EFFECT OF THE PROBLEM BASED LEARNING (PBL) MODEL ON THE STUDENT CRITICAL THINKING SKILL ON EXCRETORY SYSTEM MATERIAL IN CLASS XI SMA NEGERI 1 DOLOK PANRIBUAN ACADEMIC YEAR 2023/2024

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ABSTRACT

This research aims to obtain related information; The influence of the PBL model on critical thinking skills at SMA Negeri 1 Dolok Panribuan. This research is a type of quasi experiment research. This research was carried out at SMA Negeri 1 Dolok Panribuan Simalungun Regency. Samples were taken by proportional random sampling technique. The data collection method uses critical thinking skills questions consisting of pretest and posttest. The effect of the PBL learning model on students' critical thinking skills at SMA Negeri 1 Dolok Panribuan is as follows: There is a comparison of the results of posttest calculations in the control class and the experimental class with the Independent Sample T-Test to obtain the results of the t-table > t-calculation value of 2.998 > 1.997 with α = 5% where based on the results of the t-test it can be concluded that there is an influence of the Problem Based Learning (PBL) model on Students' Critical Thinking Skills on System Materials Excretion at SMA Negeri 1 Dolok Panribuan. The PBL learning model is better used for student learning outcomes with an average score of 83.25 than the conventional learning model with an average score of 76.00.

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INTRODUCTION

In the 21st century, students are required to have the 4C skills, namely: the ability to think critically, communicate, collaborate, and creativity. This ability will help students in solving any problems they will face (Nisyah et al., 2022). For this reason, every student must have 4C skills, so that they are able to face all kinds of challenges, obstacles, and problems, thus quality students who can master many abilities, including critical thinking. Critical thinking skills are students' ability to apply learning and solve problems in daily life (Redhana, 2019). Critical thinking skills include solving problems, drawing conclusions, calculating possibilities, and making informed decisions.

The results of the 2018 Trends In International Mathematics and Sciences (TIMSS) survey show that the quality of education and critical thinking skills in Indonesia, especially science, are only able to rank 36th out of 49 countries and then the results of the Programme for International Sudent Assessment (PISA) report in 2018 which was attended by 78 countries, show that Indonesia is ranked 72nd released by the Organization for Economic Co-operation and Development (OECD). This situation shows that the quality of education and critical thinking skills in Indonesia are still far behind compared to other countries, especially in the field of science. The low critical thinking ability of students is a problem that needs immediate attention, it is feared that students do not have the ability to analyze and solve problems accurately and quickly (OECD, 2018).

Based on initial observations made at SMA Negeri 1 Dolok Panribuan, it was found that some students were less able to answer questions related to critical thinking skills properly and correctly. This shows that students' critical thinking skills are still relatively low. Judging from the cognitive learning outcome assessment data, 55% of students have not exceeded the agreed KKM limit at SMA Negeri 1 Dolok Panribuan, which is 75. The results of interviews with biology teachers at SMA Negeri 1 Dolok Panribuan found that the learning method used in the classroom was a lecture method using powerpoint media and the tests given by the teacher were not in accordance with the indicators of critical thinking skills. This is based on the teacher's statement that most of the questions that are usually used are still at the C1-C3 level, even though the critical thinking skills are at the C4-C6 level. If this problem is not solved, it is likely that students will master the problem in memorization without understanding the concept.

Improving critical thinking skills is part of developing skills, such as analysis, reasoning, and decision-making. According to Sujianti et al., (2022), developing or improving students' critical thinking skills can be done by providing problems in the form of questions based on real events (contextual). When students are given contextual questions, it will encourage them to think critically, logically, and systematically or sequentially in solving problems. In Indonesia, in general, learning still uses the Teacher Centered Learning (TCL) model, where teachers only transfer information and teach material while students' tasks are to memorize the material taught without being accompanied by the right learning model.

Based on the result of various literature studies, student's ability to think critically is categorized as still low. Therefore it is necessary to make effort to improve student's critical thinking skills, including by changing models in the learning process. Teachers can use and apply the PBl learning model in the learning process so that students critical thinking skill are improved and during the learning process, teachers realte different cases (Mercy et al., 2020).

According to Amin et al., (2020), the use of problem-based learning models is very effective in improving students' critical thinking. Through the Problem Based Learning learning model, it is hoped that students will be able to solve problems critically so that they can make decisions based on the use of this model. Critical thinking skills improve when students encounter problems that must be solved critically, allowing them to gain new knowledge about themselves and gather a variety of information to solve those problems.

Various kinds of complex in real life problems can be solved by thinking critically. A

person ritical thinking skill cam be improved by using a learning model, namely the problem based learning model. This model aims to encourage student's ability to identify and research related concept and principles needed to solve these problems. The application of this model to learning can be done in a team where later students work in a team to unite their opinions, be able to communicate, and integrate information (Hasanah et al., 2018).

Based on the above background, a study was conducted with the title "Effect of the problem based learning (PBL) model on student critical thinking skill in excretory system material at SMA Negeri 1 Dolok Panribuan for the 2023/2024 academic year.

METHODS

This research was conducted at SMA Negeri 1 Dolok Panribuan, located at Jln Besar Parapat No 18, Tiga Dolok, Simalungun Regency, North Sumatra. The type of research is a quasi-experiment with a Pretest-Posttest Nonequivalent Control Group design. This study involved two different treatments. For Experiment class, the PBL model was applied, while for control class, the Conventional model was applied. The population in this study consisted of all 11th-grade science students at SMA Negeri 1 Dolok Panribuan, totaling 67 students divided into 2 classes. The sample in this study comprised two classes, selected using proportional random sampling. The data collection technique in this research involved using multiple choice. Data analysis was conducted using the Independent Sample T-Test and N-gain analysis.

RESULTS AND DISCUSSION

Data from the pre-test results in both treatment groups are presented in Table 1.

Table 1 Pre-test Results of Critical Thinking Ability

Class	Pre-test
PBL	53.57 ± 13.74
Control	53.87 ± 11.54
Signifikasi Independent Sample T-Test	0.922

Based on Table 1, it can be observed that the average score for the pre-test in the class using the PBL model is 53.57, while in the class using the conventional model, it is 53.87. Then, the result of the Independent Sample T-Test calculation with the testing criterion is comparing the sig. value (2- tailed) <or> 0.05. The calculation result of the pre- test yields a sig. value of 0.922 > 0.05, indicating that Ha is rejected and Ho is accepted, meaning that there is no significant difference between the pre-test scores of the PBL class and the conventional class. The data of students' critical thinking abilities (post-test) in both groups are presented in Table 2.

Table 2 Post-test Result of Critical Thinking Ability

Class	Pre-test
PBL	83.25 ± 8.44
Control	76.00 ± 9.79
Signifikasi Independent Sample T-Test	0.003

Based on Table 2, it can be seen that the average score for the pre-test in the class using the PBL model is 83,25, while in the class using the conventional model , it is 76,00. Then, the result of the Independent Sample T-Test calculation with the testing criterion is comparing the sig. value (2 – tailed) <or> 0,05. The calculation result of the post- test yields a sig. value of 0,003 < 0,05, indicating that H0 is rejected and Ha is accepted, meaning that there is a significant difference between the post- test scores of the PBL class and the conventional class.

The results of the t-test for the post-test (critical thinking abilities) can be seen in Table 3.

Table 3 Hypothesis Testing for Post-test in PBL and Conventional Classes

Independent Sampel t-tes					
	t-test for Equality of Means				
	T stat	Df	Sig.(2-tailde)	T Critical one-tail	T Critical two-tail
Equl Variances assumed	2,998	65	0,003	1,6686	1,997

Based on Table 3, obtained from hypothesis testing results using Independent Sample T-Test with Excel 2013, the testing criterion is

comparing the Sig. value (2-tailed) < or > 0.05. The calculation results of the post-test in the PBL class and the Conventional class using Independent Sample T- Test yield a Sig. value (2-tailed) of 2,998 > 1,997. Therefore, Ho is rejected and Ha is accepted, indicating a significant comparison between the average post-test scores of critical thinking abilities in the PBL class and the Conventional class.

Normality test of gain is used to determine the extent of improvement in students' learning outcomes before and after treatment. The calculation results of the N-gain test can be seen in Table 4.

Tabel 4 Results of N-Gain Test

Class	Pre-Test	Pos-ttest	N-gain	Criteria
PBL	53.57	83.25	0.65	High
Control	53.87	76.00	0.49	Medium

Based on Table 4, it can be concluded that the experimental group that used problem based learning showed a higher increase in critical thinking skill with an N-Gain value of 0,65 which is categorized is the high category. This indicates that PBL learning is more effective in improving students thinking skills. In contrast, the control group that used learning with the teacher lesson plan only achieved an N-Gain value 0f 0,49 which was categorized in the medium category. Although there was an increase in critical thinking skills, the increase was not as large as in the experimental group.

Based on the results of the difference test, the pretest data showed that the value of fcount was smaller than the value of ftable, which means that there was no significant difference between the experimental class and the control class. The results illustrate that the students' initial knowledge between the experimental class and the control class is the same. According to Kartono (2010), all the knowledge and experience that students learn from the community will be valuable initial knowledge for them while at school. Students' initial abilities are a benchmark for improving students' critical thinking skills after receiving the treatment of applying the PBL learning model.

The existence of a problem-based learning model (PBL) can affect the improvement of students' critical thinking skills in the experimental class rather than in the control class. As stated by Atikasari (2012), PBL trains students to face problems and foster their curiosity to research and solve problems using their thinking skills. Thus, students are trained to think critically. So, it can be said that students' critical thinking skills can be improved by applying the PBL learning model in experimental classrooms.

This is in line with the opinion of Hartati (2015), who stated that the PBL model uses contextual problems to foster students' curiosity and encourage them to find solutions to used learning with the teacher's lesson plan only achieved an N-Gain value of 0.49 which was categorized in the medium category. Although there was an increase in critical thinking skills, the increase was not as large as in the experimental group.

It can be seen that the final knowledge of students between the experimental class and the control class used in conventional learning is different. The posttest results showed that students in the experimental class had higher scores than KKM, while students in the control class had lower scores from KKM. Therefore, the application of the problem-based learning model (PBL) can contribute to the improvement of students' critical thinking skills (Herzon, et al., 2018). Students are trained to solve problems and present the results of discussions in front of the class, students are required to actively participate in giving opinions so that students are able to develop their critical thinking skills in accordance with PBL syntax (Kurniahtunnisa et al., 2016).

In the PBL model, students are trained to give basic explanations such as focusing questions, analyzing arguments, and giving responses (Ennis, 2011). In the PBL model, the activities of reading the question test can helped student consider the credibility of the learning resource (Yani et al., 2023). These abilities are included in the syntax that organizes students into problems. Basically, PBL focuses on giving students problems so that they get used to problems, become more active and used to

solving problems, learn to work together in groups, and be able to solve problems appropriately.

According to Maryani (2011), students can be motivated to apply critical thinking strategies such as analysis, evaluation, and the formation of new knowledge as part of solving PBL challenge problems. The habit of critical thinking has an impact on the speed and accuracy of students communicating with various points of view according to the context of the problem (Syutharidho, 2016).

Meanwhile, according to Wulandari and Sudjono (2013) stated that, compared to the conventional learning approach, learning focuses on PBL problems allows students to maximize their critical thinking skills. Learning in the experimental classroom with PBL syntax is different from learning in a control classroom with a conventional model. Students only listen to the lesson and some take notes on what the teacher says after the teacher assigns them a group assignment. During learning, only a handful of students ask or answer the questions given directly.

Rusman (2013) stated that conventional learning involving teachers as information providers cannot achieve a significant improvement in critical thinking. Students are less active in the classroom because the conventional learning model used in the control classroom is often boring. Students who have been taught using conventional learning models often feel bored with the learning delivered (Ramawati, 2016).

The lack of scientific activities in the classroom leads to poor critical thinking skills for students. This is evidenced by the low postest score in the control class. Mucharom et al., (2022) stated that students who use the PBL learning model are more active than students who use the conventional model. Asyhari (2015) stated that the PBL model can allow students to actively participate in learning through various scientific methods, so that they can use their knowledge to solve real- world problems that they can use indirectly. Students with grades above KKM are usually very active. Some students have unsatisfactory grades but remain very active. This can be understood because students are active in the learning process but do not really answer questions. This can also cause students to be unable to answer the same questions.

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that the Problem Based Learning (PBL) learning model has an effect on the critical thinking ability of students in grade XI of SMA Negeri 1 Dolok Panribuan. This can be seen in the data analysis using an independent t-test, with the decision-making criteria used being jikat-count > t-table, then H0 is rejected Ha is accepted, meaning that there is an influence given by the independent variable on the bound variable. In the data analysis carried out, it was shown that the t-count value of the control class was 0.097 < 1.997 t-table, meaning that there was no influence of the conventional learning model using the lecture method on students' critical thinking skills in the Excretion System material in class XI of SMA Negeri 1 Dolok Panribuan. Meanwhile, in the experimental class, the t-count value was 2.998 > 1.997 t-table, meaning that there was an influence of the Problem Based Learning (PBL) learning model on students' critical thinking skills in the Excretory System material in class XI of SMA Negeri 1 Dolok Panribuan.

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