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Practicality and Effectiveness of Guided Discovery Learning Based-PowerPoint-iSpring Multimedia Integrated Multirepresentation and Prompting Questions on Buffer Solution Topic

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ABSTRACT

This study aims to determine the practicality and effectiveness of learning outcomes in PowerPoint-iSpring learning media that integrates multiple representation and prompting questions based on guided discovery learning. This research is a follow-up Research and Deevaluation (R&D) using the 4-D as the instructional model. The practicality and effectivity were obtained through research instruments is practicality questionnaire and formative test. Practicality was carried out by 10 students of class XII MIPA and two chemistry teachers at SMAN 5 Tebo, while effectivity was carried out by 28 students of class XI MIPA 3 SMAN 5 Tebo. The results of analysis on practicality data showed value of 90% (for teacher practicality) and 87% (for students practicality) both showing very practical category. The result of analysis on effectivity data showed the N-Gain value of 0,78 which was categorized as high, and the hypothesis test using the paired sample t-test showed that the learning outcomes of students after being given treatment were significantly higher than before being given treatment. Therefore, PowerPoint-iSpring learning media that integrates multiple representation and prompting questions based on guided discovery learning is practical and effective for the learning outcomes of students in class XI MIPA SMAN 5 Tebo.

1. Introduction

Chemistry is one of the subjects studied in high school (SMA) (Isnaini et al., 2015). Chemistry is a science that explains the composition, composition, properties and changes of matter and the accompanying energy changes (Brady, 2012). The chemistry learning process involves abstract concepts so that it is

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difficult for students to understand (Chang, 2003). Buffer solution material is one of the materials studied in class XI SMA/MA in even semesters (Isnaini, et al., 2015).

A buffer solution is a material whose concept is partly abstract and complex, for example, a buffer solution can maintain pH when a small amount of strong acid or strong base is added, pH changes are not too significant when a strong acid or strong base is added, this is due to an equilibrium in the solution. buffer solution, events like this require explanations with multiple chemical representations (Alighiri & Drastisianti, 2018).

Based on the characteristics of chemistry, chemistry will be easy to understand if it can be represented in multiple representations (Yakmaci-Guzel & Adadan, 2013). The ability to represent chemistry at the submicroscopic level is the most important part in solving problems in chemistry learning (Sunyono, 2015). In addition, using the question method can improve critical thinking skills and increase the curiosity of students. One method of asking questions that can be applied is prompting questions (Suciana & Ellizar, 2019). Giving prompting questions from the teacher will bring up active participation both between teachers and students and between students. Prompting questions can also develop thinking processes and process skills, memory use, self-discovery and meaningful learning that affect the understanding of concepts and good student retention (Zalmi & Angraini, 2021).

The scientific approach is an approach demanded by the 2013 curriculum. In the scientific approach, the learning process is designed to make students active in building knowledge through the stages of the scientific method (Ellizar, et al., 2018). One of the recommended learning models in the 2013 curriculum is Guided Discovery Learning (Kemendikbud, 2013). In learning with guided discovery learning, students are guided to be able to think critically and actively in finding their own concepts. 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 (Mfon Effiong, 2010). The teaching and learning process using media is expected to increase the motivation and interest of students, so that students are encouraged to improve the quality of learning and student learning outcomes will increase (Damayanti, 2018).

The use of learning media based on information and communication technology or ICT can be used as an alternative to solving existing problems (Saregar, 2016). PowerPoint learning media is one of the learning media that utilizes the development of ICT. PowerPoint is software that is specifically designed to be able to display media programs in an attractive way by using hyperlinks, triggers and custom animations, easy to create and use and relatively inexpensive. The advantages of PowerPoint include: it can present text, images, films, sound

effects, songs, graphics and animations and is easy to store and efficient (Nurseto, 2011). PowerPoint can also be converted to flash using iSpring (Jamilah, 2019). iSpring has the advantage that it can design quiz questions and evaluations in various formats such as: multiple response, multiple choice, true/false, matching, type in, numeric, fill in the blank (Hernawati, 2010). It can also minimize human error, be more efficient, reduce exam cheating, time allocation can be determined and students can get feedback directly (Zakaria, 2017).

Through the distribution of questionnaires for students and chemistry teachers at SMAN 5 Tebo, data was obtained that the teaching materials used had not varied so that they had not been able to increase students' understanding of the material. The teaching materials commonly used by schools are printed books, LKPD and PowerPoint, but the three teaching materials do not all contain multiple chemical representations so that students find it difficult to understand abstract concepts contained in the buffer solution material. This can be seen from the average UH score of class XI students in semester 2 of the 2020/2021 academic year at SMAN 5 Tebo which is still low. A total of 86.20% of students scored below the standard of assessment. The development of PowerPoint-iSpring multimedia integrated multiple representation and prompting question on topic of buffer solution for senior high school learning that has been developed by Putri & Guspatni (2020) has been valid but has not been tested for its effectiveness on student learning outcomes.

Based on the explanation above, this study aims to analyze the practicality and effectiveness of PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning on buffer solution topic toward the learning outcomes of students in class XI MIPA SMAN 5 Tebo.

2. Methodology

Practical Test

Determination of the level of practicality is carried out by the chemistry teacher and students of class XI MIPA SMAN 5 Tebo, by giving practicality questionnaires to each respondent.

Data analysis was performed using descriptive statistics. Descriptive statistics are statistics used to analyze data by describing or describing the data that has been collected as it is without intending to make conclusions that apply to the public or generalizations (Sudaryono, 2018: 348). The practicality measurement scale uses a Likert scale. In research and development the Likert scale is used to measure attitudes, perceptions, and opinions of a person or group of people towards the design of a product (Sugiyono, 2017: 165).

The data analysis technique used for practicality assessment in this study uses the formula:

$$\% \text{ Practicallity} = \frac{\text{Total Score}}{\text{Maximum Score}} \times 100\%$$

The values obtained are interpreted according to categories such as Table 1.

Table 1. Categories of Practicality Assessment

Achievement Level	Category
81%-100%	Very Practical
61%-80%	Practical
41%-60%	Practical enough
21%-40%	Less Practical
0-20%	Not Practical

(Yanto, 2019)

Effectiveness Test

Effectiveness test of the PowerPoint-iSpring learning media integrated with multiple representations and prompting questions on the buffer solution material toward learning outcomes for class XI SMA/MA through pre-experimental research. According to Sugiyono (2013), pre-experimental research can be interpreted as experimental research that is not yet real because there are still influences from external variables.

The research design that will be used is One Group Pretest – Posttest Design. One Group Pretest – Posttest Design research is a design that begins with giving a pretest then the group is given a certain treatment, and ends with a posttest to see changes in the treatment. In this study, one class will be used, namely the subject class that will be taught with PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning. The research design can be seen in Table 2. below.

Table 2. Research Design One Group Pretest–Posttest Design

Pretest	Treatment	Posttest
O_1	X	O_2

Source : (Sugiyono, 2014)

Description:

O_1 = Test Before Giving Treatment

X = Learning using PowerPoint-iSpring learning media integrated multiple chemical representations and prompting questions

O_2 = Test After Being Treated

The effectiveness of the learning media was analyzed to test the truth of the hypotheses carried out in the study. The data analyzed are the results of the students' final learning test. The analysis carried out is descriptive static analysis. This analysis is used to provide an overview of the characteristics of the

achievement of student learning outcomes. The steps for data processing are as follows:

a. Normality Test

The data normality testing technique used in this study is the Shapiro Wilk test. This normality test was carried out with the help of the SPSS application, with the following test criteria:

- 1) If significant > 0.05 then the data is normally distributed.
- 2) If significant < 0.05 then the data is not normally distributed.

b. Hypothesis Testing

To test the hypothesis in this study, the paired sample t-test was used, which is one of the testing methods used to assess the effectiveness of the treatment, marked by the difference in the average before and after being given treatment. In this study, the paired sample t-test was carried out with the help of the SPSS application. The formulation of the hypothesis in this test is as follows:

H₀ : There is no difference in learning outcomes before and after using the PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning

H₁: There are differences in learning outcomes before and after using the PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning

c. N-Gain Test

To find out the effectiveness of using PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning in improving student learning outcomes, N-Gain testing is used.

The normalized gain can be calculated by the formula:

$$N - Gain = \frac{Score\ Posttest - Score\ Pretest}{Score\ Maximum - Score\ Pretest}$$

The high and low normalized Gain (N-Gain) can be classified as follows:

Table 3. N-Gain Criteria

N-Gain Criteria	Interpretation
$g \geq 0.7$	High
$0.7 > g \geq 0.3$	Medium
$g < 0.3$	Low

Source : (Hake, 1999)

3. Results and Discussion

The main components of the PowerPoint-iSpring media were developed by Putri & Guspatni (2020). On the home page there are various menu button options, namely: profiles, instructions, media components, basic competencies, competency achievement indicators, materials and evaluations. The main material in the buffer solution consists of five materials, namely the concept of a buffer solution, components of a buffer solution, the working principle of a buffer solution, calculating the pH of a buffer solution and the role of a buffer solution in living organisms. In each subject matter, they are guided by prompting questions starting from simple questions to more complex questions. Evaluation on the PowerPoint-iSpring learning media integrated multiple representation and prompting questions were used to test students' understanding of the buffer solution material.



Figure 1. PowerPoint-iSpring Home Page Display

Materi Prinsip Kerja Larutan Penyangga Asam

Prinsip kerja larutan penyangga asam CH_3COOH dan CH_3COONa saat ditambahkan HCl .
Sumber : Kurniawati, 2018

Materi Prinsip Kerja Larutan Penyangga Asam

Prinsip kerja larutan penyangga asam CH_3COOH dan CH_3COONa saat ditambahkan HCl .

1. Apa saja partikel zat terlarut yang terdapat dalam larutan HCl ?
 A. ion H_3O^+ dan ion Cl^- BENAR
 B. ion H^+ dan ion Cl^- SALAH

2. Manakah yang berpengaruh terhadap perubahan pH larutan?
 A. ion Cl^- SALAH
 B. ion H_3O^+ BENAR

SOAL EVALUASI LARUTAN PENYANGGA
 Butir soal : 20
 Waktu : 60 menit
 Klik "Start Quiz" untuk memulai.

Start Quiz

Figure 2. PowerPoint-iSpring Teaching Material Page Display

Practical Test

Practicality tests were conducted to measure the extent of the benefits and attractiveness of the media, the ease of use of the media and the efficiency of

learning time when using PowerPoint-iSpring learning media. The practicality of the PowerPoint-iSpring learning media developed is seen from the results of limited trials in the field regarding the feasibility and practicality of the products developed. The practicality test of the product developed was carried out by two chemistry teachers and 10 students of class XI MIPA SMAN 5 Tebo.

Table 4. Results of Practicality Test by Teachers

No	Aspect	% Average	Practicality Category
1	Ease of use	86	Very Practical
2	Learning time efficiency	91	Very Practical
3	Attractions and benefits	93	Very Practical
	Average	90	Very Practical

Table 5. Results of Practicality Test by Students

No	Aspect	% Average	Practicality Category
1	Ease of use	89	Very Practical
2	Learning time efficiency	91	Very Practical
3	Attractions and benefits	88	Very Practical
	Average	87	Very Practical

In the ease of use component of PowerPoint-iSpring multimedia, the practicality value by teacher is 86% and by students is 89% both in the very practical category. This data shows that the PowerPoint-iSpring multimedia developed is easy to use in terms of instructions for use and the language used is easy to understand. The storyline in this learning multimedia is easy to understand and the delivery of material in learning multimedia can strengthen students' concepts.

The practicality gain on the PowerPoint-iSpring multimedia learning time efficiency component by teacher is 87% and by students is 91% in the very practical category. This shows that the PowerPoint-iSpring learning multimedia developed can help students learn independently according to their respective learning speeds. In addition, by using this multimedia, learning time becomes more efficient.

Furthermore, on the components of the attractiveness and benefits of the PowerPoint-iSpring multimedia learning, the practicality value by teacher is 93% and by students is 88% in the very practical category. This shows that the PowerPoint-iSpring multimedia can help students understand the buffer solution material independently at school and at home, help increase students' interest in learning, and can improve students' thinking skills and memory.

The use of multimedia learning can help teachers in learning, because students can repeat the lessons they have learned at school in order to understand and solidify concepts clearly. Based on the data from the practicality test results by the teachers and students, it was concluded that the PowerPoint-iSpring multimedia integrated multiple representation and prompting questions on buffer solution material provided benefits for the teacher, namely it could help teachers in

carrying out teaching to students, as well as facilitate the teacher's task in teaching material to students.

Effectiveness Test

The type of research on this effectiveness test is a pre-experiment with the One Group Pretest-Posttest Design. Learning using the PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning on the buffer solution material was carried out in class XI MIPA 3 as a sample class. The stages of research carried out during the learning process are the initial test or pretest. Then given treatment by using PowerPoint-iSpring integrated multiple representations and prompting questions on the buffer solution material. At this stage in the implementation of learning, researchers use the Scientific Learning approach with the Guided Discovery Learning (GDL) learning model.

After that, a final test or posttest was given to prove the level of students' understanding of the material after using PowerPoint-iSpring learning multimedia. The pretest and posttest data requirements used must be normally distributed. Therefore, before the data is used, a prerequisite analysis is carried out with a normality test.

a. Normality Test

The Kolmogorov-Smirnov test is better used if the sample is more than 50 people, while the Shapiro-Wilk test is better used if the sample is smaller than 50 people (Riduwan, 2012). The samples in this study each amounted to 35 people good test to do is to use the Shapiro-Wilk test. Table 6 shows that the pretest data obtained

Table 6. Normality Test Results Pretest-Posttest Values

	Tests of Normality		
	Statistic	df	Sig.
Students' Pretest Value	0,935	28	0,085
Students' Posttest Value	0,928	28	0,056

Table 6 shows that the pretest data obtained have a significance value of 0,085 and the posttest data obtained have a significance value of 0,056 and 0,054, respectively, which means the Sig count $> 0,05$, i.e. $0,0085 > 0,05$ and $0,056 > 0,05$ with a level = 0,05. This shows that the pretest-posttest data of the experimental class has a normal distribution so that it can be directly used for further statistical tests.

a. Statistical Test (Hypothesis)

Hypothesis testing in this study used paired sample t-test. According to Widiyanto (2013) paired sample t-test is one of the testing methods used to assess the

effectiveness of the treatment, marked by the difference in the average before and after being given treatment. In this study, the paired sample t-test was carried out with the help of the SPSS application. The description of the data on the ability to understand concepts seen from the average posttest results of students in the experimental class can be seen in Table 7.

Table 7. Description of the Average Posttest Value of Experimental Class

Paired Samples Statistics		
	Mean	N
Students' Pretest Value	40,36	28
Students' Posttest Value	86,79	28

Based on Table 6, it is known that the average value of the students' conceptual understanding ability test on the topic of buffer solutions in the pretest obtained an average value (mean) of 40,36, while the posttest obtained an average value (mean) of 86,79. So it can be concluded that there is a difference in the average value of the pretest and posttest. Furthermore, to see whether the difference is significant (real) or not with the hypothesis:

- H_0 : There is no difference in learning outcomes before and after using PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning.
- H_1 : There are differences in learning outcomes before and after using the PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning.

By using Paired Sample t-test, significant data for the experimental class shows the value of Sig.(2-tailed) of $0,000 < 0,05$, it can be concluded that H_0 is rejected and H_1 is accepted. Thus, there is a significant difference between the average value of the pretest score and the posttest score. Based on the results, the posttest result got a higher average score than the pretest score. This is because in the learning process the experimental class uses PowerPoint-iSpring learning media integrated with multiple representations and prompting questions which was developed in accordance with the students' understanding of buffer solution material. Where the level students' understanding are also included in the posttest questions. The same result was also obtained by Oktavia & Guspatni (2022) where it is proven that there is an increase in the learning of students who use PowerPoint-iSpring integrated media asking prompting questions which is significantly higher than that of students who study using PowerPoint.

- b. The Effectiveness of PowerPoint-iSpring learning media integrated with multiple representations and prompting questions based on Guided Discovery Learning

To find out the effectiveness of using PowerPoint-iSpring learning media, integrated multiple representations and prompting questions in improving student

learning outcomes, N-Gain testing is used. N-Gain is the difference between pretest and posttest scores, N-Gain shows an increase in students' understanding or mastery of concepts after learning to use PowerPoint-iSpring learning media integrated multiple chemical representations and prompting questions.

Table 8. Results of N-Gain Pretest and Posttest Experiment Class

N-Gain	
Mean	0,7856

The N-gain score was obtained from the pretest-posttest difference data. Calculation of the average value of the sample class N-gain is 0,78. According to Hake (1999), the N-gain value or gain score is used to show effectiveness in three categories, namely high, medium, and low. Good teaching materials used to improve learning outcomes are teaching materials with a high level of effectiveness category. Teaching materials that have a high level of effectiveness must have an N-gain value of 0,70. The average value of the sample class N-gain is in the high category.

The average N-Gain value for the experimental class with a high category shows the PowerPoint-iSpring integrated multiple representations and prompting questions based on guided discovery learning has a high effectiveness value for improving student learning outcomes.

One of the benefit of Microsoft PowerPoint is can be used to create presentations with facilities or tools that can be used to create learning media. Microsoft PowerPoint will be more interesting if it is combined with iSpring software which can turn it into flash animation media (Suprapti, 2016: 59). iSpring is a software that can convert presentation files into flash form and can easily be integrated into Microsoft PowerPoint (Jamilah, Guntur & Amiruddin, 2019: 144 - 145). iSpring has a variety of uses, including:

- 1) Can insert various forms of media including being able to record voice, video presenters, learning videos, add Flash and YouTube videos, import or record audio, add presentation maker information and educational logos, create materials in the form of 3-dimensional books, and create navigation and attractive design.
- 2) Easy to convert in flash format without having to make it from adobe flash player software, and can also be published on web pages offline.
- 3) Can make quizzes with various types of interesting questions/questions, such as: True/False, Multiple Choice, Multiple response, Type In, Matching, Sequence, numeric, Fill in the Blank, Multiple Choice Text.
- 4) Easy manufacture and output that does not require a large capacity so that it does not burden a laptop or computer (Ramadhani, Rahmawati & Oktarika, 2019: 28)

PowerPoint-iSpring media which integrates multiple representations and prompting questions will be able to visualize abstract buffer solution material so

that students are able to observe and draw conclusions independently then prompting questions that lead students gradually on each basic competence to understand the topic of buffer solution low-high level questions.

4. Conclusion

Based on the results of the research that has been done, it can be concluded that the PowerPoint-iSpring integrated multiple representation media and prompting questions have the practicality of the teacher's response of 88% in the very practical category and the student response of 86% with the very practical and effective category in improving class student learning outcomes. XI MIPA at SMAN 5 Tebo with an N-Gain value of 0.78 which is in the high category. In addition, the effectiveness of learning outcomes can also be influenced by the application of the Guided Discovery Learning (GDL) learning model during the learning process.

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