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The Influence of Problem Based Learning and Discovery Learning Models Assisted by Learning Video Media on Student Learning Results and Activities on Redox Reaction

Aisyah Sari Dewi Harahap, Jasmidi

Department of Chemistry Education, Faculty of Mathematics and Natural Sciences, University of Medan, Jl. William Iskandar Pasar V, Medan, Indonesia.

*Correspondinge-mail: aisyahsaridh06@gmail.com

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Abstract: The Influence of Problem Based Learning and Discovery Learning Models Assisted by Learning Video Media on Student Learning Results and Activities on Redox Reaction. This study aims to analyze the differences in learning outcomes and student engagement between the Problem Based Learning (PBL) model and the Discovery Learning (DL) model supported by learning videos, as well as to identify the relationship between these factors in the context of redox reactions at MAS Muallimin Univa Medan. The sample consists of two classes randomly selected from the Class X MIA population: the PBL class (X MIA 2) and the DL class (X MIA 3). The research instruments included a multiple-choice test with 20 valid and reliable questions to assess learning outcomes and an observation sheet to evaluate student engagement. Data were analyzed using independent sample t-tests. Results indicated that the PBL class had lower scores in both engagement and learning outcomes compared to the DL class. Statistical analysis revealed significant differences in engagement and learning outcomes ($\alpha < 0.05$), with a positive correlation between student engagement and learning outcomes. The conclusion of this study is that there are differences in learning outcomes and engagement between the two models, as well as a significant relationship between student activity and learning success, with contribution rates for engagement reaching 64.3% and 24.9%.

Keywords: Learning Outcomes, Learning Activities, Problem Based Learning, Discovery Learning, Learning Videos¸ Redox Reactions.

Abstrak: Pengaruh Model Problem Based Learning dan Discovery Learning Berbantuan Media Video Pembelajaran Terhadap Hasil dan Aktivitas Belajar Siswa Pada Materi Reaksi Redoks. *Penelitian ini bertujuan untuk menganalisis perbedaan hasil belajar dan aktivitas siswa antara model Problem Based Learning (PBL) dan Discovery Learning (DL) yang didukung oleh video pembelajaran, serta mengidentifikasi hubungan antara keduanya pada materi reaksi redoks di MAS Muallimin Univa Medan. Sampel penelitian terdiri dari dua kelas dari populasi Kelas X MIA yang diambil secara acak: kelas PBL (X MIA 2) dan kelas DL (X MIA 3). Instrumen penelitian meliputi tes pilihan ganda berisi 20 soal yang valid dan reliabel untuk mengukur hasil belajar, serta lembar observasi untuk menilai aktivitas siswa. Data dianalisis menggunakan uji t sampel independen. Hasil menunjukkan bahwa kelas*

PBL memiliki skor aktivitas dan hasil belajar yang lebih rendah dibandingkan kelas DL. Analisis statistik menunjukkan perbedaan signifikan dalam aktivitas dan hasil belajar (α < 0,05), dengan korelasi positif antara aktivitas belajar dan hasil belajar. Kesimpulan dari penelitian ini adalah terdapat perbedaan hasil dan aktivitas belajar antara kedua model, serta hubungan yang signifikan antara aktivitas siswa dan hasil belajar, dengan kontribusi variabel aktivitas mencapai 64,3% dan 24,9%.

Kata kunci: *Hasil Belajar, Aktivitas Belajar, Problem Based Learning, Discovery Learning, Video Pembelajaran¸ Reaksi Redoks.*

▪ INTRODUCTION

Education is a very important aspect of human life because education will form quality and high-potential human beings. Education functions as a forum to practice and realize ideals as a learning process so that students actively develop their potential to have personality, intelligence, and skills so as to make students more critical (Taqwima, 2013). The Problem Based Learning learning model is a learning model aimed at developing student learning motivation, encouraging students to be able to think at a higher level, encouraging students to optimize their metacognizant skills, and making learning meaningful so as to encourage students to have a high sense of confidence and be able to learn independently (Abidin, 2014).

Education is inseparable from the role of teachers as facilitators, moderators, and educators (Maulana, 2021) It can be said that teachers are the spearhead in the learning process. As a teaching manager, a teacher must be able to manage the entire process of learning activities by creating learning conditions in such a way that each student is able to convey learning materials effectively and efficiently, namely an approach that is adapted to the student's situation and conditions, so as to increase student activity and learning achievement (Aliffah, 2013). In redox materials, the right media is needed to make it easier for students to understand. Through the video, examples of redox reactions in real life are given. When students' understanding is maximum, it can influence their learning outcomes so that it will increase (Setyorini, 2023).

Based on previous research conducted by Janah, et al. (2018), it was revealed that the average post-test score of the experimental class using the Problem Based Learning model was superior, namely 89.6 and the control class was 81.6. The application of the Problem Based Learning (PBL) model contributes 35.0% to learning outcomes.

Based on the results of previous research conducted by Atika, et al. (2018), learning with the video-assisted discovery learning method has an effect on the chemistry learning outcomes of high school students. The video-assisted discovery learning method has an effect on cognitive learning outcomes, as evidenced by the results of biserial coefficient analysis which reached the medium criterion with a biserial correlation of 0.42 and a determination coefficient of 17.64%.

The use of Audiovisual Media can increase the learning achievement of the Redox Reaction Concept of students in grade XII Science 1 SMA N 1 Petang in 2013/2014, with an average score of 70.00 in the first cycle and in the second cycle increased to 77.03 (Widani, 2017). Learning media can enhance the student learning process so that it can improve the learning outcomes achieved by students. The use of

appropriate media can overcome students' passive attitudes during the teaching and learning process (Mardhiah, 2018).

Based on observations and interviews at MAS Muallimin Univa Medan, several issues have been identified in the teaching and learning activities, such as the predominant use of conventional methods and low student learning outcomes, particularly in calculation materials. To address these issues, it is necessary to implement appropriate learning models and media. The researcher is interested in conducting a study titled "The Effect of Problem Based Learning and Discovery Learning Models Assisted by Learning Video Media on Student Learning Outcomes and Activities in Redox Reaction Material."

▪ METHOD

This research will be carried out in class X MIA MAS Muallimin Univa Medan, which is located at Jl. SM Raja KM 5.5 UNIVA Medan Complex, Harjosari I, Medan Amplas District, Medan City, North Sumatra. The research time will be carried out in the even semester of the 2023/2024 fiscal year. From November 2023 to May 2024.

The study adopts a quantitative research approach, which involves defining specific research questions, collecting measurable data, and analyzing it statistically to provide objective insights. Quantitative research is a type of research to obtain data in the form of numbers (scores) or questions that are assessed and analyzed with statistical analysis. The population comprises all students in class X MIA at MAS Muallimin Univa Medan, divided into four classes. The sample includes two classes, X MIA 2 and X MIA 3, each consisting of 32 students, selected through random sampling to ensure equal initial abilities across groups. The research design employed is a pretest-posttest control group design, utilizing two randomly selected groups to assess the impact of different teaching methods on student outcomes. The researchers conducted both qualitative and quantitative analyses of the instruments for this study. The purpose of the quantitative analysis is to determine the validity, reliability, difficulty level, and discriminatory power of the test items.

The test instrument in this study is an objective test in the form of 40 multiple-choice questions that will be validated. Before the learning outcome test, students will take a pre-test to assess their initial abilities. A post-test will be conducted after the entire treatment process is completed to determine whether there has been an improvement in student learning outcomes. The research instrument can be analyzed for content validity through quantitative analysis. Quantitative analysis is used to determine whether an item in the instrument needs to be revised due to identified shortcomings or should be discarded because it is ineffective (Silitonga, 2011).

In this study, a pretest-posttest control group design was used. Silitonga (2011), stated that in the design of the pretest-posttest control group, two groups of samples were used that were taken randomly from the population.

Table 1. Research Design

Class	Pretest	Treatment	Posttest
Experiment I	T1	X1	Y1
Experiment II	T3	X2	Y2

In this study, two treatments are implemented: the Problem Based Learning (PBL) model for experimental group I and the Discovery Learning (DL) model for experimental group II. The initial score for group I (T1) is recorded before they receive PBL instruction, and their final score (Y1) is assessed afterward. Similarly, group II's initial score (T2) is noted before the DL instruction, with their final score (Y2) evaluated at the end of the learning process.

The non-test instrument used in this study is an observation sheet for student learning activities. Values related to student activities are measured and observed directly by an observer. The observer can consist of the researcher along with several teachers or other parties. In this study, each experimental class is divided into three learning groups, requiring three observers. One observer observes one learning group.

The observation sheet for assessing student learning activities is structured based on specific indicators. Any test or non-test instrument used in research must be validated for validity and reliability before it is employed in the study (Silitonga, 2011). For the validity of the non-test instrument in this study, qualitative assessment is sufficient, utilizing expert judgment or consultations with experts in the field (expert validators) who consider and analyze the criteria for the suitability of the observation sheet for assessing student honesty against the attitude indicators and descriptors created by the researcher. Reliability testing of the non-test instrument was not conducted due to time and budget constraints.

The observation guidelines consist of indicators and scoring. Each learning activity has its own indicators. Each indicator has a test score. A maximum score of three is given to students who meet the established indicators, while a minimum score of zero is given if they do not meet the indicators.

The research implementation consists of several stages. In the preparation stage, activities include informing the school about the research, observing existing problems, defining the research problem, developing a learning program, and preparing research instruments such as objective tests and observation sheets for assessing communication skills. The implementation stage involves selecting sample classes through simple random sampling, administering a pretest to assess initial student abilities, and processing the results to ensure homogeneity. Treatment is given to both classes: the first class receives the Problem Based Learning (PBL) model using Learning Videos, while the second class uses the Discovery Learning (DL) model. Posttests are then conducted to evaluate learning outcomes.

Data analysis was conducted using Normality Test with SPSS 26, specifically the Kolmogorov-Smirnov test as follows: A sig value > α indicates that the data is normally distributed. Next, Homogeneity Test was performed using SPSS 26 with Levene's Test, with the following condition: A sig value > α indicates that the groups of data come from populations with equal variances (homogeneous). Lastly, Correlation Test was conducted using SPSS 26 with Pearson Correlation, with the following condition: A sig value < α indicates that the null hypothesis Ha is accepted. ypothesis testing was

conducted using SPSS 26 with the Independent Sample T-Test, with the following condition: A sig value < α indicates that the null hypothesis Ha is accepted.

Finally, during the data analysis stage, results are processed and analyzed statistically to test the hypotheses, leading to the drawing of conclusions based on the findings raw conclusions

The stages of this research can be described in the form of a scheme shown in Figure 1.

RESEARCH STAGE CHART

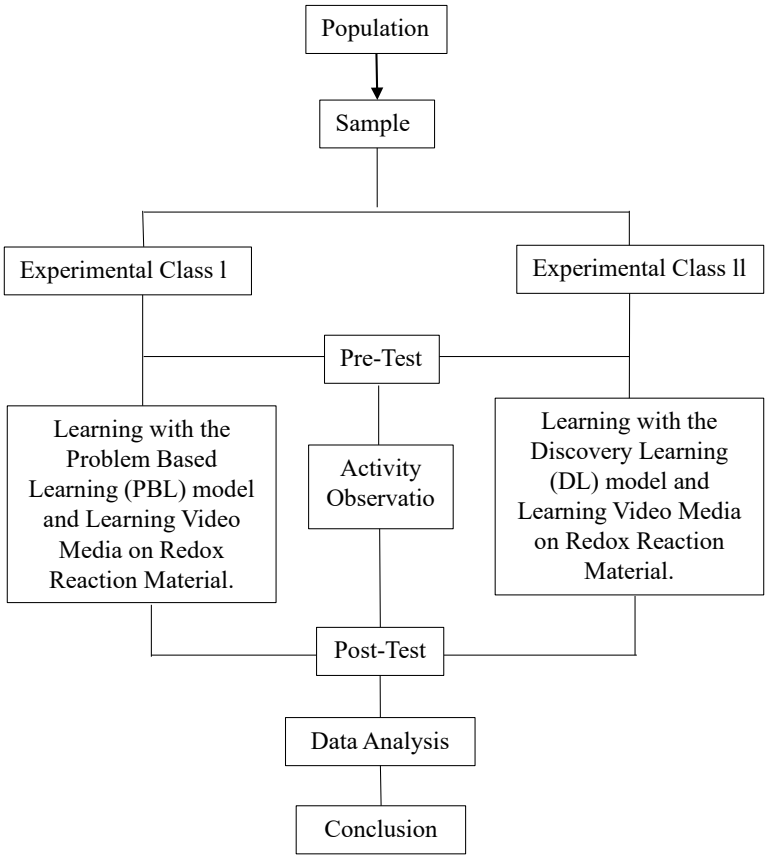

Figure 1. Research Flow Scheme

▪ RESULTS AND DISCUSSION

In this study, since all the requirements for the test instrument have been met, the test instrument can be used as a data collection tool to assess the results of this study, consisting of 20 questions from the 40 questions that were validated. The test instrument was designed to include 20 multiple-choice questions, which the students completed at the conclusion of the learning process. It is important to note that both experimental groups were carefully structured to ensure fairness; they consisted of an equal number of participants, and the questions administered to each group were identical. Upon analyzing the average post-test scores, we found a notable difference in performance between the two experimental classes. Specifically, students in Experimental Class 1, which implemented the Problem Based Learning (PBL) model,

achieved an impressive average score of 87.67. In contrast, Experimental Class 2, which employed the Discovery Learning (DL) model, had a slightly lower average score of 82.83 (refer to Table 2 for detailed results).

These findings suggest that the PBL model may be more effective in enhancing student learning outcomes, as indicated by the higher average scores. This could imply that the PBL approach not only engages students more effectively but also fosters deeper understanding and retention of the material being taught.

Table 2. Differences in Student Learning Outcomes

Class	Average post-test scores of students
Experiment 1	87.67
Experiment 2	82.83

Previous research conducted by Prasetyo (2020) also showed that the Problem Based Learning learning model was higher than the Discovery Learning model on the critical thinking skills of grade 5 students or showed a significant difference, namely 83.75 and 80.17 respectively. Student learning outcomes in classes using the Discovery Learning model have reached the Minimum Completion Criteria (KKM), while classes using the Problem Based Learning model have not reached it, with an average N-Gain Score of 0.71 and Problem Based Learning of 0.57 respectively (Anjelina, 2021).

In this study, an assessment of student learning activities was conducted using an observation sheet for student learning activities. This sheet contains the activities of the students that will be evaluated using scores, based on the activities performed by students in Experimental Class 1 and Experimental Class 2.

In this study furthermore, student learning activities were evaluated using an assessment sheet. The average post-test scores for learning activities were 75.70 for Experimental Class 1 and 82.26 for Experimental Class 2 (see Table 3). Interestingly, while Class 2 scored higher in learning activities, Class 1 outperformed in overall learning outcomes. This discrepancy warrants further investigation into the quality and impact of learning activities on academic performance.

Table 3. Differences in Student Learning Activities

Class	Average post-test scores of students
Experiment 1	75.70
Experiment 2	82.26

In this study, the relationship between activities / to student learning outcomes was carried out with the Pearson Correlation test. In addition to looking at the relationship, the determination coefficient or contribution of activity variables to learning outcomes will also be obtained. The results of the correlation test and the determination coefficient can be seen in table 4.

Table 4. The Relationship of Activities to Learning Outcomes

Data/class	Experimental Class 1	Experimental Class 2
Pearson Correlation	.802**	.499**
Sig. (2-tailed)	.000	.005
R Squared	.643	.249

Based on Table 4, it is known that in experimental class 1 the correlation coefficient value is 0.802, the sig value is 0.00 with an R Square value of 0.643. Based on the data above, it is known that the value of sig<0.05 is 0.000<0.05, so there is a correlation or relationship between activities and learning outcomes in experimental class 1 with a correlation coefficient of 0.802, indicating that there is a very high correlation between activities and learning outcomes. The R Square value in experimental class 1 shows the coefficient of determination or the contribution of learning activities to learning activities, which is 64.3%. Meanwhile, in the experimental class 2, the correlation coefficient value was 0.499, the sig value was 0.005 with an R Square value of 0.249. Based on the data above, it is known that the value of sig<0.05 is 0.001<0.05, so there is a correlation or relationship between activities and learning outcomes in experimental class 2 with a correlation coefficient of 0.249, indicating that there is a sufficient correlation between activities and learning outcomes. The R Square value in experimental class 2 shows the coefficient of determination or the contribution of learning activities to learning activities, which is 24.9%.

These findings align with previous research that emphasizes the significance of active learning strategies in improving student performance (e.g., Johnson & Johnson, 2015; Hattie, 2009). The substantial correlation observed in Class 1 underscores the effectiveness of the PBL approach in fostering not only engagement but also deeper learning outcomes. The contrast in correlations between the two experimental groups highlights the need for further exploration into how different learning models influence the relationship between student activity and academic success.

▪ CONCLUSION

Based on the data obtained from the results of the research that has been carried out, it can be concluded that there is a difference in the learning outcomes of students who use the Problem Based Leaning model assisted by learning video media compared to the Discovery Learning model assisted by learning video media. There is a difference in student learning activities using the Problem Based Leaning model assisted by learning video media compared to the Discovery Learning model assisted by learning video media. There was a correlation between learning activities on student learning outcomes in experimental class 1 and experimental class 2 with the contribution of activity variables to student learning outcomes of 64.3% and 24.9%.

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