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Motivation and Learning Outcomes in Acid-Base Topics Using Video-Assisted PBL and Discovery Learning

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Abstract: *This study used a mixed qualitative and quantitative approach with 25 purposively selected students divided into two experimental classes. Experimental Class 1 learned acid-base material using Problem Based Learning (PBL), while Experimental Class 2 used Discovery Learning (DL), both assisted by learning videos. Pre-tests and post-tests were conducted to measure learning outcomes and motivation. Results showed average post-test scores of 82.00 for PBL and 76.40 for DL. Students with high motivation scored higher in both models (PBL: 74.27; DL: 74.36) compared to those with low motivation. A significant linear relationship was found between motivation and learning outcomes in both learning models.*

Keywords: *problem based learning; discovery learning; motivation, learning outcomes, acid-bases*

INTRODUCTION

Chermistry Courseris a tool to achiervergoals and train studernts to haverthinking skills. Onerof therthings that nererds to berderverloperd in chermistry lerarning is critical thinking skills, in accordancerwith thergoals of chermistry education (Panggabean et al., 2024). Education has a very important role in ensuring the evolutionand survival of the nation, this is because education is a vehicle to improve and develop the quality of human resources (Tambunan & Damanik, 2024).

Education is a learning process as a conscious and systematic effort for students to be able to understand, comprehend, and make people more critical in thinking and every experience that has a formative effect on people's ways (Saragih & Dibyantini, 2024). The use of inappropriate teaching models is a factor in the difficulty of learning chemistry for students (Ginting & Purba, 2024).

The challenge we face is the low quality of lessons, both in formal and informal channels, thereby reducing the ability of human resources to compete in the global era (Wahyudi et al., 2022). Lessons are an important aspect of life that encompasses all knowledge and lifelong learning experiences, in all places and situations, that have a positive impact on the growth and development of

each individual (Pristiwanti et al., 2022; Ujud et al., 2023). In Indonesia, the curriculum has undergone various changes and improvements since 1947, with several revisions and updates, namely in 1964, 1968, 1973, 1975, 1984, 1994, 1997, 2004 (Competency-Based Curriculum), 2006 (Curriculum at the Unit Level), and 2013 (2013 Curriculum or Kurtilas). The Kurtilas was then revised in 2018 to the Revised Kurtilas (Ulinniam et al., 2021). The Merdeka Curriculum is present as a new curriculum designed to provide students with the opportunity to learn more relaxed and stress-free, so that they can show their natural abilities more optimally (Rahayu et al., 2022).

The Discovery Learning model can make students more active, get good learning outcomes, and create a fun atmosphere. With this model, students become enthusiastic to ask questions, pay attention to the teacher's explanations, and be able to find concepts independently. The Discovery Learning model is also very effective in developing students' ability to develop problem-solving strategies (Prasetyo & Kristin, 2020).

LITERATURE REVIEW

The Problem Based Learning (PBL) model is one of the innovative lesson approaches that can create active learning conditions for students, so that they can be more involved and motivated in the learning process (Silaban et al., 2020). With Problem Based Learning, students can develop critical thinking skills, solve problems, and improve their intellectual skills through authentic and contextual learning experiences, so that they become independent and independent learners (Pratama et al., 2017).

In accordance with the aim of education in improving human resources in the face of rapid developments in communication and information technology, the Ministry of Education continues to update the education system (Simalango & Situmorang, 2023).

The learning model is strategies based on theories and research consisting of rationale, a set of steps and actions carried out by teachers and students, learning support systems and methods evaluation or learning progress assessment system student (Simalango & Situmorang, 2023)

In this model, lessons focus on a problem that must be solved by students, so that students have the responsibility to analyze and solve the problem with their own abilities, while the role of educators is only as a facilitator and provides guidance to students (Meilasari et al., 2020).

(1)The use of knowledge sources with various uses, and the evaluation of information sources are essential processes in Problem Based Learning. (2) Learning is collaborative, communication, and cooperative. (3) Synthesis and integration of a learning process. (4) Problem Based Learning involves the evaluation and review of students' experiences and learning processes (Sudria et al., 2019).

According to (Rerung et al., 2017) advantages and disadvantages of the Problem Based Learning model. The advantages of Problem Based Learning are as follows. 1. Students are trained to have the ability to solve problems in real situations. 2. Students have the ability to build their own knowledge through learning activities. 3. Learning focuses on problems so that unrelated material does not need to be learned by students. This reduces the burden on students by memorizing or storing information. 4. Scientific activities occur in students through group work. 5. Students are accustomed to using sources of knowledge, both from libraries, the internet, interviews, and observations. 6. Students have the ability to assess their own learning progress. 7. Students have the ability to carry out scientific communication in discussion activities or presentations of their work results. 8. Learning difficulties of students individually can be overcome through group work. In addition to the advantages contained in the Problem Based Learning model, this model also has weaknesses. The weaknesses of the Problem Based Learning model are as follows. 1. Problem-type learning cannot be

applied to every subject matter, there is a part where the teacher plays an active role in explaining the material. Problem-based learning is superior for learning that requires certain abilities related to problem solving.

To create an environment that encourages active student engagement in learning activities, teachers and instructors must be able to develop appropriate strategies, models, and learning media (Simalango & Situmorang, 2023).

The Discovery Learning way is an active, hands-on learning style developed by Jerome Bruner in the 1960s. Bruner emphasized the importance of learning through hands-on experience or "learning by doing". In this way, students are actively involved in the learning process, rather than just passively receiving knowledge (Khasinah, 2021). However, the drawback is that this model requires students to be more active, so students with poor initial abilities may experience difficulties in the learning process (Jana & Fahmawati, 2020).

Experts develop learning models based on learning principles, psychological, sociological, systems analysis, or other supporting theories (Khoerunnisa & Aqwal, 2020).

Learning outcomes are the abilities that students have as a result of the learning process that can be observed through their appearance. Learning outcomes include knowledge, skills, and attitudes. To find out the learning outcomes, an appropriate assessment is needed. Teachers have an important role in creating and managing meaningful lessons for students, so that learning outcomes can be optimal (Kalsum et al., 2023).

Based on research that has been conducted by (Silaban et al., 2020) There was an increase in the chemistry learning outcomes of students who were taught using the Problem Based Learning (PBL) model and the Card-mediated Scientific Approach from an average of 27.2 pretests to 63.95 and 72.5 in both experimental classes and chemistry learning outcomes of students who were taught using Problem Based Learning (PBL) (Silaban et al., 2020). In addition, the research conducted by (Panggabean et al., 2022), The results of chemistry learning using a Problem Based Learning (PBL) based module developed on buffer solution materials were higher than the KKM score (75) with an average score of 80.13. Likewise, research conducted by (Haetami et al., 2022) The Discovery Learning model has an active learning strategy that involves students' activeness to find out and learn new material to be taught, so that students are not passive in looking for concepts but active in finding concepts. In addition, based on research conducted by Kuryanti, it was reported that the learning video media on acid-base material is valid for use in schools, the average validity percentage obtained is 85.33%. The completeness of learning outcomes was 81.23 and was declared complete (Kuryanti et al., 2022).

METHODS

It was carried out at SMA N 2 MERANTI which is located in Meranti District, Asahan Regency, North Sumatra. It will be carried out in September – March 2025. In the range of time intervals, it is included in observation, preparation of lesson media, research instruments, analysis of research results and processing.

The population in this study is all students of class XI MIA at SMA Negeri 2 Meranti which totals 4 classes (Class XI MIA-1 to XI MIA-4). Each class averages 30 students. A population is an element that is studied. The research population is a subject that meets the criteria that have been set. The population in this study is students majoring in mathematics and mathematics class XI of SMA Negeri 2 Meranti for the 2024/2025 Academic Year which consists of 2 classes with a total of 60 students.

The sample used in this study is a member of the target that is taken randomly. Class XI-MIA-1 was selected as the

experimental class 1 which was taught using the problem-based learning model assisted by learning videos and class XI-MIA-2 was selected as the experimental class 2 which was learned with the discovey learning model assisted by learning video media.

Data analysis used validity tests, difficulty level, discrimination power, reliability, normality, homogeneity, tests of the relationship between learning outcomes and motivation, and hypothesis tests.

RESULT AND DISCUSSION

This research began with the provision of an initial test (pretest) to students, where the pretest questions were given as many as 20 questions that met the requirements in terms of validity, difficulty, differentiation, and reliability. The pretest is done offline using paper that already contains the question with a processing time of 1 hour. The use of the pretest is carried out to determine the initial ability of students and as a benchmark for improving student learning outcomes after treatment. Based on the pretest data, the two sample groups were homogeneous and normally distributed with an average score of 65.72 and experimental class 2 of 66.60. This means that the sample in experimental class 2 has a higher initial ability compared to experimental class 1.

The next step is to carry out different learning in each class where class XI MIPA 2 as an experimental class 1 is learned with the Problem Based Learning (PBL) learning model and class XI MIPA 3 is learned with the Discovery Learning (DL) learning model.

After the learning process is completed for 3 meetings, a post-test is carried out to find out the students' learning outcomes and a motivation questionnaire is given to find out the student's learning motivation is included in the high or low motivation category. Based on post-test data, the average learning outcomes of students in experimental class 1 were 82.00 and experimental class 2 with an average student learning outcome of 76.40.

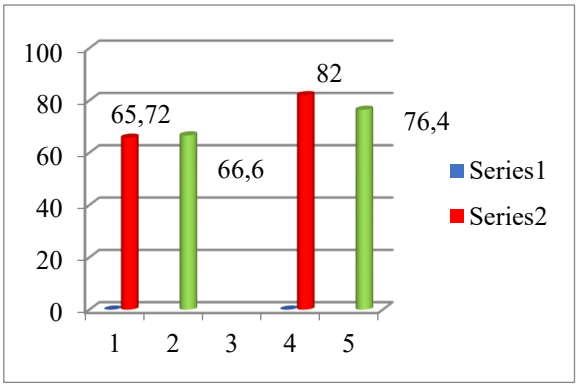

Figure 1. Student Learning Outcomes Graph

The results of the hypothesis test obtained the average learning motivation of students who were taught with the Problem Based Learning (PBL) model with high motivation of 74.27, and low motivation of 35.82. Meanwhile, in the class learned with the Discovery Learning (DL) model, the average learning outcomes of students with high motivation were 74.36, and low motivation was 33.36.

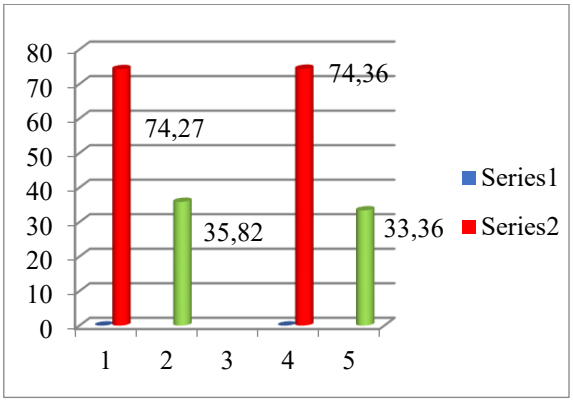

Figure 2. Average student learning outcomes with varied models and motivations.

The results of the hypothesis testing obtained a sig. (2-tailed) value of 0.031 <α (0.05) with a significance level of 95%. For the first problem formulation, Ha is accepted and Ho is rejected, which means that there is a difference in student learning outcomes taught using the Problem Based Learning and Discovery Learning models on acid-base material. For the second problem formulation on learning motivation that varies between high motivation and low motivation, sig (2-tailed) 0.000 <α (0.05) is obtained so that Ha is accepted and Ho is rejected, it can be concluded that there is a

difference in student learning motivation taught using the Problem Based Learning and Discovery Learning models on acid-base material. Furthermore, for the third problem formulation on the interaction between the learning model and learning motivation, sig (2-tailed) 0.000 <α (0.05) is obtained so that Ha is accepted and Ho is rejected, it can be concluded that there is a linear and significant relationship between motivation and student learning outcomes taught using the Problem Based Learning and Discovery Learning models.

Table 1. Hypothesis Test Results

Hipotesis	Source	Sig.	Information
I	Learning Outcomes	0,031	H_a Accepted
II	Student Motivation	0,000	H_a Accepted
III	Learning Outcomes * Student Motivation	0,000	H_a Accepted

CONCLUSION

After conducting research, calculations, and hypothesis testing, the conclusion obtained is, There are differences in student learning outcomes learned using the Problem Based Learning and Discovery Learning models in acid-base materials. The average learning outcome of students in experimental class 1 was 82.00 and experimental class 2 with an average student learning outcome of 76.40. There is a difference in the learning motivation of students who are learned using the Problem Based Learning and Discovery Learning models in acid-base materials. The average score of student learning motivation learned with the Problem Based Learning (PBL) model with high motivation was 74.27, and low motivation was 35.82. Meanwhile, in the class learned with the Discovery Learning (DL) model, the average learning outcomes of students with high motivation were 74.36, and low motivation was 33.36. There is a linear and significant relationship between motivation and student learning outcomes.

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