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Effectiveness of Guided Inquiry-based Interactive Power-Point Learning Media on Electrolyte and Non-electrolyte Solution Materials for Class X SMA

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Abstract: Effectiveness of Guided Inquiry-based interactive Power-Point learning Media on Electrolyte and Non-electrolyte Solution Materials for Class X SMA. Effectiveness of Interactive Power-Point Learning Media based on Guided Inquiry on Electrolyte and Non-electrolyte Solution Materials for class X SMA. This study aims to determine the level of effectiveness of guided inquiry-based interactive Power-point learning media on improving student learning outcomes in class X SMA Adabiah 2 Padang. This Research is carried out in April 2022- May 2022. The type of research used is quasi-experimental research. The instrumental used in the study was a test in the form of 20 multiple-choice questions that had validity, difficulty index, distinguishing power and Reliability with good question criteria. The Effectiveness level of Interactive Power-Point Learning Media based on guided inquiry is seen from the N-Gain test.

Keywords: Electrolyte and Non-electrolyte, Power-Point, Guided Inquiry

Abstrak: *Keefektifan Media Pembelajaran Power-Point Interaktif Berbasis Inkuiri Terbimbing pada Materi Larutan Elektrolit dan Non Elektrolit Siswa Kelas X SMA.Penelitian ini bertujuan untuk mengetahui tingkat keefektifan media pembelajaran Power-Point interaktif berbasis inkuiri terbimbing untuk meningkatkan hasil belajar siswa hasil belajar siswa kelas X SMA Adabiah 2 Padang. Penelitian ini dilakukan pada akhir bulan April 2022 - Mei 2022. Jenis penelitian yang digunakan adalah penelitian akhir pada Percobaan Kuasi (Quasi Experiment). Instrumen yang digunakan dalam penelitian ini adalah tes berupa 20 soal pilihan ganda yang memiliki validitas, indeks kesukaran, daya pembeda dan reliabilitas dengan kriteria soal baik. Tingkat Keefektifan Media Pembelajaran Interaktif Power-Point berbasis inkuiri terbimbing dilihat dari uji N-Gain. N-Gain kelas sampel yang menggunakan media Power-Point interaktif berbasis inkuiri terbimbing lebih tinggi (0,68) dibandingkan kelas sampel yang tidak menggunakan media Power-Point interaktif sebesar (0,52) sehingga Daya Interaktif berbasis Inkuiri Terpandu -Media Pembelajaran Titik Efektif digunakan untuk meningkatkan hasil belajar siswa.*

Kata Kunci : *Solusi Elektrolit dan Non-elektrolit, Titik Daya, Pertanyaan Terpandu*

• INTRODUCTION

Chemistry is part of the natural sciences (IPA) subjects that study matter and chemical changes that involve changes in elements and compounds. One of the main material in chemistry subjects is electrolyte and nonelectrolyte solutions which cover several factual, conceptual, procedural aspects and have theoretical properties (chang, 2010). Characteristics of electrolyte and nonelectrolyte

solutions are factual and abstract. Material that is factual in nature can be seen through learning carried out using experimental methods while material that is abstract is submicroscopic which cannot be seen. This invisible submicroscopic can be displayed through learning media that displays animation, so that it can help students find a concept. The scientific approach is a learner-centered approach(Fauziah et al., 2017). Success in the learning process is not only determined by the learning model used, one of which is the guided inquiry learning model (Winda, 2014). Inquiry itself is a learning strategy that asks students to investigate systematically, critically, logically and analytically by the way the teacher asks students to investigate the given learning model and students are directed to answer key questions.(Suyanti, 2010). The stages in the guided inquiry learning model include orientation, exploration, and concept formation, application and closing or conclusion.

The results of observations and interviews conducted at SMA Adabiah 2 Padang obtained data: (1) the limited duration of learning both face-to-face and online so that the material has not been fully conveyed, (2) as many as 76.7% of students have difficulty understanding the material as evidenced by the average value of students' daily tests is low, (3) as many as 43.3% of teachers use modules, 52.3% use textbooks and 4.4% use worksheets which only display two levels of representation, namely symbolic and macroscopic so that participants students do not understand the concept of the material being taught. Student learning outcomes are strongly influenced by students' understanding of concepts. If students have difficulty in understanding the concept of the material, the learning outcomes will not be achieved optimally. Therefore, learning media is needed that can display chemical material according to the nature of the chemical material (macroscopic, symbolic and submicroscopic). One of the learning media that can display the nature of the chemical material is interactive Power-Point which is equipped with animation. Animation-based Power-Point is proven to increase students' motivation and learning outcomes(Yuliasah, 2018).

Other research shows the use of interactive learning media has a major influence on student learning outcomes with the experimental class n-gain value of 0.74 in the high category.(Kartini, Ketut Sepdyana., Putra, 2020). Subsequent research conducted by(Nasution, 2021)produce interactive Power-Point learning media based on guided inquiry on electrolyte and nonelectrolyte solutions that are equipped with multiple representations. The results of several studies indicate that the use of multiple representations in learning will help students to form mental models as a form of approach to real life from the outside.(Sunyono, 2015). This interactive Power-Point learning media is equipped with Figures, electrolyte and nonelectrolyte solution materials, animations and practicum experiment videos. Students are directed to investigate the given model and are equipped with key questions in the form of multiple choice questions, so that the three-level representation model and key questions are expected to assist students in understanding the concepts of electrolyte and non-electrolyte solutions.

Interactive media are media that are equipped with controllers that can be operated by users so that users can choose what they want for the next process. Interactive learning serves to channel messages and can also stimulate students' feelings, attention, and willingness so that the learning process occurs intentionally, has a purpose and is controlled.(Daryanto, 2010). Interactive learning media has several advantages, namely:

a. The delivery of lessons is becoming more standardized. Every student who sees or hears the presentation of lessons through the media receives the same message
b. Learning can be more interesting. Media can be associated with attracting attention and keeping students awake and paying attention to teacher explanations
c. The learning process becomes more interactive
d. The length of the learning time can be shortened
e. Learners can receive learning when and where or when it is needed, especially if the learning media is designed for individual users(Arsyad, 2013).

Guided inquiry-based interactive Power-Point learning media on electrolyte and nonelectrolyte solutions developed by(Nasution, 2021)already has high validity and practicality, but has not tested the effectiveness of learning media on student learning outcomes so that it cannot be used in a wider scope. Therefore, this study aims to test the effectiveness of the interactive Power-Point learning media based on guided inquiry on electrolyte and nonelectrolyte solutions on the learning outcomes of

students in class X SMA Adabiah 2 Padang.
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- **METHOD**

Types of research

The type of research used is a follow-up study from previous R & D research which was carried out using quasi-experimental methods and improvements to existing media were made. Quasi-experimental research (quasi-experimental research) is a type of research that does not allow to control all variables related to the sample except for some variables used in the study.(Sugiyono, 2013)The population in this study was class X SMA Adabiah 2 Padang in the 2021/2022 academic year.

The sample is part of the number and characteristics possessed by the population. The selected sample consisted of 2 classes, namely the experimental class and the control class. The sample is taken in a way called the Sampling technique, the sampling technique in this study used a purposive sampling technique which is defined as a way of taking samples with certain conditions.(Sugiyono, 2013).

Research Variables

Research variables are everything in any form determined by the researcher to be studied so that information is obtained about it, so that a conclusion can be drawn(Sugiyono, 2013). The variables in this study are:

a. Independent variables / independent, namely variables that affect or cause changes or emergence of the dependent variable. In the research that will be carried out, what is used as the independent variable is assisted learning using guided inquiry-based interactive powerpoint learning media on electrolyte and nonelectrolyte solutions in the experimental class and ordinary learning in the control class.
b. The dependent variable / bound, namely the variable that is influenced or which is the result, because of the independent variable. In this study, the researchers made student learning outcomes obtained from the pretest and posttest results in the experimental class and control class as the dependent variable.
c. Control variable, namely the variable that is controlled or made constant so that the influence of the independent variable on the dependent variable is not influenced by external factors that are not examined. In this study, all control variables must be made the same, including:
    1) The initial ability of students is the same
    2) The material, source book and time allocation used are the same
    3) The teacher who teaches is the same
    4) The learning model and learning method used must also be the same

The type and number of questions tested must be the same

Research Procedure

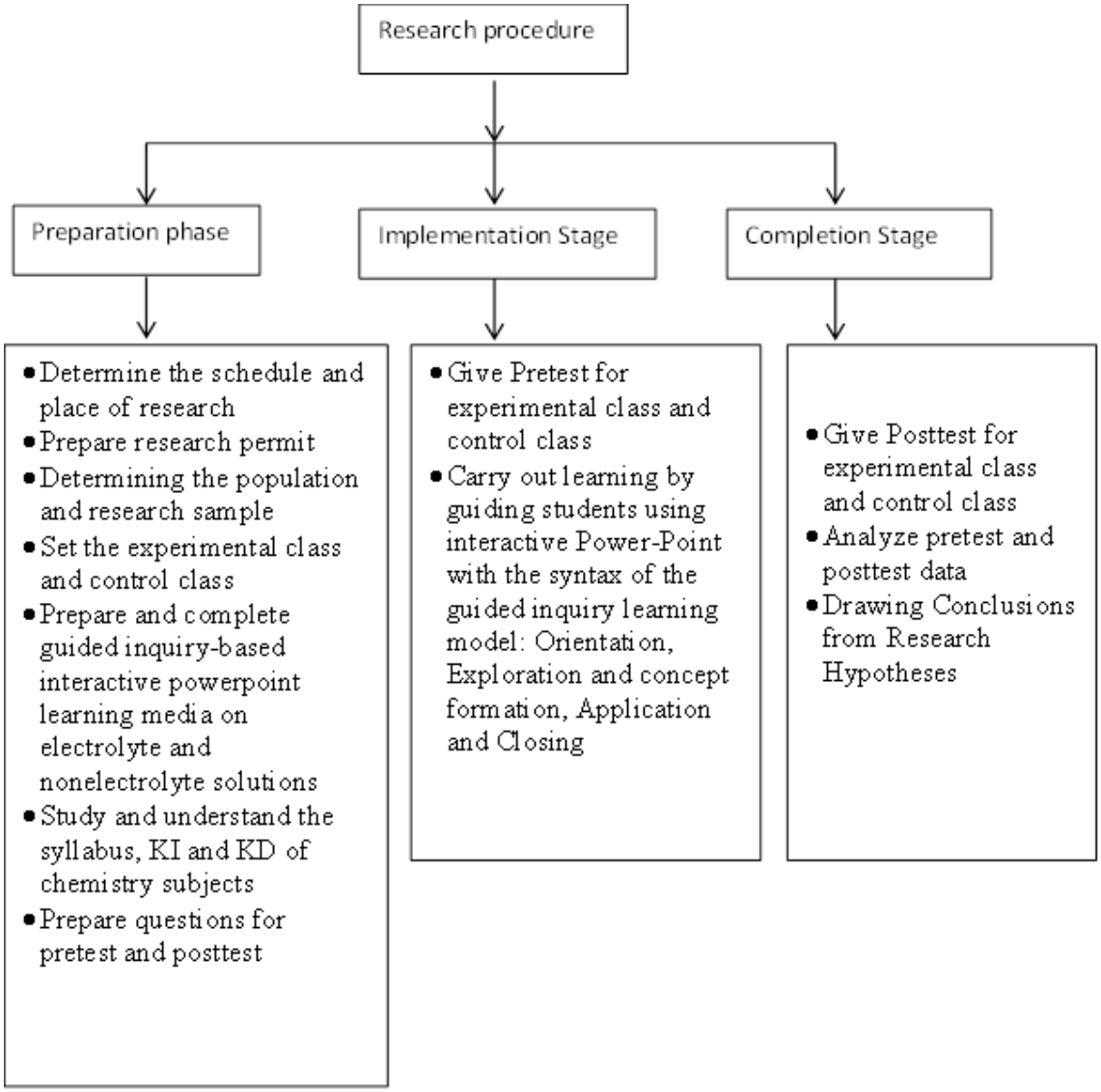

Figure 1. Prosedur Penelitian

Research Instruments

The instrument used in this study was a test of student learning outcomes. This test is a series of questions or other tasks that are used to assess and measure abilities, individual skills in certain aspects that must be answered, carried out or carried out.(Susetyo, 2015)This test is carried out on a sample class. The test used in this study is in the form of multiple choice questions that are adjusted to indicators of competency achievement. Research on learning outcomes was carried out by giving a pretest and posttest in the form of an objective test with 5 answer choices.

Daltal Analysis Techniques

Data analysis techniques are used to prove the truth of the hypotheses that have been put forward so that a conclusion can be obtained in this study. The data analysis technique used is the similarity test of two averages (t-test), the N-Gain test and the percentage of mastery learning. Prior to the t-test, the normality test and homogeneity test were carried out. the statistical formula used in this study include:

Normality test

To test for normality, the Lilliefors . test was used(Sudjana, 2011).

a. Data X1, X2,……, Xn are used as frozen numbers Z1, Z2,…….Zn by using the formula: $Zi = \frac{X - \overline{X}}{S}$

Information :

Zi = standard number

x = score obtained by students

= score or average score$\bar{x}$

s = sample standard deviation

b. The standard normal distribution list is used, then the probability is calculated

F(zi) = P(ZZi)≤

c. Next, the number of Z1, Z2,…….Zn which is smaller or equal to Zi is calculated. if this amount is expressed by S (zi) then:

$$S(zi) = \frac{a\ lot\ of\ Z1, Z2, \ldots\ Zn\ is\ the \leq Zi}{n}$$

d. Calculate the difference between F (Zi) – S (Zi), then determine the absolute value

e. The largest price is taken between the absolute value of the difference and is expressed by L0

f. To accept and reject the working hypothesis, the L0 value obtained is compared with the critical value in the table (Ltable) with a level of = 0.05. With test criteria as below:

1) If L0 < Ltable , then the sample is normally distributed
2) If L0 > Ltable, then the sample is not normally distributed

Homogeneity Test

To test this, the F test proposed by(Sudjana, 2011). Look for the variance of each data then calculate Fcount using the F price formula with the formula:

$$F = \frac{S_1^2}{S_2^2}$$

Information :

F = data group variance

s_1^2= the largest learning outcome variance

s_2^2= the smallest learning outcome variance

a. After obtaining the price, then the price of Fcount is compared with the price of Ftable contained in the distribution list F with a significance level of 5%, dk the numerator = n1 – 1 and dk the denominator = n2 – 1.

b. If the value of Fcount is smaller than Ftable (Fh < Ft) it means that both have homogeneous variance, and vice versa.

Hypothesis testing

From the learning outcomes of the experimental class and the control class that are normally distributed and have a homogeneous variance, the following formula is used:

$$t = \frac{\bar{\bar{x}}_{1-\bar{x}_2}}{s\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$$

where :

$$S = \sqrt{\frac{(n_1 - 1)\,S1^2 + (n_2 - 1)\,S2^2}{n_1 + n_2 - 2}}$$

Information:

$\bar{x}_1$= Experiment class average score
$\bar{x}_2$= Control class average score
S =The combined standard deviation of the two classes
n1 = Number of students in the Experiment class
n2 = Number of students in Control class
S_1^2= Variance for Experiment class
S_2^2= Variance for Control class

Testing criteria is where accept H0 If t < t1- and H1 is accepted if tcount > ttable. where t1- is obtained from the distribution list t with dk = (n1 + n2 – 2) and probability (1 –).

Normalized Gain Test (N-Gain)

The effectiveness of guided inquiry-based interactive Power-point learning media on students' cognitive learning outcomes can be tested using the N-Gain test. where the effectiveness of the learning media is obtained from the results of the pretest and posttest using the Gain Score and then interpreted in the Hake classification(Hake, 1998).

a. To obtain student scores from the pretest and posttest

$$\text{Student Score} = \frac{\sum \text{the answer score obtained}}{\text{score max}}\ x\ 100\%$$

b. After the student scores are obtained, the N-Gain value of each student is calculated using the N-Gain formula proposed by(Hake, 1998), which is as follows:

$$\text{N-Gain or Gain Score} = \frac{\text{score posttest} - \text{score pretest}}{\text{skor max} - \text{skor pretest}}$$

c. Finding the average N-Gain with the Formula:

Average N-Gain = $=\frac{\sum student\ N-Gain}{total\ student}$

- Presentation of student learning completeness

According to(Trianto, 2011). the percentage of completeness of student learning outcomes used The formula as:

Completeness Percentage Formula = $=\frac{number\ of\ student\ completed}{total\ number\ of\ student}\ x\ 100\%$

- **RESULT AND DISCUSSION**

Daltal Collection and Literalture Study

Pretest Data – Sample Class Posttest

Table1. Pretest - Posttest Value Data Sample Class

Number	Score	Score	Class Frequency			
			Experiment		Control	
			Pretest	Posttest	Pretest	Posttest
`1	5	25	4	-	-	-
2	6	30	3	-	-	-
3	7	35	8	-	2	-
4	8	40	3	-	5	-
5	9	45	7	-	7	-
6	10	50	-	-	6	-
7	11	55	-	-	5	-
8	12	60	-	-	-	1
9	13	65	-	2	-	5
10	14	70	-	1	-	3
11	15	75	-	8	-	6
12	16	80	-	4	-	6
13	17	85	-	8	-	4
14	18	90	-	-	-	-
15	19	95	-	2	-	-
Total students			25		25	
Average			36.2	79.6	46.4	74.6

Sample Class N-Gain Average

Table2. Sample Class N-Gain Average

Class	Amount Student	Average			Category
		Pretest	Posttest	N-gain	
Experiment	25	36.2	79.6	0.68	Currently
Control	25	46.4	74.6	0.52	Currently

Sample Class Normality Test Results

Table3. Sample Class Normality Test Results

Class	N	Significance Level	Count	Ltable	Decision
Experiment	25	0.05	0.171	0.173	Normal
Control	25		0.166		Normal

Sample Class Homogeneity Test Results

Table4. Sample Class Homogeneity Test Results

Class	N	A	S	S2	Fcount	Ftable	Information
Experiment	25	0.05	16.13	260.18	1.28	1.93	Homogeneous
Control	25		18.30	334.89			

Research Hypothesis Test Results

Table5. Results of Hypothesis Testing for Sample Class Data

Class	N	X	Sgab	tcount	table	□	Decision
Experiment	25	45	17.24	5.14	1.67	43.4	H0
Control	25	27.5				28.3	Rejected

Presentation of Student Learning Outcomes Completeness

Table6. Presentation of Student Learning Outcomes Completeness

No	Class	Total students	Number of Completed Students	% Complete	Category
1	Experiment	25	22	88%	Very good
2	control	25	16	64%	Enough

Discussion

The level of effectiveness of learning media is seen from the increase in student learning outcomes before and after using the learning media. Table 1 shows the posttest average value of the experimental class of 79.6 and the control class of 74.6. The posttest (final test) which has a higher value than the pretest (initial test) indicates that the learning process that has been carried out is going well.(Latisma, 2011). Table 2 shows the experimental class has an average n-gain value of 0.68 and the control class has an average N-gain value of 0.52. The average value of the n-gain of the experimental class and the control class is in the medium category, but the n-gain of the experimental class is greater than the N-gain of the control class. This indicates that the use of interactive learning media has a major influence on student learning outcomes(Kartini, Ketut Sepdyana., Putra, 2020). Learning outcomes can be said as an achievement of someone who has carried out learning activities that include several psychomotor, affective and cognitive aspects. Learning outcomes can be in the form of numbers, sentences, letters or symbols that reflect the quality of activities carried out by individuals during the learning process(Nurdyansyah, 2016). After getting the sample n-gain value, a hypothesis test is carried out.

The research hypothesis was carried out after the normality test and homogeneity test. Normal distributed data is interpreted that the sample really represents the population so that conclusions can be drawn from the research that can be generalized to the population. The data in this study are

normally distributed because the value of Lcount (0.171) < Ltable (0.173) for the experimental class and Lcount (0.166) < Ltable (0.173) for the control class so that it can be concluded that this study is interpreted as representing the population, namely all students in class X. MIPA SMA Adabiah 2 Padang. The test results which state that the sample is normally distributed and have a homogeneous variance can be seen in Table 3 and Table 4. So that the sample hypothesis test was carried out with the t test.

The results of hypothesis testing of interactive Power-Point learning media based on guided inquiry on electrolyte and nonelectrolyte solutions are effective in improving the learning outcomes of students of class X SMA Adabiah 2 Padang as evidenced by the t test. The decision from the test carried out is to reject H0 because the tcount (5.14) is greater than the ttable value (1.67) and the value of 1 (43.4) > 2 (28.2), can be seen in Table 5. Percentage of student learning completeness seen from the posttest score generated by the school KKM, which is 75.

Other research shows the use of interactive learning media has a major influence on student learning outcomes with the N-Gain value of the Experiment class of 0.74 in the high category.(Kartini, Ketut Sepdyana., Putra, 2020). Study(Yuliasah, 2018)on the effectiveness of animation-based PowerPoint learning media shows the results of using animation-based PowerPoint learning media can increase motivation and learning outcomes of students in class X SMA.

The PowerPoint learning media before being used has also been slightly updated, one of which is adding the number of options A, B, C and D and showing examples in everyday life in the Orientation stage so that it helps refine the research process where interactive Power-Point media is guided by guided inquiry. evidenced by srifujiyati's research on the effect of guided inquiry learning models on creative thinking skills of students in SMA Negeri 5 Palu shows that there are differences between groups of students who use guided inquiry learning models and groups of students who use conventional learning models.(Srifujiyati et al., 2018). This guided inquiry-based interactive Power-Point also has the advantage that the learning steps are equipped with guided inquiry syntax starting from orientation, exploration, concept formation, application and closing with conclusions.(Hansoon,2015). The learning steps equipped with guided inquiry syntax consist of 5 stages starting from orientation, exploration, concept formation, application and closing.(Richard S. Moog, 2000):

Orientation

The first stage begins with the introduction, which prepares students to learn. This orientation stage can provide motivation, stimulate student interest, arouse student curiosity, and make connections to prior knowledge.

Figure 2. Orientation Stage Display

Exploration

This exploration is the second stage where in this stage, students are given the opportunity to investigate and analyze data and information. Students are given a model to achieve what must be learned so that learning objectives can be achieved.

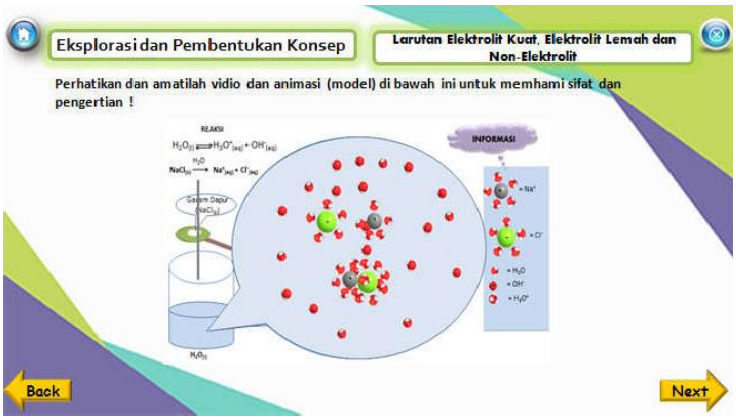

Figure 3. Exploration Stage View

Concept Formation

When students explore the information model and the key questions given, it means that students have entered the next stage, namely the stage of concept formation. Students are effectively guided and encouraged to explore, then draw conclusions and make predictions.

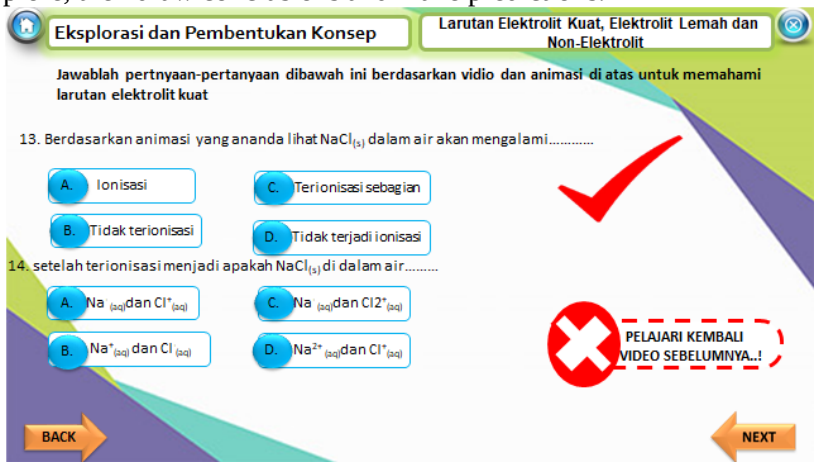

Figure 4. Concept Forming Stage Display

Application

At this stage the concept is identified, understood, strengthened and expanded. This application stage is the stage of giving questions with several questions.

Figure 5. Application Stage View

closing with conclusion

At the closing stage students are asked to make conclusions, think about and understand what they get and assess their work.

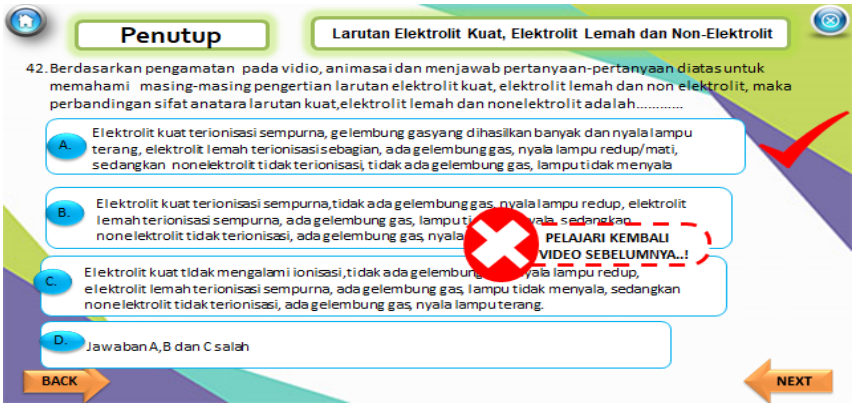

Figure 6. Closing Stage View

The material shown in detail at three levels of learning includes macroscopic, sub-microscopic and symbolic aspects. The results of several studies say the use of multiple representations in learning will help students to form mental models as a form of approach to real life from the outside(Sunyono, 2015). The interactive Power-Point media is also equipped with multiple choice questions that make it easier for students to answer questions so that they can help students understand the concepts of electrolyte and nonelectrolyte solutions.

Based on the explanation above, it can be concluded that there is a significant increase in learning outcomes for the experimental class using interactive PowerPoint-based learning media based on guided inquiry on electrolyte and nonelectrolyte solutions than the control class using ordinary PowerPoint in general. Interpreting the use of interactive PowerPoint-based learning media based on guided inquiry on electrolyte and nonelectrolyte solutions effectively to improve the learning outcomes of students in class X SMA Adabiah 2 Padang.

• CONCLUSION

The conclusions that can be drawn from the results of research that have been carried out are interactive PowerPoint-based learning media based on guided inquiry on electrolyte and nonelectrolyte solutions. effectively improve the learning outcomes of students of class X SMA Adabiah 2 Padang in the medium category with an average N-gain value of 0.68.

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