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Effectiveness of Integrated PowerPoint-iSpring Multimedia Prompting Questions on Learning Electrolyte and Nonelectrolyte Solutions Based on Guided Discovery Learning on the Learning Outcomes of Class X High School Students

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A B S T R A C T

This study aims to reveal the level of effectiveness of the PowerPoint-iSpring multimedia integrated prompting questions on guided discovery learning based electrolyte and nonelectrolyte solution learning on the learning outcomes of class X SMA students. SDI Silungkang seen from the value of pretest and posttest . This type of research is pre-experimental with one group pretest posttest design . The population and sample in this study were class X SMA SDI Silungkang. The sampling technique in this study is a saturated sampling technique. The research instrument used was a multiple choice question with 20 items with 5 answer choices. From the results of the study, the average value of the pretest of students was 36.90 and the average value of the posttest was 84.52. Student learning outcomes showed that there were no students who scored below the KKM. The N-Gain value obtained is 0.76 in the high category. It can be concluded that the PowerPoint-iSpring multimedia integrated prompting questions in guided discovery learning -based electrolyte and nonelectrolyte solution learning is effective in improving the learning outcomes of class X students at SMA SDI Silungkang.

1. Introduction

Electrolyte and nonelectrolyte solution material is one of the main subjects taught in chemistry subjects in class X SMA in even semesters . According to the 2013 revised 2018 curriculum, the Basic Competencies (KD) of this material are KD 3.8 which reads to analyze the properties of solutions based on their electrical conductivity and KD 4.8 which reads to distinguish the electrical conductivity of

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various solutions through the design and implementation of experiments (Permendikbud, 2018).

Based on the results of the questionnaire obtained from chemistry teachers who teach at SDI Silungkang High School, it is known that (1) the activeness and understanding of students is still not high, so that student learning outcomes are not maximized as evidenced by the existence of students who have not reached the Minimum Completeness Criteria (KKM) in the material. this. (2) The learning media used in schools do not yet display the submicroscopic form. The material of electrolyte and nonelectrolyte solutions is closely related to everyday life, because in it there are facts, concepts, and procedures that can be observed directly. And the concepts in this material are concrete and abstract, so they need representation at the microscopic, submicroscopic, and symbolic levels. According to Langitasari (2016), these three levels of representation are needed to understand the material of electrolyte and nonelectrolyte solutions. To be able to present these three levels of representation, learning media is needed.

Learning media are everything in the form of software or hardware that is usually used to deliver learning materials or content (Jalinus, 2016). The combination of several learning media that can contain information in the form of text, graphics or animated graphics, movies, and audio is called multimedia. (Hackbarth , 1996 in Priyanto, 2009). One example of a multimedia form is PowerPoint. PowerPoint-iSpring is a combination of PowerPoint that is integrated with iSpring presenter . which can convert presentation files into web-based flash (swf) and can be accessed by computers or platforms easily. (Hernawati, 2010). In addition, in PowerPoint-iSpring , questions can be used. Prompt which serves as a guide or giver of direction to students when thinking in finding answers in a way. stimulate students' memory, so that students can remember and relate questions to previously acquired knowledge (Guspatni, et al., 2018).

To produce students who have good character and learning outcomes, during the learning process a scientific approach can be applied with one of the learning models, namely guided discovery learning (GDL). The GDL learning model is a method of teaching that allows two-way interaction between teachers and students, where students can conclude answers with guidance from the teacher in accordance with the sequence of questions and steps that have been determined (Markaban, 2008). At this time, there is an integrated PowerPoint-iSpring learning multimedia available for prompting questions on electrolyte and nonelectrolyte solutions which has been developed by Saputri & Guspatni (2021) and has been tested for validity and practicality, but has not been tested for effectiveness. Therefore, the authors are interested in conducting research with the title of the effectiveness of PowerPoint-iSpring multimedia integrated prompting questions on guided discovery learning -based learning electrolyte and nonelectrolyte solutions on the learning outcomes of class X high school students.

2. Methodology

Research design

This type of research is pre-experimental (*Pre-experimental design*). The design used is *One Group Pretest-Posttest Design* . Sugiyono (2010), said that this design is a research where a *pretest is given* before treatment, then a *posttest is given* . The subjects of this study were students of class X MIPA at SMA SDI Silungkang. The object of this research is multimedia *PowerPoint-iSpring* integrated prompting questions in guided discovery learning-based electrolyte and nonelectrolyte solution learning.

Research Place

This research is located at SMA SDI Silungkang in the even semester of the 2021/2022 academic year.

Population and Sample

The sample in this study took all the population as a sample using a saturated sampling technique. The total number is 21 people.

Data Analysis Techniques

The data analysis technique used the N-gain test and the Hypothesis Test (t-test).

3. Results and Discussion

Research result

The results of the study are in the form of data obtained from student learning outcomes in the realm of knowledge (C4). The research instrument used in this study was in the form of multiple choice questions with a total of 20 items. Students who answer correctly are given a score of 5 for each item, if incorrectly given a score of 0 for each item. The lowest *pretest score* obtained by students was 20, and the highest score was 55, each of which was obtained by one student. While the lowest score for the *posttest* was 75 which was obtained by five students, and the highest score with a value of 100 was obtained by two students. Then obtained the average value of the students' *pretest* and *posttest* . Information on students' *pretest* and *posttest scores* can be seen in this information can be seen in Table 1

Table 1. Experiment Class Average

	N	Average
Pretest	21	36.90
Posttest	21	84.52

Furthermore, the N -Gain test was conducted to determine whether there was an increase or decrease in changes that occurred before and after learning. The results of the experimental class N-Gain test can be seen in Table 2

Table 2. Experimental class N-Gain test results

Posttest average	Average pretest	N-Gain	Category
84.52	36.90	0.76	Tall

In Table 2 it can be seen that the results of the N-Gain test in the experimental class are 0.76 in the high category. This proves that there is an increase in changes that occur before and after learning after being given treatment using *PowerPoint-iSpring multimedia* integrated with *prompting questions.* based on *guided discovery learning* on the learning outcomes of class X high school students.

Then a hypothesis test is conducted in the study which aims to determine whether the research hypothesis can be accepted or not. However, before testing the hypothesis, the normality test and the homogeneity test of variance of the data were first tested. Information on the results of the data normality test can be seen in Table 3

Table 3. Normality Test Results

	N	□	L_{count}	L_{table}
Pretest	21	0.05	0.134	0.190
Posttest			0.187	

In Table 3 it can be seen that $L_{count} < L_{table}$, it can be concluded that the two data (*pretest* and *posttest*) are normally distributed. Furthermore, the homogeneity of variance test was carried out. Information on the results of the homogeneity of variance test can be seen in Table 4

Table 4. Variance Homogeneity Test Results

	N	S^2	F_{count}	F_{table}
Pretest	21	78.69	1.17	2.12
Posttest	21	67.26		

In Table 4 it can be seen that $F_{count} < F_{table, it}$ can be concluded that the data is homogeneously distributed . After it was found that the two data were normally distributed and homogeneous, then the hypothesis was tested using a t-test. Information on the results of hypothesis testing can be seen in Table 5

Table 5. Hypothesis Test Results

	N	□	$\bar{X}$	S^2	T_{count}	T_{table}
Pretest	21	0.05	36.90	78.69	5.57	1.68
Posttest	21		84.52	67.26		

In Table 5it can be seen that $t_{count} > t_{table,}$ it can be concluded that $H_{o\ is}$ rejected and H_1 is accepted, meaning that there is a difference in students' *pretest* and

posttest scores after using the integrated *PowerPoint-iSpring* multimedia with *prompting* questions in *guided discovery -based* learning of electrolyte and nonelectrolyte solutions. *learning* class X SMA, where the student *'s posttest score* is greater than the *pretest score* .

Discussion

This research is a follow-up study from the previous development research by Saputri & Guspatni (2021) which has reached the stage of validity and practicality by using the 4D model, but its effectiveness has not been tested on learning outcomes. The purpose of this study was to reveal the effectiveness of the *PowerPoint-iSpring* multimedia integrated *prompting questions on guided discovery learning* -based electrolyte and nonelectrolyte solution learning. on student learning outcomes in class X SMA. This research is limited to the *small group* and in terms of the realm of knowledge (C4).

This type of research is a pre-experimental design with One Group Pretest-Posttest Design which has three stages of research, namely pretest, treatment , then posttest (Sugiyono, 2010). So that the data obtained are used to compare the results obtained before and after being given treatment using *PowerPoint-iSpring multimedia* integrated with *prompting questions* on electrolyte and nonelectrolyte solutions based on *guided discovery learning for* class X SMA.

Multimedia *PowerPoint-iSpring* is a combination of several media in order to convey messages or information in the form of text, graphics or animated graphics, movies, and audio. Multimedia includes *hypermedia* and *hypertext* (Hackbarth, 1996 in Priyanto, 2009). This *PowerPoint-iSpring multimedia* uses the iSpring presenter which is integrated with *PowerPoint* . iSpring presenter is a tool that can convert presentation files into *flash form* web-based that can be opened easily on various platforms such as computers, laptops, and android/IOS. So that *PowerPoint-iSpring* multimedia can be one of the interactive media based on *software* or web that can increase student activity in finding concepts in learning (Daryanto, 2010).

The stages of research carried out during the learning process are initial tests or *pretests* given at the beginning of learning in order to determine the extent to which students' initial knowledge of electrolyte and nonelectrolyte solution materials. Based on the data that has been obtained, it is known that the average *pretest* on the electrolyte and nonelectrolyte solution material is 36.90. This is still far from the Minimum Completeness Criteria (KKM) applied by schools.

Then given the treatment using multimedia *PowerPoint-iSpring* integrated *prompting questions* on electrolyte and nonelectrolyte solution learning based on *guided discovery learning* . At this stage in the implementation of learning, researchers use the *Scientific Learning approach* with the *Guided Discovery Learning (GDL) learning model.* Learning model This GDL is one of the recommended learning models in the 2013 curriculum that applies a scientific approach (Permendikbud, 2014). In this GDL learning model, it is focused and

centered on the activities carried out by students during the learning process so that students can develop science skills. In this case, it is expected that students can learn independently by finding their own concepts. According to Sumarniti (2014), the application of this learning model can improve student learning outcomes. Because the student-centered learning process can require students to be more active and independent in learning, while the teacher acts as a facilitator who provides direction and guidance to students if there are obstacles that occur during the learning process. The steps of the GDL learning model These are Motivation and Problem Presentation (Motivation and Problem Presentation), Data Collection (*Data Collection*), Data Processing (*Data Processing)* , Verification (*Verification*), conclusion (*closure*) (Yerimadesi, 2017).

The allocation of time for the learning process was carried out for three meetings or 6 x 45 minutes in class X SMA SDI Silungkang in May 2022. Each meeting of researchers limited to two GPAs so that students could study and understand this material well. During learning, students use *PowerPoint-iSpring learning multimedia* as the main source by utilizing school facilities, namely computer labor. Students were divided into seven groups, each group consisting of three people. To ensure that students understand the material they are learning, every GPA is completed in *PowerPoint-iSpring multimedia,* there is a quiz that can help students understand the material well. In addition, sometimes the teacher also gives random questions to students related to the material of electrolyte and nonelectrolyte solutions.

After all the material has been studied and understood well, all students are given a final test or *posttest* to prove the level of students' understanding of the electrolyte and nonelectrolyte solution material. Based on the data obtained the average *posttest score* of students is 84.52 . According to Latisma (2011), the learning process can be said to be good if the students' *posttest scores* are higher than the *pretest scores* . To find out if there is an increase or decrease after using the integrated *PowerPoint-iSpring multimedia, prompting* questions on electrolyte and nonelectrolyte solution learning based on *guided discovery learning.* N-gain test can be done.

The N-gain test can be analyzed by processing the difference between the *posttest scores and the students' pretest* scores . In Table 6 it can be seen that the N-gain score in this study was 0.76 . According to Hake (1999) there are three classifications in determining the N-gain criteria, namely low, medium, and high. From the data obtained, the N-gain score in this study is in the high category. This shows an increase in learning outcomes after using *the PowerPoint-iSpring multimedia* integrated with *prompting questions in guided discovery learning* based electrolyte and nonelectrolyte solutions . Information on the difference in students' *pretest* and *posttest scores* can be seen in Figure 1.

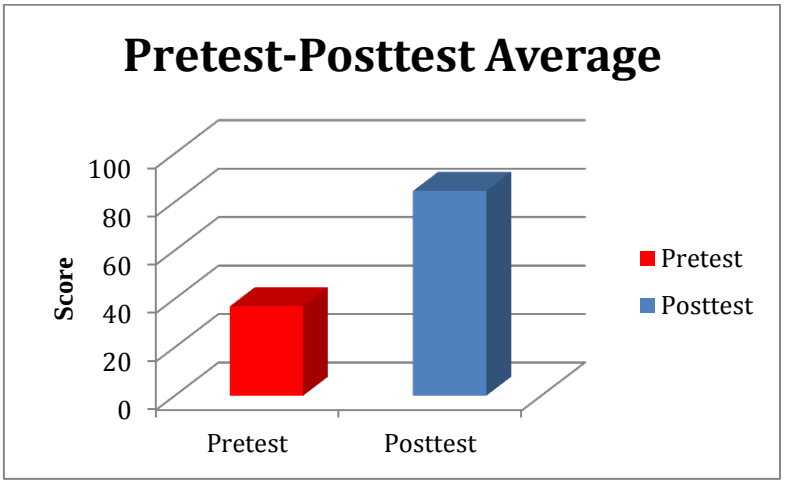

Figure 1. *Pretest-Posttest Mean* Difference

Furthermore, to prove the truth of the research hypothesis, a hypothesis test is carried out. However, before testing the hypothesis, it is necessary to test the normality and test the homogeneity of variance first. In this study, the normality test used the Liliefors test and the homogeneity test of variance was carried out by the F test. Based on the processed data, it was found that the research data were normally distributed and homogeneous, because the hypothesis test was t-test with the results of the decision-making criteria of real level. = 0.05, dk = (*40*) and the probability (0.95) is that t_{count} (5.57) > t_{table} (1.68), then $H_{o\ is}$ rejected and $H_{1\ is}$ accepted. This means that there is a difference in the students' *pretest* and *posttest scores* after using *the PowerPoint-iSpring* multimedia integrated with *prompting questions in guided discovery learning* based electrolyte and nonelectrolyte solutions. class X SMA, where there is an increase in learning outcomes as evidenced by the *posttest scores* of students are greater than the *pretest scores* .

This is in accordance with the research conducted by Pooroe, et al (2020) regarding the use of ispring and *PowerPoint media* on the sub-concept of basic chemical laws to improve the learning outcomes of class X students of SMA Negeri 7 Ambon. Based on his research, it is known that there is an increase in student learning outcomes as evidenced by all students successfully achieving the Minimum Completeness Criteria (KKM). Then the research conducted by Anggriawan, et al (2017) about the effectiveness of using interactive multimedia based on *guided discovery learning* in developing students' understanding of molecular symmetry material based on the results of their research students' understanding is higher when using interactive multimedia based on *guided discovery learning.*

Increased learning outcomes due to this *PowerPoint-iSpring learning multimedia* has several features, including iSpring presenter works as *add-ins PowerPoint* that makes media display much better and attractive so that students' interest in learning becomes higher. Then in *the PowerPoint-iSpring learning multimedia* used, there are also *prompting questions* that make the media more interactive and can help students solve problems so that students are able to find their own concepts.

Furthermore, the media also contains three levels of chemical representation, namely macroscopic, submicroscopic, and symbolic. At the macroscopic level, knowledge is presented in the form of facts that can be sensed, such as a beaker containing a mixture of salt and water in a homogeneous phase. At the submicroscopic level, knowledge is abstract and cannot be observed directly, for example the decomposition of Na^{+} and Cl^{-} ions in salt in water (H_2O). At a symbolic level that describes qualitative or quantitative knowledge, for example, the equation for the reaction that occurs when the process of dissolving salt ($NaCl_{(s)}$) in water ($H2O_{)}$ (Jansoon & Coll, 2009).

This is supported by Noer, J (2022) who argues that one solution for studying abstract material can be used *Powerpoint-iSpring* because it can visualize abstract concepts, practice processes that are difficult to do manually, make the material display more attractive, not constrained by space, and allows for student interaction with the material being studied.

In addition, the application of the *guided discovery learning model* during the learning process can help students grow independent, active, and critical thinking characters because this learning model is student-centered so that students are able to find their own concepts without more help from the teacher. Based on the description of some of these advantages, it is very possible to significantly increase student learning outcomes.

During the study, there were several obstacles experienced including (1) when using *PowerPoint-iSpring learning multimedia*, especially after seeing the video shows available in the quiz, the media automatically exited and closed, resulting in the media returning to the initial display and previous quizzes that had been completed. the work done is not saved, (2) when *the PowerPoint-iSpring learning multimedia is* used the teacher has difficulty being able to monitor students in doing quizzes or evaluating questions because there is no link to submit answers, so the teacher is constrained to be able to ascertain whether students are working or not and how many scores are given. obtained, (4) there are still many students who are constrained in linking the material with the prerequisite material so that students still need guidance from the teacher.

4. Conclusion

Based on the results of the research that has been done, it can be concluded that *the PowerPoint-iSpring* learning multimedia is integrated *prompting* questions on electrolyte and nonelectrolyte solutions effectively improve the learning outcomes of class X students at SMA SDI Silungkang with an N-gain value of 0.76 which is in the high category. However, this can also be influenced by the implementation of the *Guided Discovery Learning* (GDL) learning model during the learning process.

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