the chemical reactions that occur are acid-base reactions. This impacts student learning outcomes in acid-base concept material, which begins to decline in acid-base reaction equations.

Every learning process requires a learning model. Learning models that can be used with Edmodo also involve concept discovery, namely guided inquiry. Guided inquiry is a learning model where students are required to discover concepts through necessary instructions in the form of guiding questions from a teacher (Krissandi et al., 2017). With the guided inquiry model, students receive information or study to prepare for exams, and guided inquiry is preparation for lifelong learning. Guided inquiry is effective in preparing students to think deeply about a subject so that they can be successful in learning. Guided inquiry targets assessment of the learning process, and the result is lasting learning that has meaning and application in students' lives (Kuhlthau et al., 2017). In this model, students also identify problems, find solutions, formulate questions, conduct investigations, analyze and interpret data, discuss, reflect, make conclusions, and present results (Trianingsih, 2018). According to Sukma (2016), the guided inquiry learning model is a teaching model that emphasizes the process of discovering concepts and relationships between concepts where students design their experimental procedures so that the role of students is more dominant while the teacher guides students in the right direction. This learning model hopes that students will be able to build concepts so that learning becomes memorable and not just memorizing the material. Based on the background description, this research aims to improve student learning outcomes of acid-based subject matter through a guided inquiry learning model assisted by the Edmodo platform. With that, it is hoped that this research will enhance student learning outcomes in acid-based subject matter through a guided inquiry learning model assisted by the Edmodo platform.

METHOD

Research Design

This research uses quasi-experiments, and the research design used is posttest-Only Control Group Design. The target of this research is 55 students at SMA Kartika XX-1 Makassar for the 2020/2021

academic year. The samples in this study were class XI MIPA 5, the experimental group that was treated using Edmodo in guided inquiry learning and class. The sampling technique is simple random sampling because the sampling of sample members from the population is carried out randomly without paying attention to the strata in the population. The syntaxes and learning implementation using Edmodo are shown in Table 1.

Table 1. Guided Inquiry Syntax in Edmodo Platform

Guided Inquiry Syntax	Activity in Edmodo Platform
Orientation	The teacher checks the attendance of the students. Teachers ask for news directly, which can also be given in the wellness check feature. The teacher provides lesson plans through the library feature, which students can access.
Formulate a problem	The teacher provides stimulation through pictures in the library featuring acid bases in everyday life. Then, learners can observe and formulate problems from the picture.
Formulate a hypothesis	Students formulate hypotheses after formulating problems that can be written in the discussion column.
Data collection	Students collect relevant information by reviewing the literature, conducting direct experiments, or observing experimental descriptions provided by the teacher in the form of videos and material files uploaded in the library feature.
Testing the hypothesis	Students process data and test hypotheses, then upload them in the discussion column.
Formulating conclusions	Students draw conclusions related to the problem material that they find in the discussion column.

Research Instrument

Data collection in this research was carried out by giving a final test (post-test) to students who were given the same for each experimental group and control group. The instrument used is 16 multiple-choice questions from 26 that have previously undergone a validation process by experts and empirical validation. The validation by experts results that all 16 multiple choice questions are valid, and the result of empirical validations using product moment (r_{xy}) from 26 multiple choice questions there are 16 questions are valid, and reliability using r_{11} is 0,57, which means the questions are reliable.

Data Analysis

The data analysis techniques used are descriptive statistical analysis and inferential statistical analysis. Before testing the hypothesis, a prerequisite test was carried out, namely the normality and homogeneity tests. Based on the research results, it was obtained that the data for the two groups were not normally distributed and homogeneous. The normality result is shown in Table 2.

Table 2. Normality Test

Class	Kolmogorov-Smirnov	Shapiro-Wilk	Sig (α)	Description
	Sig			
Experiment	0,000	0,000	0,05	not normally distributed
Control	0,001	0,005	0,05	not normally distributed

Based on Table 3, the sig value of Kolmogorov-Smirnov and Saphiro-Wilk is <0,05, meaning the data is not normally distributed. The homogeneous data is shown in Table 3.

Table 3. Homogeneity Test

Class	Levene Statistic Sig	Sig (α)	Description
Experiment Control	0,286	0,05	Humogen

Because the data is not distributed normally but still humogen for learning results, hypothesis testing used Mann-Whitney non-parametric statistics (Arikunto, 2005).

RESULT AND DISCUSSION

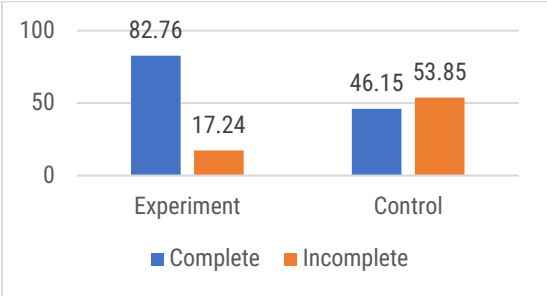
Learning outcomes

Student learning outcomes were analyzed using descriptive statistical analysis. Based on the experimental and control group students' learning results, descriptive statistical data analysis results were obtained, which can be seen in Table 4; the table shows the highest score and the highest average score obtained by the experimental group.

Table 4. Statistical Values of Student Learning Outcomes

No	Descriptive statistics	Statistical Value	
		Experimental Group	Control Group
1	Sample Size	29	26
2	The highest score	94	89
3	Lowest Value	39	39
4	Average value	81.3	71.5
5	Median	83.9	74.5
6	Mode	86.1	75.8
7	Standard Deviation	128.67	159.39

These students' learning outcomes were then grouped based on the criteria for the completeness value of the student's learning outcomes at SMA Kartika XX-1 Makassar in Graph 1, which shows that the experimental group had a higher percentage of completeness, namely 82.76%.



Graph 1. Categories of Completeness of Student Learning Outcomes

Completeness of Competency Achievement Indicators (GPA)

Student learning outcomes are classified based on the category of completion of each indicator; there are 10 GPAs shown in Table 5.

Table 5. Competency Achievement Indicators (GPA)

GPA	Description
1	Explaining the differences in the meaning of acids and bases according to Arrhenius and Bronsted-Lowry
2	Explaining the differences in the meaning of acids and bases according to Bronsted-Lowry and Lewis
3	Explaining the meaning of indicators acid-base,
4	Identifying substances that are acidic and basic in everyday life using synthetic indicators

GPA	Description
5	Determining the pH of a solution based on the results of observing the trajectory of color changes as an acid-base indicator
6	Explaining the meaning of acid-base strength based on data from measurements of several acid and base solutions of the same concentration
7	Explain the relationship between the strength of acids and bases with concentration, ionization constant, and solution pH.
8	Calculate the strength of acids and bases with the degree of ionization (α) and acid constant (Ka) or base constant (Kb),
9	Calculate the pH of solutions of strong acids, weak acids, strong bases, and weak bases whose concentrations are known.
10	Conduct experiments on making acid-base indicators from natural materials.

The completeness of each indicator can be seen in Table 6. This table shows that the average GPA percentage for the experimental group is higher, with a score of 72.

Table 6. Completeness Category and Percentage for Each GPA

GPA	Experimental Group	Control Group
1	90	81
2	96	88
3	59	50
4	96	85
5	83	54
6	69	92
7	59	73
8	76	27
9	28	15
10	59	36
Average completion of each indicator	**72**	**60**

The average completion rate of the experimental group was higher than that of the control group. The average percentage of indicator completion for the experimental group was 72%, while for the control group was 60%. In the experimental group, 5 out of 10 indicators were completed. Then, there were two indicators in the experimental group whose percentages were lower than those in the control group. This indicator is the sixth indicator regarding the definition of acid-base strength based on data from measurements of several acid and base solutions of the same concentration, and the seventh indicator regarding the relationship between acid and base strength and concentration, ionization constant, and pH of the solution. This proves that using Edmodo does not affect these two indicators.

Learning Activities

Learning was carried out using a guided inquiry learning model assisted by the Edmodo application in the experimental group and Zoom/Google Meet assisted by the WhatsApp application in the control group. In the experimental class, the learning process was dominated by an asynchronous process. In contrast, in the control group, the learning process was dominated by synchronous, so this research is biased. However, terms using Edmodo positively influence students' learning outcomes on acid-base material. Because Edmodo has various supporting features to carry out the distance learning process asynchronously (Ariani, 2019). Edmodo allows users to upload teaching materials and conduct online discussions (Yuliani et al., 2020). The learning implementation stage follows the syntax of the guided inquiry model:

a. Orientation

This orientation stage is an introduction before the learning process begins. At the beginning of the meeting, the teacher checks the students' attendance, asks for news, and gives information on the lesson plan. In the experimental group, Edmodo provides features that can open teacher interactions with students, such as a wellness check feature for asking students how they are and a library feature for uploading lesson plans before learning begins. Students' enthusiasm can be seen in giving emoticons describing the news, so communication between students and teachers occurs even though it is asynchronous. A calendar feature on Edmodo also helps students see what schedules, materials, and agendas will be implemented. This feature also reminds students if assignments still need to be submitted.

Compared to the control group, orientation was carried out synchronously using Google Meet; there was still interaction between students and teachers, which was not much different from asynchronous interaction on Edmodo. Then, in the control group, no features resembled the Edmodo calendar feature, so many students forgot what material they were following and what assignments they still needed to complete, even though the teacher reminded them at the end of the lesson (Figure 1 and 2).

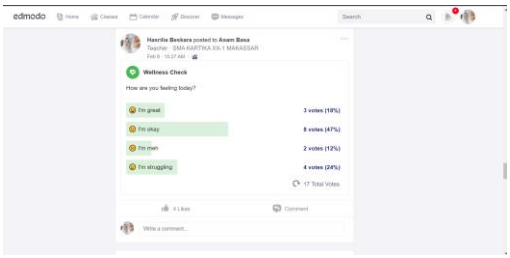


Figure 1. Edmodo's Wellness Check feature

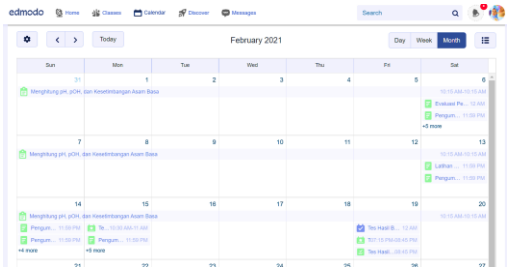


Figure 2. Edmodo Calendar Feature

b. Formulating the Problem

Students are asked to formulate problems related to stimulation in the form of images given by the teacher. In the experimental group, stimulus images are provided through the discussion feature; from these images, students can immediately provide comments and formulate problems. Through this feature, the teacher can immediately give students comments and feedback, and discussions can occur with students that are well organized and can be viewed again. In the control group, problems were formulated synchronously by displaying images on the Google Meet screen; then, students prepared problems (Figure 3).

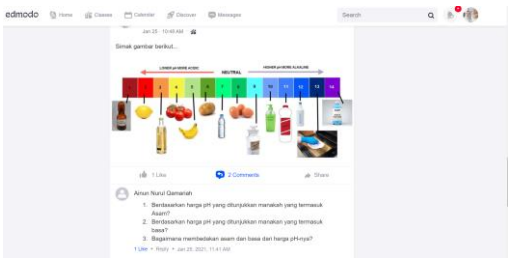


Figure 3. Formulating Problems in the Edmodo Discussion Feature

c. Formulate a Hypothesis

Students formulate a hypothesis after formulating the problem. The experimental group, formulating hypotheses, was also conducted asynchronously by directly filling in the LKPD, which had been distributed in the library feature. Apart from that, the teacher also asked several questions to students through the discussion feature to help students understand the material being taught. Students are quite active in answering questions, as seen from the comments they give; apart from that, if there are students who need to be more accurate in their answers, they will be given guiding

questions in the comment column. The discussion was well organized, so all students could quickly review what we discussed (Figures 4 and 5).

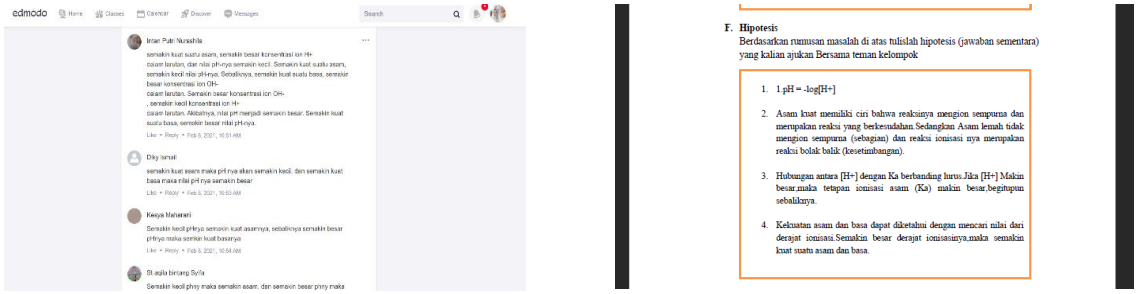


Figure 4. Formulating Hypotheses on LKPD

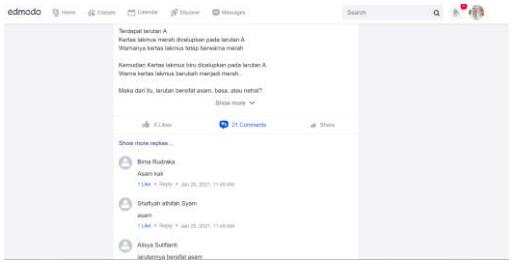


Figure 5. Asking questions on the Edmodo Discussion feature

Formulating hypotheses in the control group was carried out synchronously by asking students to state them directly and then write them on the LKPD that had been distributed. Several questions were also given to help students understand the material being taught. However, compared to the experimental group, students were less interactive when the teacher asked questions directly.

d. Collect Data, Test Hypotheses, and Formulate Conclusions.

These three stages were carried out asynchronously for the experimental group using Edmodo, while for the control group, they were done synchronously using Google Meet. In the experimental group, data was collected from teaching materials provided by the teacher in the library feature and through explanations via the discussion feature. After that, students are asked to test the hypothesis, which is done directly on the LKPD. In the control group, these three stages were carried out synchronously by asking students to express their ideas now and then write them on the LKPD that had been distributed. After all the core activities have been carried out at the end of the meeting, students are asked to conclude regarding the material discussed through the discussion feature (Figure 6).

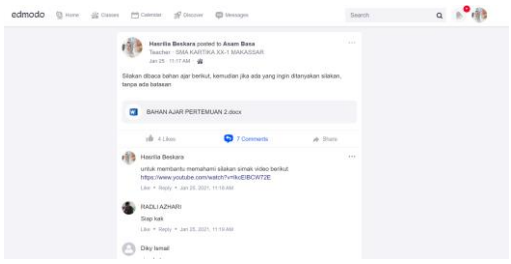


Figure 6. Edmodo Library Features

Inferential Statistical Analysis

The results of inferential statistical analysis using the hypothesis test (Mann-Whitney) showed that the significance of the experimental and control groups was smaller than 0.05, namely 0.001 < 0.05, so

Ha was accepted, and H0 was rejected. Based on the hypothesis test, it can be concluded that using Edmodo in guided inquiry learning positively influences students' learning outcomes on acid-based material.

The inferential analysis results indicate a positive impact of using Edmodo in guided inquiry learning on students' learning outcomes in acid-base material. This finding is corroborated by descriptive data analysis, revealing disparities in learning outcomes between the experimental and control groups. Table 6 illustrates that the experimental group achieved higher scores, with the highest score at 96 compared to the control group's highest score of 88. Similarly, the experimental group's average score of 71.5 surpassed the control group's average score. Despite both groups sharing the lowest score of 39, the experimental group's median and mode scores (83.9 and 86.1) outperformed those of the control group (74.5 and 75.8), indicating superior learning outcomes among students utilizing Edmodo in guided inquiry learning. The variance values (128.67 for the experimental group and 159.39 for the control group) demonstrate significant differences between the two groups' data. Furthermore, the standard deviation values (11.34 for the experimental group and 12.62 for the control group) indicate variations in data distribution between the experimental and control groups. The frequency and percentage regarding the completeness of students in the experimental group was 24 out of 29 students, with a percentage of 82.76%. In contrast, 14 out of 26 students were in the control group, with a rate of 53.85%. This shows that the experimental group who studied guided inquiry learning with Edmodo had higher completion than the control group who studied guided inquiry learning without Edmodo.

The positive influence of using Edmodo on guided inquiry learning in this research is also supported by previous research; in line with previous research, Nurul (2017) reported that the group that studied with Edmodo showed student learning outcomes in physics material that was in the very high category. Setyana et al. (2020) also explain that using Edmodo is effective; this can be seen from the classical completion of the experimental group, which was more significant than that of the control group. This research explained that the experimental group students could easily access and download the materials available on Edmodo using their smartphones. Study material can also be saved in the library feature for independent study according to students' wishes. Edmodo has a simple feature display in an application that is easy to use and can be accessed via smartphone anytime and anywhere. Also, Saputri's research (2018) explains that the results of this research indicate that the increase in the learning outcomes of the experimental group was more significant than the increase in the learning outcomes of the control group in the cognitive domain, this is because through the Edmodo features teachers can easily carry out the syntax of the learning model, such as providing stimulation, providing information links, providing evaluations that can be accessed in the form of online quizzes for a limited time and providing additional material. Apart from that, research by Al-Anshori and Sukmawaty (2019) on the learning outcomes of the experimental class and control class students is in the high category, with an average score for the experimental class 74.73 and an average score for the control class 69.73. So, the learning outcomes of experimental class students who were taught using the Edmodo application were higher than those who were not trained using Edmodo. It is also explained that using the Edmodo application is effective for classroom learning, as Wibowo (2020) explains that Edmodo-based e-learning lectures were quite effective in improving the learning outcomes of cadets. This learning media is, therefore, feasible to be applied in the learning process as an alternative to the cadets' learning needs in this digital age. The striking difference between classes taught using the Edmodo application and those not is the practicality of learning management and assignments to students. Classes that use the Edmodo application are more organized in their assignments; they can submit assignments more on time because if the time specified in the application runs out, students can no longer offer the assignments. In contrast to the control group, students who submitted their assignments late could still submit them on another day. Exams taken using the Edmodo application are also better and more effective in determining grades.

The Edmodo application can be used by teachers in learning because it provides space for each student to interact online. Edmodo also helps teachers pack learning materials and stimuli and give feedback to students. This makes students more interested and active in learning because students are engaged in asking questions in the comment column, whether during or outside class hours. Besides the Edmodo application, the inquiry learning model influences student learning outcomes. The guided inquiry

learning model emphasizes the process of discovering concepts and relationships between concepts where students design their experimental procedures so that the role of students is more dominant. In contrast, the teacher guides students towards appropriate/correct (Sukma, 2016).

Limitations, Advantages, and Recommendations

This research exhibits several limitations, notably the requirement for a sample size exceeding 60 students in experimental and control classes. However, using the Edmodo platform for teachers' references and implementing the guided inquiry learning model is advantageous, which has shown promise in enhancing students' understanding of acid-based subject matter. There are ample opportunities for further exploration, particularly in conducting research utilizing the Edmodo platform with varying learning models or approaches, thus enriching our understanding of its potential impact on educational outcomes.

CONCLUSION

Based on the results of data analysis and based on the results of data analysis and discussion, it can be concluded that there is an influence of using Edmodo in guided inquiry learning on the learning outcomes of students in group XI MIPA SMA Kartika XX-1 Makassar on the primary material of acids and bases. The Edmodo platform can easily interact with students, making enrolling in a class more accessible. All the learning material can be saved, and students can open it anytime. The results of this research can be input for chemistry teachers that can be used in the learning process, especially during this online learning period, to improve student learning outcomes.

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