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Practicality and Effectiveness of Salt Hydrolysis Module Bases on Guided Discovery Learning for Learning Outcomes of Senior High School

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Abstract—This study aims to reveal the level of practicality and effectiveness of the salt hydrolysis module based on guided discovery learning on the learning outcomes student of senior high school whose validity has been obtained. The practicality test starts from the prototype stage III to the assessment phase and the effectiveness test, research was conducted using a quasi-experimental method in the form of a non-equivalent control group design. The research instrument used in the practicality test was a practicality questionnaire sheet and student answer sheets in the module and the effectiveness test was in the form of a multiple choice test which had validity, reliability, discriminatory power and a difficulty index with good question criteria. The research sample in the practicality test were three chemistry teachers and 29 grade XII students of SMAN 13 Padang and the sample for the effectiveness test consisted of two classes, namely class XI MIPA 2 and XI MIPA 3 at SMAN 13 Padang. Sampling was done by purposive sampling. From the results of the study, it was found that the practicality test data for the module using the Aiken's V formula was 0.73 with a moderate practicality category. In the module effectiveness test, the data obtained from the t-test results at a level of 0.05 t_{count} (2.064) > t_{table} (1.984) and the experimental class N-Gain value of 0.72 with a high category. Based on the results of data analysis, it was concluded that the salt hydrolysis module based on guided discovery learning on the learning outcomes of senior high school was practical and proven effective on student learningoutcomes.

Keywords— Effectiveness; Module; Guided Discovery Learning; Learning outcomes; Practicality

I. INTRODUCTION

Salt material hidrolysis is a learning material that analyzes concepts such as the properties of a salt solution and determines the formula for solving it [1]. The concept of salt hydrolysis is a concept that is difficult for students to understand, because there are several abstract concepts and concepts that are related to the previous concept [2]. Therefore, salt hydrolysis material requires a printed teaching material that can help students find or determine concepts, principles or theories in their learning, be it independentlearning.

Yuliani and Saragih [3] expressed the opinion that one of the causes of the low ability of students is that the learning tools used in the learning process are not effective in achieving the desired learning objectives. This is also seen by the lack of interest and motivation to learn, as a result, students have difficulty in following the learning process. One effort to overcome learning difficulties experienced by students is to increase interest in learning through the provision of media or teaching materials that are able to guide students in carrying out the learning process. One of the teaching materials that can be used is amodule.

Module is a text book that is presented in a structured manner, including methods, materials, learning objectives based on indicators of achievement, basic competence, self-study activities instructions, and exercises to test academic achievement [4].

With the module, it can help students study alone or in groups to obtain the concepts that have been studied [5]. The use of

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modules is one way to help educators teach a theory in certain subjects to students [6]. The modules that have been developed are guided discovery learning-based modules.

Guided discovery learning-based module has 5 stages of the guided discovery learning model proposed by Yerimadesi [7]. In the application of guided discovery learning, the teacher is only a facilitator and motivator, where the teacher will play a role in guiding students to develop the ideas, concepts and skills that have been learned. The guided discovery learning model places students as its main concern. Students play an active role in finding concepts and can formulate learning through various simple experiments that help solve various problems [8].

One of the guided discovery learning-based modules that has been developed is the redox reaction module and guided discovery learning-based electrochemical cell for senior high school by Yerimadesi et al, [9] with the results of validity (0.83), practicality (0.79) and effectiveness (N-Gain experimental class 0.7 and control class 0.53) [10] and guided discovery learning-based chemical equilibrium module for senior high school by Said and Yerimadesi [11] the value of validity (0.80), practicality (0.88) [12] and effectiveness (N-Gain experimental class 0.35 and control class 0.25) [13]. So that the guided discovery learning module has a very high level of validity, practicality and effectiveness in chemistry learning.

Based on the results of observations that have been made by giving a questionnaire to the chemistry teacher of class XI and 20 students of class XII MIPA at SMAN 13 Padang, information was obtained that: (a) 87% of students had difficulties in learning chemistry, especially salt hydrolysis material, (b) 65, 2% of students are rarely actively involved in learning salt hydrolysis material, (c) 62.3% of students have never used guided discovery learning-based modules in chemistry learning (d) all teachers are interested in guided discovery learning-based salt hydrolysis modules tested for practicality and effectiveness againststudents,

(e) and 79.7% of students were interested in using the salt hydrolysis module based on guided discovery learning. To help students' difficulties in understanding the concept of salt hydrolysis material, a salt hydrolysis module based on guided discovery learning was developed.

Peresearch conducted by Artika and Bayharti [14] , has developed a salt hydrolysis module based on guided discovery learning for class XI high school students. From the results of the study, it was found that the module developed had a high validity category, but the level of practicality and effectiveness of the module had not been tested. Therefore, the idea was put forward in a research entitled "Practicality and Effectiveness of Salt Hydrolysis Module Based on Guided Discovery Learning for Learning Outcomes of senior high school".

II. METHODS

This research is a continuation of Research and Development (R&D) research. In previous studies, a salt hydrolysis module based on guided discovery learning for class XI SMA has been obtained which has been valid. The study continued with the practical level of the salt hydrolysis module based on guided discovery learning and then carried out the level of effectiveness of the salt hydrolysis module based on guided discovery learning on the learning outcomes of SMA/MA students through quasi-experimental research in the form of a non-equivalent control group design. This research was conducted from February to March 2021 at SMAN 13 Padang. The research population is students of class XI MIPA and XII SMAN 13 Padang in the academic year 2020/2021. The sampling technique is purposive sampling. The samples in the practicality test were three chemistry teachers and 29 students of class XII MIPA SMAN 13 Padang and the sample for the effectiveness test consisted of two sample classes, namely class XI MIPA 2 and XI MIPA 3. The research method using quasi experimen mehod in the form of non-equivalent control design in show in Table1.

Table 1. non-equivalent control design

Class	*Pretest*	Treatment	*Posttest*
R_1	O_1	X	O_4
R_2	O_2	Y	O_3

Based on the research design with R_1= experimental class, R_2= control class, X = learning using -based modules *guided discovery learning,* Y= learning using teaching materials from school, O_1= initial test, O_2= final test [15] The experimental class conducted learning using the salt hydrolysis module based on guided discovery learning, while the control class studied using teaching materials provided by the school. The research instrument used for testing is in the form of a practicality questionnaire sheet and student answer sheets in the module and the effectiveness test is in the form of multiple choice and has validity, reliability, discriminatory power and difficulty index on good question criteria [16]. The data obtained after conducting the research were processed using the Aiken's V formula for practicality testing [17] and the effectiveness test for processing data using the n-gain test [18], normality test [19], homogeneity test and hypothesis [20].

III. RESULTS AND DISCUSSION

This study aims to reveal the level of practicality and effectiveness of the hydrolysis module based on guided discovery learning on student learning outcomes at SMAN 13 Padang.

A. Practicality Test

1. Prototype Phase III (One to One EvaluationTest)

Based on the results of the one to one evaluation test, the image on the cover and the module display design is good, it just needs to be given a brighter color so as to increase the attractiveness of student readers. From the results of the one to one evaluation test, it was concluded that the salt hydrolysis module based on guided discovery learning was practical and able to guide students in finding concepts according to compeency achievement indicators and learning objectives.

2. Prototype Phase IV (Small GroupTest)

Based on the results of data analysis, the average Aiken's V formula was 0.72 with a medium practicality category and the average percentage of students' ability to answer questions in the module was 81.5% in the high category. From the results of the analysis of the small group test data, it was concluded that the guided discovery learning-based salt hydrolysis module was practical. The results of the module practicality test at the small group stage can be seen in Table 2.

Table 2. Results of Module Practicality Test at the Field Test Stage

No	Rated aspect	*Aiken's V*	Practicality Category
1.	Ease of Use	0.69	Moderate practicality
2.	Learning Time Efficiency	0.67	Moderate practicality
3.	Utilization	0.81	High practicality
Average practicality		0.72	Moderate practicality

3. Assessment Stage (FieldTest)

Based on the results of the analysis of the field test assessment data, the average Aiken's V formula was 0.73 with a medium practicality category and the percentage of students' ability to answer questions in the module was 91% with a very high category. The results of the module practicality test at the field test stage can be seen in Table 3.

Table 3. The results of the Practicality Test Module at the Field Test Stage

No.	Rated aspect	Teacher	Student	Average Practicality	Practicality Category
1.	Ease of Use	0.81	0.66	0.74	Moderate practicality
2.	Learning Time Efficiency	0.79	0.59	0.69	Moderate practicality

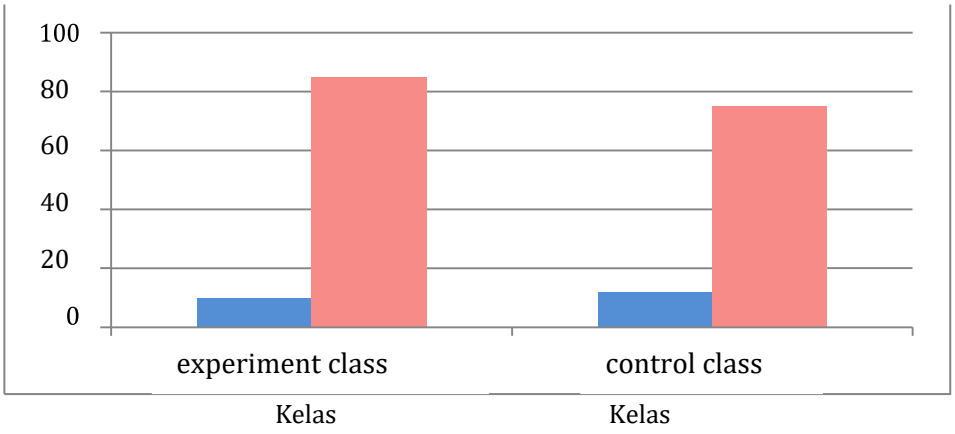
3.	Utilization	0.87	0.64	0.76	Moderate practicality
Aiken's V . Index		0.82	0.63		Moderate practicality
Average Practicality		0.73			Moderate practicality

From the results of the field test, revisions were made based on suggestions from practitioners. The salt hydrolysis module based on guided discovery learning was revised by giving each module a bright color and writing the letters in bold so that the reader could read it clearly and increase the interest of the reader's attraction.

From the overall results of the practicality tests that have been carried out, it is concluded that the salt hydrolysis module based on guided discovery learning has been practical and can be continued with research on testing the effectiveness of the module.

B. EffectivenessTest

The research data were obtained after conducting research and data collection at SMAN 13 Padang. Data collection was carried out directly from the data on the learning scores of the sample class students in the cognitive realm. The results obtained are shown in Figure 1.



Picture 1. Sample Class Pretest and Posttest

Based on the results of data analysis, obtained an increase in student learning outcomes for the two sample classes that were given different treatments. In both classes the sample was given an initial test before starting the lesson. The pretest was conducted to measure the students' initial ability in the material before starting the lesson. From the results of the average value of the initial test, it can be seen that the value of the experimental class is lower than the value of the control class. After being given different treatment to the two sample classes, at the end of the lesson a final test was given. The final test aims to measure students' abilities after going through the learning process. Based on the results of the average final test scores for the sample class, it can be seen that the value of the two sample classes has increased. However, the experimental class has a higher learning outcomevalue.

The effectiveness of the Gudid Discovery Learning-based salt hydrolysis module can be seen with the n-gain test. The test results of the two sample classes obtained are shown in Table 4.

Table 4. Sample Class N-Gain Test Results

Class	N	Pretest Average	Posttest Average	Average N-Gain	Category
Experiment	36	9.89	85	0.83	High
Control	37	12	75.13	0.72	High

The n-gain analysis describes an increase in the results of the two sample classes after learning. The average n-gain for the experimental class is 0.83 while the control class is 0.72. The average of the two sample classes is in the high category, but the difference in value between the two is 0.11 with the experimental class being higher. This shows that the salt hydrolysis module based on guided discovery learning has a high level of effectiveness to improve student learning outcomes. To prove the value of the sample class has a significant difference, a hypothesis test is carried out. To test the hypothesis, it is necessary to know in advance whether the data obtained are normally distributed and homogeneous or not.

The research sample can be said to truly represent the population if the sample is normally distributed. The results of the normality test can be seen in Table 5.

Table 5. Data Normality

Class	A	N	L_0	L_t	Information
Experiment	0.05	36	0.115	0.886	Normal
Control		37	0.243		Normal

The table above shows the results of the normality test with a significance level of 0.05, the L_0value in the experimental class is 0.115 and the control class is 0.243 and the $L_t$value is 0.886. The results of data analysis concluded that the distribution was normal. Homogeneity test was carried out to obtain homogeneous variance data or not. The homogeneity test results are shown in Table6.

Table 6. Data Homogeneity

Class	N		S^2	F_{count}	F_{table}	Information
Experiment	36	0.05	0.078	1.089	1,748	Homogeneous
Control	37		0.085			

The table above shows the value of $F_{count} < F_{table}$. with F_{count}= 1.089 and F_{table}= 1.748. The results of data analysis concluded that the two sample classes had homogeneous variances. The results of the normality and homogeneity test showed that the data were normally distributed and homogeneous, so the hypothesis test was carried out by independent t-test (Table 7).

Table 7. Hypothesis testing

Class	N	X	S^2	t_{count}	t_{table}	Information
Experiment	36	30.02	0.078	2.064	1,667	H_0 rejected
Control	37	26.56	0.085			

The results of the hypothesis test show that the value of $t_{count} > t_{table}$ which indicates that H_0 rejected. Thus, the application of the salt hydrolysis module based on guided discovery learning is more effective on student learning outcomes.

Guided discovery learning-based learning has five stages, namely motivation and problem delivery, data collection, data processing, verification and closing. With the module guided discovery learning, making the learning process is more focused because it has been equipped with a step-by-step learning model. Each step of the learning module is equipped with key questions so that students can study independently. The key questions contained in the module help students find concepts. Require students to be able to think to solve a problem critically as well as analytically.

The limitations of this study are the ineffectiveness of learning hours and less effective time controllers at each stage of guided discovery learning because each stage takes quite a long time and as a result researchers lack time in teaching.

Based on this description, it can be concluded that the salt hydrolysis module based on guided discovery learning on the learning outcomes of SMA/MA students has practicality with an average Aiken's V formula value of 0.73 with the practicality category of moderate and the salt hydrolysis module based on guided discovery learning is effective in improving student learning outcomes of class XI MIPA at SMAN 13 Padang with a score of 0.83 in the high category. Thus, the module can be used as teaching material that helps students understand the concept of learning in salt hydrolysis material and improve student learningoutcomes.

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