Differences in Learning Outcomes and Critical Thinking Ability of Students Taught Using Learning Video Media and PowerPoint with Problem Based Learning Model on Reaction Rate Material

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Abstract: Differences in Learning Outcomes and Critical Thinking Ability of Students Taught Using Learning Video Media and PowerPoint with Problem Based Learning Model on Reaction Rate Material. This study aims to determine the differences in learning outcomes and critical thinking ability of students as well as the correlation between critical thinking Ability and learning outcomes of students taught using learning video media and PowerPoint with problem-based learning models on reaction rate material. This research method is a true experiment. The population of this study were all students of class XI IPA SMA Negeri 1 Lubuk Pakam and the sample was class XI J as the first experimental class taught with learning video media and class XI K as the second experimental class taught with PowerPoint media taken using random sampling technique. The results showed that there were differences in learning outcomes and critical thinking Ability of students taught using learning video media and PowerPoint with problem-based learning models on reaction rate material. The average learning outcome of experimental class I was 89.67 and experimental class II was 85.33. The critical thinking ability of experimental class I was 77.67 and experimental class II was 69.87. There is a positive and significant correlation between critical thinking ability and learning outcomes of students taught using learning videos of 0.837 with a very high category and using *PowerPoint* of 0.796 with a high category.

Keywords: Problem based Learning, Learning Video, PowerPoint, Learning Outcomes, Critical Thinking Ability

Abstrak: Perbedaan Hasil Belajar dan Kemampuan Berpikir Kritis Siswa Yang Dibelajarkan Menggunakan Media Video Pembelajaran dan PowerPoint dengan Model Problem Based Learning Pada Materi Laju Reaksi. *Penelitian ini bertujuan untuk mengetahui perbedaan hasil belajar dan kemampuan berpikir kritis siswa serta korelasi antara kemampuan berpikir kritis dan hasil belajar siswa yang dibelajarkan menggunakan media video pembelajaran dan PowerPoint dengan model problem based learning pada materi laju reaksi. Metode penelitian ini adalah true eksperimen. Populasi penelitian ini adalah seluruh siswa kelas XI IPA SMA Negeri 1 lubuk pakam dan Sampelnya adalah kelas XI J sebagai kelas eksperimen I dibelajarkan dengan media video pembelajaran dan kelas XI K sebagai kelas eksperimen II dibelajarkan dengan media PowerPoint yang diambil menggunakan teknik random sampling. Hasil penelitian menunjukan bahwa terdapat perbedaan hasil belajar dan kemampuan berpikir kritis siswa yang dibelajarkan menggunakan media video pembelajaran dan PowerPoint dengan model problem based learning pada materi laju reaksi. Rata-rata hasil belajar kelas eksperimen I sebesar 89,67 dan kelas eksperimen II sebesar 85,33. Kemampuan berpikir kritis kelas eksperimen I sebesar 77,67 dan kelas eksperimen II sebesar 69,87. Terdapat korelasi*

positif dan signifikan antara kemampuan berpikir kritis dan hasil belajar siswa yang diajarkan dengan menggunakan video pembelajaran sebesar 0,837 dengan katagori sangat tinggi dan menggunakan PowerPoint sebesar 0,796 dengan katagori tinggi.

Kata Kunci: *Pembelajaran Berbasis Masalah, Video Pembelajaran, PowerPoint, Hasil Belajar, Kemampuan Berpikir Kritis*

- **INTRODUCTION**

Learning is a change in behaviour that is relatively permanent and comes from past experience. Learning is an activity carried out by everyone in order to obtain changes in behaviour in the form of knowledge, skills and attitudes during the educational process. Learning is an ongoing process that is a fundamental element in the implementation of various types and levels of education (Nurrita, 2018).

Chemistry as one of the compulsory subjects in the learning curriculum in high school is a concept-rich and abstract science. Chemistry is not a new subject for students, but it is often found that students consider chemistry material complicated and difficult to learn, so they feel less able to learn it (Nainggolan, 2019). Reaction rate material is one of the topics in chemistry that is difficult for students to understand because it is part of an abstract chemical concept so that students often have difficulty understanding the concept (Sari et al., 2019). Students' understanding of reaction rate material requires changes that can improve understanding from conventional learning to innovative learning.

Based on the results of observations and interviews at SMA Negeri 1 Lubuk Pakam school, in the chemistry learning process the teacher still uses text book as the media, and the blackboard which makes the teacher the center of learning (teacher center) where this results in students being less active in the learning process, lack of student involvement in the learning process where students are accustomed to only taking notes and listening to the teacher explain this can be seen from the lack of student participation in asking questions related to material that has not been understood, students are also still difficult in completing assignments or problems given by the teacher which results in low student learning outcomes.

So, a strategy that involves a lot of active roles of students in finding and solving a problem related to the appropriate material is needed. The use of innovative learning media is needed to increase the enthusiasm for learning and make it easier for students to observe and follow the learning process in the classroom. The use of learning media is needed to help students in the learning process to achieve learning goals and gain success in learning (Wibowo et al., 2021). The use of media and learning models in the teaching and learning process can arouse new curiosities and interests, generate motivation and stimulation of learning activities in the problem-solving process, and have a psychological influence on students (Nainggolan, 2019). It is needed to choose a model and teaching media that can improve students' critical thinking skills. This aims to make the learning process more effective and interesting, in accordance with the material being studied. Students who have good critical thinking skills tend to understand learning materials more easily. This critical thinking skill also provides great benefits in solving learning challenges and daily life situations (Afriani et al., 2020).

The development of education in Indonesia currently emphasises on improving the quality of learning outcomes, especially in the fields of science and technology. To achieve this, efforts are needed to improve the learning process. One of the strategies

that can be taken is to find the right model, method, or learning media, so that all aspects of learning can be utilised optimally in order to achieve the desired learning objectives (Rizkia & Simorangkir., 2018).

One of the appropriate learning that can be used in 21st century learning is TPACK. According to Schmidt et al (Farikah and Malik, 2020) Technological Pedagogical Content Knowledge (TPACK) is an understanding of how technology can be utilised in the teaching and learning process. TPACK includes knowledge of various technologies that can be applied in teaching and the ability to use technology to change teachers' teaching methods. Advances in science and technology have made students more likely to learn with new, easy, and interesting methods, such as through images, videos, or animations on devices such as televisions, computers, or gadgets. The development of science and technology also encourages rejuvenated efforts in utilising the results of technology to improve the quality of learning.

Learning media in the teaching and learning process is an important factor in supporting the success of learning. In addition, the use of media can help the teacher's task in delivering subject matter because the media contains materials that students must learn so that students' obscurity of the material the teacher explains can be helped by the existence of learning media. The utilisation of learning media in the teaching process is not only able to foster new learning interests and motivations, but also provide positive stimuli for student learning activities, and even have a psychological impact on students. In addition to increasing student motivation and interest, learning media can also support increased student understanding, present data in an interesting and reliable manner, facilitate data interpretation, and summarise information effectively. (Ismail et al., 2016).

Video media has the advantage of conveying messages that can be received evenly by students, both in explaining the process, overcoming space and time limitations, can be stopped, and repeated as needed and gives a deep impression in influencing students' attitudes (Harling, 2021). The utilisation of video media helps in illustrating concepts that are considered abstract for students. By using video media as a visual and audio aid, the delivery of knowledge to students becomes more effective. By visualising abstract concepts, students develop critical thinking and problem-solving skills that impact their academic success and interest in learning (Atika et al., 2018).

According to Agustiningsih (Artayasa, 2021), video media can eliminate the impression of verbalism in conveying messages because it is combined with impressions other than words. As well as expanding learning inspiration, videos also make it easier for students to learn complex and complicated material (Limbong & Simarmata, 2020). Not only video media, but there are also good media used by teachers in teaching and learning activities, especially the use of PowerPoint Media. PowerPoint media is one of the Microsoft office application programs that is useful for making presentations in the form of pages. PowerPoint applications (presentation media) are very often used by educators in the education process. The use of PowerPoint makes learning easy and interesting because it is supported by various objections and themes to make the presentation look beautiful (Kadaruddin, 2018).

PowerPoint is one of the popular tools because of its ease and completeness of features that are very supportive in making a good presentation. With this program, it can explain ideas or ideas to others such as teachers, friends, or parents effectively so that the material we convey will be clearer, interesting, easy to understand and practical.

Therefore, this program can provide attractive images and colors on presentation sheets, as well as neatly arranged (Irawan, 2022).

In addition to the use of learning media, the use of the right learning model can help students in the learning process to improve learning outcomes. One of the learning models that can be applied in the learning process is the Problem Based Learning (PBL) model. Problem Based Learning (PBL) is a model that is designed for students to gain important knowledge that makes them proficient in problem solving and has Ability in participating in teams (Magdalena et al., 2014). Problem-based learning is a learning strategy by exposing students to practical problems as a foothold in learning or students learn through the presentation of problems. This learning is expected to attract students' interest and activeness to learn chemistry so that their learning outcomes will improve (Nainggolan, 2019).

Previous relevant research has been done but only measuring learning outcomes has not measured important aspects such as critical thinking Ability. As conducted by Syaribuddin (2016) shows that problem-based learning assisted by video media can improve learning outcomes with an average score of 84 in the experimental class. Research conducted by Saragi (2022) states that the effect of problem-based learning models using PowerPoint on the results on reaction rate material can improve learning outcomes with an average score of 80.88. Based on this, researchers feel the need for further research to find out the differences in learning outcomes and critical thinking Ability of students who are taught using learning video media and PowerPoints with problem-based learning models on reaction rate material.

- **METHOD**

The method in this research is true experiment. This research was conducted in October-November at SMA Negeri I Lubuk Pakam. The population is all students of class XI IPA SMA Negeri 1 Lubuk Pakam which amounted to 4 classes. The sample was class XI J as an experimental class I which amounted to 30 people and XI K as an experimental class II which amounted to 30 people. Samples were taken with random sampling technique. Experimental class I was taught using learning video media with problem-based learning model and experimental class II was taught using PowerPoint media with problem-based learning model.

The procedure in this study is organized in three stages, namely: 1) the preparation stage, including: observation, problem formulation, preparing lesson plans, preparing and validating test instruments and learning media, standardizing research instruments; 2) the implementation stage, including: determining the sample, conducting pre-test, implementing learning, conducting post-test, conducting critical thinking Ability tests; 3) the data analysis stage, including: processing or analyzing data hypothesis testing and making conclusions.

The instrument used is in the form of pre-test and post-test questions totaling 20 multiple choice questions and critical thinking Ability questions totaling 5 essay questions. Before the instrument was used, the researcher first compiled 40 multiple choice question grids and 5 essay question grids. The grids were then validated by the expert lecturers and then multiple choice questions were tested on students. After the trial, the validity, reliability, difficulty level, distinguishing power, and distractors were tested.

Technical data analysis includes prerequisite analysis consisting of homogeneity test and hypothesis test. After that, hypothesis testing was carried out by using a two-

party t test and a correlation test between critical thinking Ability and learning outcomes.

- **RESULT AND DISCUSSION**

The results acquired in this study are described as follows:

1. Data on Student Learning Outcomes and Critical Thinking Ability

The data obtained are pre-test, post-test and critical thinking Ability. The average data of experimental class I and experimental class II can be seen in Figure 1 below.
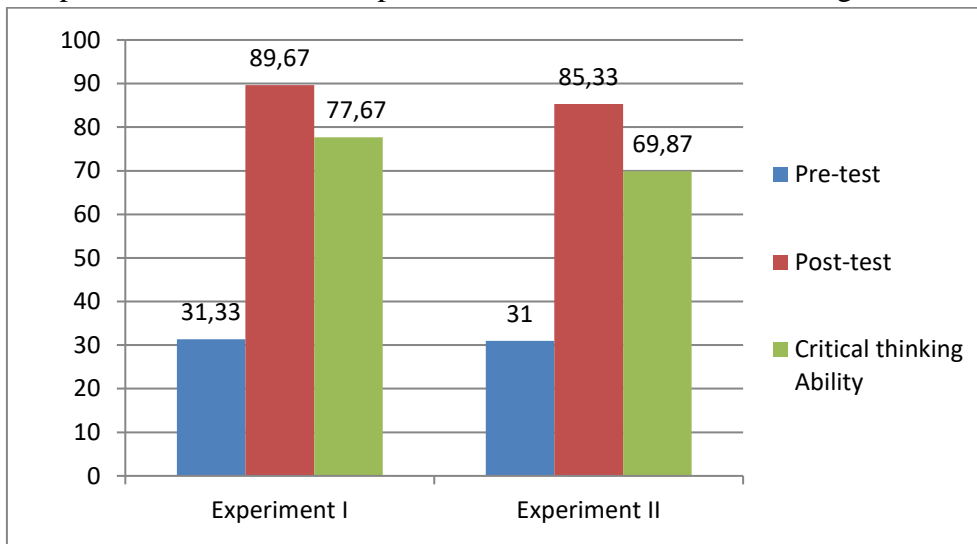
Gambar 1. Graph of Data on Student Learning Outcomes and Critical Thinking Ability

The graph in Figure 1 shows that the average pre-test of experimental class I is 31.33, the post-test value is 89.67, and the critical thinking ability is 77.67. While in experimental class II, the pre-test value was 31, the post-test value was 85.33, and the critical thinking ability was 69.87.

Experimental class I which was taught using learning video media with a problem-based learning model obtained higher learning outcomes and critical thinking ability than experimental class II which was taught using PowerPoint media with a problem-based learning model. This is because the use of learning video media is more attractive to students in paying attention to learning, the use of learning video media can provide visual and music simulations, and can eliminate the impression of verbalism in conveying messages because it is combined with impressions other than words, and expand learning inspiration. As a result, students think critically, and problem solving ability increase and their success and interest in learning. compared to the use of PowerPoint media where some student behaviors such as lack of enthusiasm in paying attention to learning.

2. Data Normality Test

Normality was measured using the chi squared test at a significant level of $\alpha = 0.05$. The test results can be seen in Table 1 below:

Tabel 1. Data Normality Test

Data	Class	$(X^2)_{Count}$	$(X^2)_{Table}$	Description
Learning Outcomes	Experiment I	7,85	11,07	Normally distributed
	Experiment II	6,25	11,07	Normally distributed
critical thinking Ability	Experiment I	6,40	11,07	Normally distributed
	Experiment II	6,75	11,07	Normally distributed

The data in Table 1 shows that learning outcomes and critical thinking Ability are normally distributed.

3. Data Homogeneity Test

The results of the homogeneity test conducted in this study can be seen in Table 2 below:

Tabel 2. Data Homogeneity Test

Data	F_{Count}	F_{table}	α	Description
Learning Outcomes	1,11			Homogeneous
critical thinking Ability	1,44	1,86	0,05	Homogeneous

The data in Table 2 shows that the data on learning outcomes and critical thinking Ability are homogeneous.

4. Hypothesis Test

Hypothesis testing is done through two-party t test and correlation test. Hypothesis testing is explained as follows:

Tabel 3. Hypothesis Test I (Learning Outcomes)

Class Data		t_{Count}	t_{table}	α	Description
Experiment I	Experiment II				
$\bar{X}_1 = 89,667$	$\bar{X}_2 = 85,333$				Ha accepted, Ho denied.
$n_1 = 30$	$n_2 = 30$	2,86	2,00	0,05	
$S_1 = 6,008$	$S_2 = 5,713$				

The data in Table 3 shows the value of $t_{count} > t_{table}$ (2.86 > 2.00). Thus Ha is accepted, namely there is a significant difference in the learning outcomes of students taught using learning video media with Problem Based Learning models compared to

the learning outcomes of students taught using PowerPoint media with Problem Based Learning models on reaction rate material.

Tabel 4. Hypothesis Test II (Critical Thinking Ability)

Class Data		t_{Count}	t_{table}	α	Description
Experiment I	Experiment II				
$\bar{X}_1 = 77{,}667$	$\bar{X}_2 = 69{,}867$				Ha accepted,
$n_1 = 30$	$n_2 = 30$	3,07	2,00	0,05	Ho denied.
$S_1 = 8{,}922$	$S_2 = 10{,}699$				

The data in Table 4 shows the value of $t_{count} > t_{table}$ (3.07 > 2.00). With Ha accepted, namely there is a significant difference in the critical thinking ability of students taught using learning video media with Problem Based Learning model compared to the critical thinking ability of students taught using PowerPoint media with Problem Based Learning model on reaction rate material.

Tabel 5. Hypothesis Test III (Correlation of Critical Thinking Ability and Learning Outcomes)

Class Data		r_{Count}	r_{table}	Description
Experiment I	Experiment II			
$\sum X : 2330$	$\sum X : 2096$			
$\sum Y : 2690$	$\sum Y : 3560$	I = 0,837		
$\sum X^2 : 183272$	$\sum X^2 : 149760$			Ha accepted,
$\sum Y^2 : 242250$	$\sum Y^2 : 219400$		0,361	Ho denied.
$\sum XY : 210225$	$\sum XY : 180270$	II = 0,796		
N : 30	N : 30			

The data in table 5 shows the value of $r_{count} > r_{table}$ (0.837 > 0.361) and (0.796 > 0.361). Thus Ha is accepted, namely there is a positive and significant correlation between students' critical thinking ability and student learning outcomes on reaction rate material.

In this study, the learning process was carried out based on the problem-based learning model using learning video and PowerPoint media. Experimental class I used learning video media with problem-based learning model and experimental class II used PowerPoint media with problem-based learning model.

In hypothesis test I, obtained t_{count} greater than t_{table} (2.86 > 2.00) which means Ha is accepted which means there is a significant difference in the learning outcomes of students who are taught using learning video media with Problem Based Learning model compared to the learning outcomes of students who are taught using PowerPoint media with Problem Based Learning model on reaction rate material. The average value of learning outcomes of experimental class I was obtained at 89.67 and experimental class II at 85.33, where the average learning outcomes of experimental class I which

was taught using learning video media with a problem-based learning model were higher than experimental class II which was taught using PowerPoint media with a problem-based learning model. The same results were obtained in Mudasih's research (2019) which stated that the average learning outcomes using video media were 85 and those using PowerPoint media were 79 and by Nainggolan (2023) which stated that the average learning outcomes using learning video media were 82.29 and learning outcomes using PowerPoint media were 78.06.

The results of hypothesis II testing obtained t_{count} greater than t_{table} (3.07> 2.00) which means Ha is accepted which means there is a significant difference in the critical thinking ability of students taught using learning video media with Problem Based Learning model compared to the critical thinking ability of students taught using PowerPoint media with Problem Based Learning model on reaction rate material. The average value of critical thinking ability of experimental class I was obtained at 77.67 and experimental class II at 69.87. Thus, the average results of the critical thinking ability of experimental class I which is taught using learning video media with problem-based learning model is higher than experimental class II which is taught using PowerPoint media with problem-based learning model. This is in line with research conducted by Melisa (2023) which states that the average high-level thinking ability with learning video media are 77.03 and using PowerPoint media 45.92.

In hypothesis III, the correlation test from the calculation results obtained $r_{count}>$ r_{table}. in experimental class I 0.837> 0.361 and in experimental class II 0.796> 0.361. Thus Ha is accepted, namely there is a positive and significant correlation between students' critical thinking ability and student learning outcomes on reaction rate material. This is in accordance with Raturoma's research (2023) which states that there is a positive and significant correlation between critical thinking and student learning outcomes.

- **CONCLUSION**

Based on the results of the study, there is a significant difference in learning outcomes and critical thinking ability of students taught using learning video media with Problem Based Learning model compared to the learning outcomes of students taught using PowerPoint media with Problem Based Learning model on reaction rate material. There is a significant correlation between students' critical thinking ability and the learning outcomes of students taught using learning video media and PowerPoint with problem-based learning models on reaction rate material.

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