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THE EFFECTIVENESS OF POWERPOINT-iSPRING INTEGRATED MULTIPLE CHEMICAL REPRESENTATION LEARNING MEDIA ON ACID-BASE MATERIALS TO IMPROVE STUDENTS LEARNING OUTCOMES FOR SENIOR HIGH SCHOOL

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Abstract: We have previously produced a PowerPoint-iSpring Integrated Learning Media Multiple Chemical Representations on Acid-Base Materials. It is valid and practical but has not been tested for its effectiveness on student learning outcomes in Senior High School. The research is experimental with a quasi-experimental design with a Non-equivalent Control Group Design. The research population is all class XI Senior High School students for the 2021/2022 academic years. Purposive sampling was used as a sampling technique with homogeneous sampling criteria. The classes selected as samples were class XI MIPA 1 as the experimental class and class XI MIPA 2 as the control class. The instruments used were questionnaires and student learning outcomes tests in the form of 20 multiple choice questions. The N-Gain and hypothesis testing were carried out for data analysis with an independent sample t-test. Based on the data analysis, the N-Gain of the experimental class was higher than the control class with the medium category. PowerPoint-iSpring Integrated Learning Media with Multiple Chemical Representations on Acid-Base Materials is Effective for Improving Learning Outcomes of Class XI Senior High School Students.

Keywords: Effectiveness, PowerPoint-iSpring, Acid-Base, Multiple Chemical Representations, Learning Outcomes.

INTRODUCTION

The learning approach used in the 2013 Curriculum is scientific. A scientific approach is an approach that is student-centered in learning. There are five stages abbreviated as used in the scientific approach during the learning process, namely observing, asking questions, gathering information, associating, and communicating [1]. One of the chemistry materials that must apply this scientific learning approach is acid-base material. Because the acid-base material contains contextual examples and phenomena that students must observe, practical activities also require skills.

Acid-base is material for class XI SMA/MA at the beginning of the semester. Acid-base material is complex for students to understand because it contains a lot of factual, conceptual, and procedural knowledge. Acid-based learning involves understanding concepts, principles, theories, and calculations. As a result, this material is complex for students to understand [2]. In addition, acid-base material is also considered difficult, contains reaction equations, and is abstract and microscopic [3].

Based on the results of the questionnaire given to the teachers of SMAN 2 Batang Kapas, it is known that students have not been actively involved in learning, and their learning outcomes have not been maximized. The teacher uses learning media in modules, animated videos, and PowerPoint in acid-base learning. However, the learning media does not yet display a submicroscopic representation, which is very useful for helping students understand the material at a particular level [4]. Students' understanding can be seen from their ability to transfer and connect three levels of chemical representation, namely, macroscopic, submicroscopic, and symbolic [5]. Therefore, learning media containing three chemical representation levels are needed to help students understand this acid-base material.

The three levels of chemical representation can be seen using interactive learning media. Learning through multimedia is a learning experience for students using various media such as text, images, videos, and so on [6]. Interactive learning is a non-linear media, meaning it can cause an active learning process between teachers and students [7]. Interactive learning multimedia has several advantages, namely flexible, self-passing, content-rich, interactive, and individual [8]. One of the interactive learning media is PowerPoint-iSpring. It is said to be interactive because PowerPoint-iSpring contains text, videos, images, and animations that can help teachers and students learn. PowerPoint-iSpring integrated multiple chemical representations is a learning media with evaluation questions that lead students to learn to find concepts.

The use of interactive learning media is very helpful for students in achieving satisfactory learning outcomes. Interactive media greatly improves student learning outcomes on acid-base material at MAN 1 Meulaboh Aceh [9]. Interactive multimedia learning media can effectively improve students' cognitive abilities in chemistry [10].

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Before testing the effectiveness of the PowerPoint-iSpring learning media, a practicality test was first carried out. It was found that the media was declared practical, for the results can be seen in Appendix 8 and 11. It can be seen from the effects of completing questionnaires conducted by teachers and students. Based on the description above, currently available learning media in PowerPoint-iSpring integrated multiple chemical representations developed [11]. This learning media has been tested for validity with a very high category. Still, the effectiveness of the media has not been tested, which will be seen in students' learning outcomes.

RESEARCH METHODS

This research is experimental, namely by testing the effectiveness of the PowerPoint-iSpring learning media on student learning outcomes. Empirical research is a method used to find the effect of specific treatments on others under controlled conditions [12].

The type of experimental research used is quasi-experimental (Quasi Experiment Design). A quasi-experiment is a development experiment from an actual experiment (True Experiment Design) that is difficult to carry out. This design has a control class. However, this design does not fully control the variables that affect the implementation of the experiment [13]. The model that will be used is the Non-Equivalent Control Group Design. This research model is almost the same as the Pretest-Posttest Control Group Design, using two sample classes, namely the experimental and control classes, but the course is not chosen randomly. For the research population, all students of class XI SMAN 2 Batang Kapas for the academic year 2021/2022. The experimental class was given treatment using PowerPoint-iSpring learning media, while the control class was treated without using PowerPoint-iSpring learning media. The sampling technique used was purposive sampling with homogeneous criteria [14]. The course selected as the sample is class XI MIPA 1 as the experimental class and class XI MIPA 2 as the control class. The instrument was used as a questionnaire, and a test of student learning outcomes in the form of multiple choice questions, totaling 20. The N-Gain and hypothesis testing were carried out for data analysis with an independent sample t-test (T-test).

Table 1. N-Gain Test Criteria

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

N-Gain test aims to see the effectiveness. The effectiveness of PowerPoint-iSpring learning media can be tested with N-Gain data. The following levels of N-Gain criteria can be categorized in Table 1.

To test the hypothesis by using the independent sample t-test (T-test). Acceptance criteria H0, if H_0 has a significance value > 0.05 and if H_0 < 0.05 then it is rejected. H_0 is a statistical hypothesis that states no effect of the treatment given. Acceptance criteria at a significance level of 0.05

- Significance value (sig) > 0.05 accept H_0
- Significance value (sig) < 0.05 reject H_0.

RESULTS AND DISCUSSION

The lowest pretest score was obtained in the experimental and control classes, and one person received the lowest score with a value of 10. The highest score in the experimental class and control class was 35, which were both obtained from 3 students. The following is for the post-test score of students after the learning process related to Acid & Base material. The lowest post-test score in the experimental class was 30, and the control class was 25. In contrast, the highest score in the experimental class post-test was 80, obtained from 1 student, and 70for the control class, which received three students.

The average pretest value obtained from the experimental class was 22.83, while the control class was 22.67. The average post-test value in the experimental class, the score was 51.33, and for the control, the class was 43.33. The average value in the experimental class is higher than the control classes, where the experimental class's average value is 28.5 while the control class is 20.7.

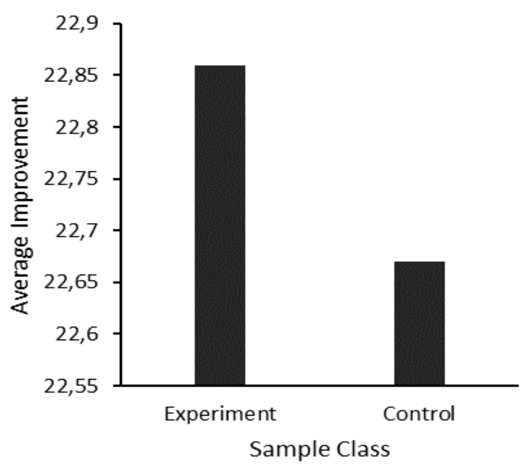

Figure 1. Comparison graph of the average improvement in learning outcomes for the sample class

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From the graph, it can be seen that the comparison of the increase in student learning outcomes, where the increase in learning outcomes in the experimental class is higher than in the control class. The difference in the average value of the sample class is 7.8.

Table 2. Sample Class N-Gain Results

Class	Average N-Gain	Category
Experiment	0.38	Medium
Control	0.27	Low

The average value of N-Gain in the experimental class is 0.38, which is in the medium category. In the control class, the average N-Gain value is 0.27, where this value is in the low category [15].

Table 3. Sample Class Normality Test Results

Class	Significance (Sig)	Category
Experiment	0.129	Normal
Control	0.095	Normal

From these data, the two sample classes are normally distributed, where the results of significance > 0.05, which means that the data is normally distributed.

Table 4. Sample Class Homogeneity Test Results

Class	Significance (Sig)	Category
Experiment Control	0.561	Homogeneous

The homogeneity test in the sample class obtained a significance value (sig) of 0.561 > 0.05. That is, the learning outcomes of the sample class data have a homogeneous variance [16].

Table 5. Sample Class Hypothesis Test Results

Class	(Sig 1-tailed)	Category
Experiment Control	< 0.001	H_0 rejected H_1 received

Based on the table above, it can be seen that the Sig (1-tailed) value for the T-test is < 0.001. Thus, H0 is rejected because of the Sig (1-tailed) value < 0.05. While H1 is accepted in this T-test, it proves that using PowerPoint-iSpring Integrated Multiple Chemical Representation learning media effectively improves student learning outcomes in the experimental class, where the learning outcomes are higher than in the control class.

The learning process in the experimental class, namely XI MIPA 1, uses learning media such as PowerPoint-iSpring Integrated Multiple Chemical Representations. Learning activities are carried out at the Computer Laboratories in the school. While in the control class, learning is carried out in the classroom, and the learning media used is in the form of PowerPoint, which is adapted to the PowerPoint owned by the chemistry teacher at school. The use of PowerPoint in learning uses infocus so that it can be seen together by students. This PowerPoint contains text and images. At the end of the lesson, each sample class was given practice questions. It was done to strengthen students' concepts regarding the material being studied. Carrying out exercises after learning can reinforce students' concepts [17]. After education is completed in the two sample classes, each class is given a post-test.

Using PowerPoint-iSpring learning media integrated with Multiple Chemical Representations on Acid-Base Materials effectively improves student learning outcomes. Learning media can enhance students' learning process and learning outcomes [18]. And PowerPoint-iSpring media can be said as interactive multimedia. Multimedia is a media that contains a combination of images, videos, text, art, and animations that are delivered to students through electronic devices [19]. Besides that, multimedia involves students actively in learning, such as learning to find concepts and answer questions contained in the media. Interactive media can improve students' analytical and synthesis skills [20]. PowerPoint-iSpring integrates Multiple Chemical Representations. Multiple Chemical Representations, including macroscopic, submicroscopic, and symbolic, can facilitate learning chemistry and helps increase student learning success [21]. PowerPoint-iSpring learning media integrated prompting questions on the chemical equilibrium shift sub-material effectively improves student learning outcomes [22].

The obstacles experienced during the study were the lack of student motivation to repeat learning at home and not being careful in reading and understanding the pretest and post-test questions. Therefore, students must repeat the lessons learned to obtain maximum learning outcomes. From the explanation above, it can be concluded that there is an increase in student learning outcomes using PowerPoint-iSpring learning media compared to the control class in the learning process without using PowerPoint-iSpring. As a result, the availability of PowerPoint-iSpring learning media on Acid-Base material effectively improves the learning outcomes of class XI Senior High School students.

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CONCLUSION

The PowerPoint-iSpring learning media that integrates multiple chemical representations effectively improves student learning outcomes on acid-base material for class XI Senior High School. It can be seen from the learning outcomes between the experimental class that used PowerPoint-iSpring, that the student scores were higher than the control class, which did not use PowerPoint-iSpring media.

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