Vol 13 (3), 2024, 11-19 DOI: 10.23960/jppk.v13.i3.30478
Jurnal Pendidikan dan Pembelajaran Kimia
e-ISSN: 2714-9595| p-ISSN 2302-1772
http://jurnal.fkip.unila.ac.id/index.php/JPK/index

The Influence of the Implementation of the *Discovery Learning* Model Assisted by *Powtoon* Animated Video Media on Student Learning Outcomes in Buffer Solution Material

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Received: July 2nd, 2024 Accepted: November 30th, 2024 Online Published: December 25th, 2024

Abstract: The Influence of the Implementation of the *Discovery Learning* Model Assist ed by *Powtoon* Animated Video Media on Student Learning Outcomes in Buffer Solution Material. The quality of education can be improved through teaching methods that actively engage students, such as Discovery Learning. However, at SMAN 15 Medan, students still struggle to understand the topic of buffer solutions, resulting in exam scores that do not meet the Minimum Mastery Criteria (KKM). The use of Powtoon animation media in the Discovery Learning model is expected to help students understand abstract concepts and improve their learning outcomes. This study aims to evaluate the effect of the Discovery Learning model supported by Powtoon animation videos on students' learning outcomes in the topic of buffer solutions. The research population includes all 11th-grade students at SMAN 15 Medan, with a sample of class XI IPA 4 selected through the Simple Random Sampling method. The instrument used is a learning outcome test consisting of 20 multiple-choice questions. The hypothesis test using a one-sample t-test shows a significance value of 0.043, which is lower than α (0.05), thus accepting the alternative hypothesis (Ha) and rejecting the null hypothesis (Ho). This indicates that students who learn using the Discovery Learning model assisted by Powtoon animation videos successfully achieve the Minimum Mastery Criteria of 78 or KKM (78). Additionally, the N-gain analysis shows an average score of 0.72, with a percentage of 71.68% falling into the high category. These results indicate that the implemented learning model is quite effective in improving students' learning outcomes on the topic of buffer solutions. The learning outcomes of students taught using the Discovery Learning model assisted by Powtoon animation videos in the 11th-grade science class (MIPA) exceed the Minimum Mastery Criteria of 78 or KKM (78). There is an influence of the Discovery Learning model assisted by Powtoon animation media on students' learning outcomes.

Keywords: Discovery Learning Model, Learning Outcomes, Powtoon Animated Video Media, Buffer Solution.

Abstrak: Pengaruh Penerapan Model Discovery Learning Berbantuan Media Video Animasi Powtoon Terhadap Hasil Belajar Siswa Pada Materi Larutan Penyangga. *Mutu pendidikan dapat ditingkatkan dengan metode pembelajaran yang melibatkan*

siswa secara aktif, seperti Discovery Learning. Namun, di SMAN 15 Medan, siswa masih kesulitan memahami materi larutan penyangga, yang mengakibatkan hasil ujian belum memenuhi KKM. Penggunaan media animasi Powtoon dalam model Discovery Learning diharapkan dapat membantu siswa memahami konsep yang abstrak dan meningkatkan hasil belajar mereka.Penelitian ini bertujuan untuk mengevaluasi pengaruh model pembelajaran Discovery Learning yang didukung oleh video animasi Powtoon terhadap hasil belajar siswa pada materi larutan penyangga. Populasi penelitian mencakup seluruh siswa kelas XI di SMA Negeri 15 Medan, dengan sampel kelas XI IPA 4 yang dipilih melalui metode Simple Random Sampling. Instrumen yang digunakan adalah tes hasil belajar berupa 20 soal pilihan ganda. Uji hipotesis menggunakan t-test satu sampel menunjukkan nilai signifikansi 0,043, yang lebih rendah dari α (0,05), sehingga hipotesis alternatif (Ha) diterima dan hipotesis nol (Ho) ditolak. Hal ini menunjukkan bahwa siswa yang belajar dengan model pembelajaran Discovery Learning berbantuan video animasi Powtoon berhasil mencapai Kriteria Ketuntasan Minimal 78 atau KKM (78). Selain itu, analisis N-gain menunjukkan skor rata-rata 0,72, dengan persentase sebesar 71,68% yang masuk dalam kategori tinggi. Hasil ini mengindikasikan bahwa model pembelajaran yang diterapkan cukup efektif dalam meningkatkan hasil belajar siswa pada materi larutan penyangga. Hasil belajar siswa yang diajarkan dengan model pembelajaran Discovery Learning berbantuan media video animasi Powtoon pada materi larutan penyangga di kelas XI MIPA melampaui Kriteria Ketuntasan Minimal 78 atau KKM (78). Ada pengaruh model pembelajaran Discovery Learning berbantuan media video animasi Powtoon terhadap hasil belajar siswa.

Kata kunci: *Model Discovery Learning, Hasil Belajar, Media Video Animasi Powtoon , Larutan Penyangga*

- **INTRODUCTION**

To achieve improvement, education is necessary as it guides individuals towards betterment, and this effort is known as learning. In the context of learning, the role of teachers becomes crucial as a primary driver to enhance the quality of education (Anggorowati, 2020). Improved student learning outcomes are an indicator of enhanced educational quality (Baghdadi, 2021). Consequently, one method to enhance educational quality and achieve educational goals is by shifting the focus of the learning process from teachers to students. With this approach, students are encouraged to actively construct their own understanding, which in turn has the potential to improve student learning quality (Ratnadewi & Arini, 2018).

The improvement of education quality is closely related to the learning process. Ideally, the learning process encompasses interactive, inspirational, enjoyable, active, challenging, motivating aspects, and provides students with opportunities to become more independent. The principles of learning in the 2013 Curriculum are designed to meet these standards. The 2013 Curriculum aims to implement a learning approach that no longer focuses on teachers but on students. One of the principles of learning in the 2013 Curriculum is the role of students shifting from being receivers of information to seekers of knowledge from various sources, not just from teachers (Majir, 2017).

One of the high schools in Medan, namely SMAN 15, still uses the 2013 curriculum for grades XII and XI. However, for grade X, they have already

implemented the Merdeka Belajar curriculum. According to the researcher's initial observations, the issue in the field of chemistry, particularly regarding buffer solution materials, is perceived as difficult to understand by students due to the abundance of abstract concepts requiring thoughtful comprehension. Lecture techniques are still employed by teachers when discussing learning topics. A significant amount of time is spent on answering questions, completing assignments, and taking notes. Learning and note-taking consume more time. Because students find buffer solution materials challenging, the examination results conducted have not yet met the Minimum Completion Criteria (78).

Chemistry is one part of the natural science (IPA) field of study which is very close in context in everyday life. Chemistry is one of the subjects that is difficult for most high school students (Sitinjak & Pulungan, 2024). The main problem students face in understanding chemistry learning is that the material contains many abstract and complex concepts so they need in-depth understanding (Angel & Silitonga, 2024). In chemistry, buffer solution material is one of the topics. Buffer solution is a chemically complex composition that involves abstract properties in acid-base reactions mathematically in pH calculations and applicatively in function. Students are expected to grasp basic concepts about buffer solutions, such as acid-base materials, equilibrium, and salt hydrolysis. Therefore, they are likely to be able to complete tasks related to buffer solution materials (Genes et al., 2021). If students struggle to understand the concept of buffer solutions, they may encounter misconceptions. If these misconceptions occur repeatedly, it can lead to a misunderstanding of the concept (Sihaloho, 2013)

Discovery Learning is a learning model where the teacher acts as a facilitator, assisting students in exploring, examining, and discovering new information through direct activities. The teacher challenges students, which they use to solve problems and investigate. Discovery Learning is part of the scientific learning paradigm, aimed at enhancing student understanding and making learning more relevant (Syafii, 2022).

According to previous research, learning buffer solutions through the Discovery Learning approach can improve student learning outcomes. According to Nurfauzia et al. (2021), this not only enhances student learning outcomes but also increases their participation in chemistry learning activities (Jayadiningrat et al., 2019). Discovery Learning is a teaching method where students organize their own information with the goal of uncovering previously unknown topics or principles. This model is implemented using media such as visual animations (Putra and Sujana, 2020).

One example of animation media is Powtoon animation videos. Powtoon animation videos can enhance the Discovery Learning model by presenting complex concepts visually and dynamically, stimulating critical thinking, and facilitating independent exploration by students. In the context of Discovery Learning, animation videos can be used to illustrate natural phenomena, abstract processes, or scientific concepts that are difficult to understand through verbal explanations or text alone. With engaging animations, students can observe events they might not witness directly, control the speed and repetition of material presentations, and have the opportunity for deep reflection. They can explore cause-and-effect relationships and gain a profound understanding of the concepts being learned. As an interactive tool, animation videos

expand the learning space and enable students to become active learners who lead their own discovery process (Rizqi et al., 2024).

The Powtoon animation media is designed to make abstract concepts more concrete, making it highly suitable for Discovery Learning practices. This method is very effective in enhancing students' interest in face-to-face learning, which can improve their learning outcomes. This is consistent with Tarigan's research (2023) titled "The Effects of Model Problem Based Learning Based on Powtoon and Powerpoint Animations on Student Learning Outcomes." According to Tarigan (2023), the use of Powtoon application provides a more specific and clear learning experience, facilitating students' understanding. This indicates that the use of Powtoon animation media has a positive impact on learning outcomes.Based on the background above, the author is interested in conducting a research.

▪ METHOD

Population and Sample

The population of this study consists of all 11th-grade students in the Science Program at State Senior High School 15 Medan for the academic year 2023/2024, comprising 9 classes and 315 students, all of whom are included in this research. To collect a sample, one class was selected using simple random sampling, which is the simplest method conducted fairly, ensuring that each unit has an equal chance of being chosen.

Research Design and Variables

According to Sugiyono (2014), this study utilizes a pretest-posttest one-group design. In this research design, the experimental group was administered a pre-test before the learning began, and a post-test was given after the treatment using Powtoon animation videos with the Discovery Learning model applied.

Independent Variable The variable that influences the dependent variable is called the independent variable (X). In this study, the Discovery Learning model assisted by Powtoon animation videos serves as the independent variable. Dependent Variable The dependent variable (Y) is the variable that is influenced by the independent variable. In this research, the dependent variable is the students' learning outcomes. Control Variables The control variables in this study include the taught material (Buffer Solutions), the same teacher, and the Pretest and Posttest instruments.

Research Instruments

This Research employs pre-test and post-test findings of students in chemistry learning. The post-test is conducted at the end of the learning session to measure students' learning outcomes after the intervention. This test consists of forty multiple-choice questions, initially validated, each with five answer options (A, B, C, D, and E) and one correct answer. These questions were validated by experienced validators and piloted in a Class XII Science program.

Bloom's Taxonomy defines four cognitive levels: understanding (C2), application (C3), and analysis. The research instrument's analysis is conducted qualitatively. This strategy involves selecting relevant test items while considering reliability, validity, difficulty level, and discriminative power. A sample of Class XII students from State Senior High School 15 Medan participated in the test, scoring 1 for correct answers and 0 for incorrect ones. Final scores were calculated based on students' total scores.

Data Collection Techniques

The data collection method involves interviews and observations with teachers regarding issues occurring at State Senior High School 15 Medan. Furthermore, the research is conducted to gather learning outcome data. This is achieved through the use of Pretest and Posttest assessments on buffer solution materials. The Pretest is administered before implementing the Discovery Learning model, which utilizes Powtoon animation videos in the classroom.

Data Analysis

Normality Test

The normality test is used to determine whether the data obtained from the study, particularly from the Posttest, follows a normal distribution or not. The normality test is conducted using the Shapiro-Wilk test at a significance level of 5% or 0.05. Data is considered normal if the p-value > α (0.05), and not normal if the p-value < α (0.05).

Homogeneity Test

The homogeneity test analyzes the standard deviation in this study to ensure that the tested data has a uniform distribution or does not differ significantly from the population assumptions.

Hypothesis Testing

This study employs a one-sample t-test hypothesis test at a significance level (α) of 0.05. The alternative hypothesis (Ha) is accepted if the p-value < α (0.05), and the null hypothesis (Ho) is accepted if the p-value > α (0.05).

▪ RESULT AND DISCUSSION

Normality of the data was tested using SPSS Version 20.0 for Windows software, employing the Shapiro-Wilk test at a significance level of α = 0.05. Based on the test results, if the p-value > α (0.05), it can be concluded that the data follows a normal distribution. Detailed results of the normality test for this research data can be seen in Table 1.

Table 1. Results of Normality Test

	Shapiro-Wilk		
	Statistic	Df	Sig.
Learning_outcomes	0,950	32	0,144

From Table 1, it is found that the p-value for learning outcomes is 0.114. Since this p-value is greater than α (0.05), it can be concluded that the learning outcomes using the Discovery Learning model assisted by Powtoon animation videos follow a normal distribution.

To test homogeneity, the standard deviation of the posttest results was evaluated. A standard deviation value of 8.302 indicates that, with this relatively small standard deviation, the data is considered homogeneous. Table 2 displays detailed results of the homogeneity test for this research data.

Table 2. Results of Homogeneity Test

	Mean	***Variance***	***Std. Deviation***	***Minimum***	***Maximum***	***Range***
Learning_outcomes	81,09	68,926	8.302	60	95	35

After completing the parametric test requirements, where the data are normally distributed, they can be combined with statistical tests for hypothesis testing. Hypothesis testing is conducted using a one-sample t-test at a significance level α (0.05). If the resulting p-value (sig) < α (0.05), the alternative hypothesis (Ha) is accepted; if sig > α (0.05), Ha is rejected. The results of hypothesis testing calculations are presented in the table.

Table 3. The Results of the Hypothesis Test (One-Sample Test)

	N	***Mean***	***Std. Deviation***	***Std. Mean***
Learning_outcomes	32	81.09	8.302	1.468
	Test Value = 78			
	T	***Df***	***Sig. (2-tailed)***	***Mean Difference***
Learning_outcomes	2.108	31	.043	3.094

The hypothesis testing was conducted using Windows SPSS Version 20 at a significance level (α) of 0.05, with the students' p-value (sig) being 0.043, which is below α (0.05). The results indicate that the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected. Therefore, based on the research problem formulation, it can be concluded that students using the Discovery Learning model with the assistance of Powtoon animation videos achieved the Minimum Mastery Criteria (78) in buffer solution material for Class XI Science.

Table 4. The Results of the N_gain Test

	Pretest	***Posttest***	***N_gain Score***	***N_Gain Score (%)***
Learning_outcomes	34.69	81.09	0.72	71.68

Based on the results of the N-gain test, it can be concluded that the use of the Discovery Learning model assisted by Powtoon animation videos on the topic of buffer solutions is quite effective, with an average N-gain score of 0.72. According to the percentage of the N-gain score, which is 71.68%, it falls into the high category. Therefore, it can be concluded that there is an influence of the Discovery Learning model assisted by Powtoon animation media on students' learning outcomes. The N-gain calculation can be seen in the appendix.

This study focuses on a single experimental class, namely class XI IPA 4. The Discovery Learning teaching method, which involves Powtoon animation videos, was used to teach the buffer solution topic in the second semester of grade XI at SMA

Negeri 15 Medan. The research involved all eleventh-grade students, consisting of nine classes. The sampling method used was simple random sampling.

To begin the study, the research sample was given a pretest consisting of twenty questions, which met requirements such as difficulty, discrimination power, validity, instructions, and reliability. The pretest lasted for 45 minutes, or one learning session. Both sample groups showed normal and homogeneous distribution, with an average pretest score of 34.68 (±7.88). The results indicated that the students had a low initial ability in the experimental class.

The Discovery Learning model was then used to continue the learning process in the classroom, with the assistance of Powtoon animation media. The learning began with preparatory activities, such as greetings, prayers, and taking attendance. After that, the topic was introduced, and students were given motivation related to the subject matter. Additionally, the learning objectives were stated. Subsequently, 32 students were divided into groups of 5-6 people. The researcher then proceeded with the core activities according to the learning model's syntax and delivered the lesson material using Powtoon animation videos. The students enjoyed the learning process because it was highly engaging. The classroom atmosphere became more lively and enjoyable with the use of the Discovery Learning model and Powtoon video media. Discovery Learning with animations encouraged students to independently discover and learn ideas, combined with the engaging and interactive Powtoon animations, making the class more dynamic and fun. As a result, the students felt more involved and motivated to follow each step of the learning process, prompting them to participate actively.

After three sessions, a posttest was conducted to measure the students' learning outcomes following the intervention. Based on the posttest data, the average learning outcome score of the experimental class was 81.09 ±8.30.

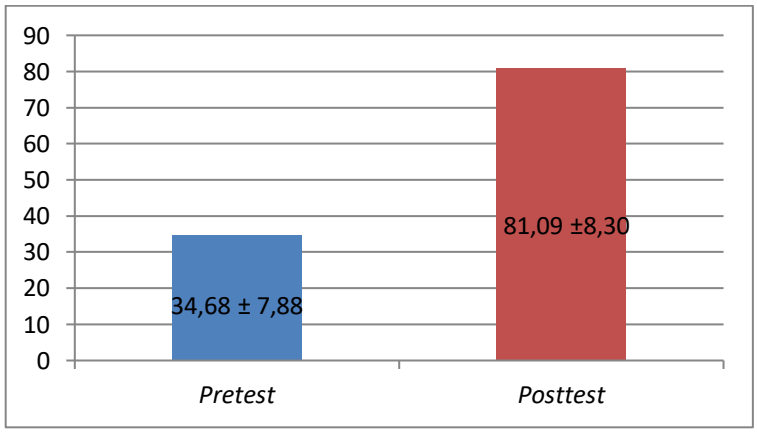

Figure 1. Graph of Learning Outcomes

Figure 1 shows the improvement in students' learning outcomes after applying Discovery Learning with Powtoon animation videos. A significance value of 0.043 < α (0.05) confirmed that students who used this approach met the Minimum Mastery Criteria (KKM) of 78, with an average score of 81.09 ± 8.30, indicating better performance. Agustina et al. (2019) and Tarigan (2023) supported these findings, suggesting that this method enhances learning in buffer solutions. Hypothesis test 2 results showed a high N-gain score of 0.72 (71.68%), indicating

effective improvement. The study demonstrated the significant impact of Discovery Learning with Powtoon in engaging students and improving understanding, especially in complex topics like buffer solutions.

In the early meetings, students watched Powtoon videos, asked questions, and discussed in groups, showing enthusiasm. In week three, they conducted practical work to apply theories learned, followed by presentations. Challenges included students' unfamiliarity with the Discovery Learning syntax and misuse of phones. For future research, better preparation is needed to introduce Discovery Learning, strict supervision of phone use should be applied, and active participation in group discussions should be encouraged by assigning clear roles to all members.

▪ CONCLUSION

Based on the research conducted, it can be concluded that the learning process using the Discovery Learning model combined with Powtoon animation video media on the topic of buffer solutions has a positive impact on grade XI science students. This is evidenced by the students' learning outcomes, which successfully exceeded the Minimum Mastery Criteria (KKM) set at 78. Furthermore, the use of the Discovery Learning model assisted by Powtoon animation videos has been shown to have a significant influence on students' understanding of buffer solution material.

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