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Effects of Problem-Based Learning Model with Wordwall Media on Students' Critical Thinking Skills

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ABSTRACT

The research aims to improve the appearance of critical thinking by using a problem-based learning model assisted by wordwall media. Method of research is quasi-experimental with a post-test only control grup design, the research was done at SMAN 4. The phase E population was sampled using a lateral random cluster, where the control class was phase E7 and the experimental class was phase E6. The assessment is carried out in the form of test questions with cognitive data results as independent variables and skill data as bound variables. The experimental and control classes obtained average cognitive results of 68.61 and 57.22, while the skill scores were 68,5 and 60,56. The magnitude of the relationship between the PBL model with wordwall assistance media and critical thinking skills using a t-test with a calculated t result class experiment of 5.27 and class control is 3.88 with a table t of two class is 2.12. the study concluded that there was a significant relationship and linearity in the PBL model with wordwall assistance media on students' critical thinking skills.

INTRODUCTION

Competency in the 21st century is something that needs to be obtained in education. This must be developed by students in the 21st century competencies so that they can be used in the future. This aims to enable students to hone competencies that can help students in various contexts such as creative ideas, deciding a problem or thinking critically, collaborating and being able to communicate (Sidik, 2019). Moreover, learning that requires students to develop these competencies such as physics learned. Physics learning is learned material that uses the real world and is connected to theories, laws, principles, and so on. Thus, to improve of the 21st century competence for education requires the use of the right learning model and media (Sidik, 2019)

Developing a skill that will be essential in the modern world must use a model or approach so that students can adjust to the age of now (Zulyusri et al., 2023). One of the 21st century competencies that need one to be improved critical thinking skills. The skills are thoughts that are carried out comprehensively intellectually and mentally (Khoirunisa, 2024).

Those skills have an important role in education, where students must carry out the process of seeking information, observing, identifying, filter information and can strengthen opinions (Kononova, 2023). Thus, critical thinking skills are a comprehensive thinking process to be able to solving a problem accurately and clearly. Of course, these skills are something that must be trained, in order to develop logical thinking in deciding a problem.

The test results were carried out on initial observations to investigate students' understanding of the material based on critical thinking skills. The test results conducted at SMAN 4 Solok are based on indicators of students' critical thinking skills or cognitive ability to think critically (Susanto, 2012). The following data is obtained from the cognitive results of students' critical thinking skills in Table 1.

Table 1. Result of Class XI Critical Thinking Cognitive Value

Class	N	Result
IPA 1	17	43.24
IPA 2	19	47.84
IPA 3	16	40.25

The data obtained from the research are that the averaged score of students was less than 50. Results of concluded that the average student was still low in the cognition of critical thinking skills. The cause of the decline in students' critical thinking is a lack of practicing this skill. Increased student competence must be in accordance with the model and media used. Based on observations made in schools, the model used is still not implemented properly. The media used by teachers has increased student competence but not competence in increased student critical thinking. Therefore, to improve critical thinking skills, teacher must use the right models and media in the learning at the process of teaching.

The process is carried out using the right models and media, one of which is the problem-based learning model or PBL models, and wordwall assistance media. The PBL model is a learning process where connecting a material using problems in daily life (Faqiroh, 2020). This is also supported by the fact that the PBL model can increase a competency such as critical thinking (Gonzalez, 2019). This model is used in the learning process to apply problems to students' thinking processes analyzing or synthesizing, or deciding on problem solving. Thus, there is a relationship between the PBL model with wordwall assistance media and students' critical thinking skills.

Wordwall assistance media is a media browser where the app serves as an entertaining medium for student evaluation, as well as a resource for learning (Pamungkas et al., 2023). Media that facilitates learning allows for two-way connection between teachers and students. Media such as wordwalls can pique students' interest and encourage them to actively engage with what they have learning (Pamungkas et al., 2023). The existence of wordwall media can increase student activity in the learning process and help student complete learning. This aims to help students understand the material so that they can achieve learning goals. Thus, wordwall-assisted media is used as a helper for the PBL model so that educators can achieve learning goals.

Wordwall assistance media is an interactive media that can improve competencies such as critical thinking (Pradani, 2022). The media has many advantages, such as features that are easy for teachers to use. According to the study, there is a relationship between each

variable. Proving that there is a relationship between PBL models, wordwall assistance media and the researcher can help pupils develop their critical thinking abilities. Wordwall assistance media and PBL methods work together to help students develop their critical thinking abilities, as stated in the previous explanation.

This study aims to investigate the relationship related to the bound and free variables where the free variable has a relationship with media use. The research treatment uses global warming materials, where global warming materials have real-world problems that can be solved by students by developing students' critical thinking skills. Thus, the combination of the PBL learning and wordwall assistance media in global warming material can be used by other educators, so that they can be trained and can improve students' critical thinking.

METHODS

Method of research was used a quasi-experimental approach and type of research is quantitative research. The design was used in the study used a post-test only control design group with both the experimental and control groups. The both of group is required to take the same test immediately following treatment (Yusuf, 2013). The population in the study was made up off all phase E students at SMAN 4 Solok with a total of 131 students with the number of class 7 phase E. Sampling was done by cluster random sampling. The sampling was carried out randomly with groups that had been determined at the school, in order to get the control class in E7 and the experimental class in E6.

The research was carried out by providing treatment in the experimental class and the control class. In the control class, the treatment was given using a cooperative model, while in the experimental class, the treatment was given using a problem-based learning model assisted by wordwall media. In the class E6 used PBL model with wordwall assistance media was applied, while in the class E7 used the NHT cooperative model was applied (Fitri et al., 2024). The modules used in the experimental class have been tested for validation and practicality, where the validation results show an average of 91.84 while the This aims to see the relationship between each variable and each control class and the experimental class in order to see the relationship so that it can improve students' critical thinking skills. Average practicality of students and teachers is 85.17 and 95.73. Thus, the use of integrated modules in included in the high category and can be used as a reference in research.

The instrument used in the research is in the form of an essay test. Tests conducted in previous sample classes will be tested at other schools that have the same characteristics. The tests carried out are such as validation, reliability, difficulty index and differentiation. The data analysis technique in the sample class used a hypothesis test with a hypothesis t-test for the relationship between class experiment and class control and a simple linear regression analysis test for relationship between a variable independent and dependentThis aims to see the relationship between each variable and each control class and the experimental class in order to see the relationship so that it can improve students' critical thinking skills.

RESULTS AND DISCUSSION

Results

The research data obtained in the control class and the experimental class had two assessments, the first being cognitive and the second being a skill. The experimental class applied a PBL model with wordwall assistance media, in contrast to the experimental group, which assessed students' critical thinking abilities using the NHT cooperative model. The assessment consisted of an experimental class and a control class where the class had different treatment. The assessment consists of four questions, where the questions have cognitive and skills based on indicators. The data from the research results is presented in Table 1.

Table 1. Results of Cognitive Values and Critical Thinking Skills

Class		N	Result
control	Cognitive	18	57.22
	Skills		60.56
Experiment	Cognitive	18	68.52
	Skills		68.61

The results of Table 1 show that the value of the experiment class is higher that of the control class. In cognition obtained in the control class was 57.22 and the experimental class was 68.61. The highest and lowest cognitive scores obtained in the experimental class were 95 and 55, while the scores in the control class were 30 and 85. The skill value obtained in the control class was 60.56 while the experimental class was 68.61. The highest and lowest skill scores in the experimental class were 100 and 46.66 while the control class was 90 and 10. It was found that the difference between the experimental scores, both cognitive and experimental, was smaller than the control value. Thus, the variation in the experimental class scores shows that students understand a lot of material while the material comprehension control class is still uneven.

After results of the data, process the data use formula of normality test. This aims to determine if the data obtained is normal or abnormal. This normality functions as a requirement in data analysis techniques. The normality tested uses the Lilliefors test with criteria, if the small Lo of Lt is normal, if the large L count or Lo of L table or Lt then the data does not follow a normal distribution. Result data with normality with lilliefors tested in the Table 2.

Table 2. Normality Test

Class		N	A	Lh	Lt
control	Cognitive	18	**0,05**	1.1380	0.2
	Skills			0.1006	0.2
Experiment	Cognitive	18		0.1830	0.2
	Skills			0.1798	0.2

The results obtained in the control class and the experimental class had a Lh value smaller than the Lt value. In the control class, the cognitive Lh value was 1.138 and the skill was 0.1006 and the experimental class was a cognitive Lh of 0.183 and the skill was 0.1798. The criteria for normality that if Lh is less than Lt then the data is normally distributed and if

the Lh value is greater than Lt then the data is not distributed normally. Based on a normality test criteria, the results of table 3 show that the scores of both classes are normally distributed. The data was generated after data analysis using the Lilliefors test process.

The normality test is a condition for simple linear regression with normal data criteria. After using the normality test, because it uses a simple linear regression test, it determines that the data has linearity and regression significance. In linearity, the criterion is used if the f count is small from the f table and If the Fh is large of Ft then the data is not linear. The significance test is, if the regression of the large f count from the f table and if the regression of Lh is smaller than Ft it means that it has no regression relationship. Result of data student's linear regression test and the significance of the regression in the Table 3.

Table 3. Linearity Test and Regression Significance

Class		N	A	fh	ft
control	linear	18	**0.05**	0.44	3.07
	The significance of regression			1162.52	4.49
Experiment	linear	18		0.89556	5.91
	The significance of regression			982.032	4.49

The result of data 3 show that both classes have linear data and the influence on the data obtained in the study. In the study, we see the relationship between the PBL model assisted by wordwalls and students' critical thinking skills. Regression has two conditions, namely the data must be linear and significant from the regression. From these results, there is a determination coefficient of 0.90, where the determination coefficient aims to determine the variation caused by free variation. With the coefficient of determination, it can be concluded that the problem-based learning model assisted by wordwall media has an effect on critical thinking skills.

Results Data analysis techniques to see the influence of the problem based learning model assisted by wordwall media on students' critical thinking using the t-test. The t-test aims to see the significant difference between the two groups between the experimental class and the control class. It is proven that the problem-based learning model can improve students' critical thinking. With the t-test, we can see significant differences between the cooperative model class and the problem-based learning model assisted by wordwall media. Results of data with simple linear regression are tested in Table 4.

Table 4. Table t-test

Class		N	Th	Tt
Skill	Experiment	18	5.27	2.12
	Control			
Cognitif	Experiment	18	3.85	2.12
	Control			

The results of the data in Table 4 show that critical thinking skills have a th value in the experimental and control classes is 5.27 and a Tt value of 2.12. The hypothesis test criteria are

that if Th is large from T then there is an influence while if Th is small from Tt then there is no significant influence. The results obtained in the study are that there is a significant influence between the problem-based leanring model assisted by wordwall media on critical thinking skills. In critical thinking cognitive, the Th value was 3.85 and the Tt value was 2.12. The criteria obtained for cognitive critical thinking are that the problem-based learning model assisted by Wordwall media can have a significant influence. By using the PBL approach and Wordwall media, students' understanding of global warming subjects can be improved by honing students' critical thinking skills and students' cognition according to the results of this research.

Discussion

Cognitive and critical thinking abilities were greater in the test group than in the control group, according to the study's results. (Budiman et al., 2022), (I.K. Supriana et al., 2023), (Prihono & Khasanah, 2020), (Sitompul, 2021) (Mas & Made, 2021) stated the same thing that the use of PBL models improves students' decision-making on a problem or critical thinking. There is research by to foster critical thinking using the PBL model (Thorndahl & Stentoft, 2020). It is also proven that the results of using a PBL model based on wordwalls can improve critical thinking. The research found that the PBL model and critical thinking skills have a linear relationship and a significant influence on the two variables.

Critical thinking skills are obtained from the process of solving a problem so that they can decide a problem (Fakhrel, 2024) (Munawaroh, 2024). LKPD or Module is a step taken by educators to communicate a learning. The steps taken by educators are a learning model that can make it easier for teachers to learn so that learning objectives can be achieved. The results obtained in () are based on the results of the study that the use of the problem-based learning model can meet the needs of students in improving critical thinking skills.

The problem-based learning model is a learning using a problem. In the process of solving problems, students must hone skills in the world of education in the 21st century such as critical thinking skills and students' cognitive abilities in critical thinking. According to the PBL paradigm, students' thinking processes may be improved through the usage of problems (Cahyani et al., 2024). Students are able to think more creatively and with more ease. Among the improved cognitive capacities are students' critical thinking skills. The PBL paradigm can help students develop their critical thinking skills, according to the research findings.

Critical thinking skills really need to be developed in the learning process. Research is line with this research that to foster students' critical thinking skills is needed in the learning process (Kurniawati & Ekayanti, 2020). This is because skills must be trained frequently in order to be able to smooth the thinking process and complete the right decision. According the PBL model process is in line with several indicators of critical thinking skills such as analysis and synthesis, as well as cognitive indicators of critical thinking such as evaluation and problem prioritization (Seibert, 2021). Thus, to train cognitive and critical thinking skills, students can use the PBL model. Research shows that critical thinking skills can improve because the classroom environment is fun so that students are active in learning (Yonanda et al., 2023). The state of the classroom is fun in the form of how the teacher communicates with the students so that learning can be carried out.

Thus, indirectly the help of wordwall media can affect students' critical thinking skills in accordance with the research(Nanden et al., 2023) . This is because the media can make the classroom atmosphere fun so that students are active in the learning process. This is also based

on (Shiddiq, 2021) research that the use of the right media can increased student activity so that students' critical thinking skills increased.

The use of wordwalls in the use of learning models is a media aid used by teachers to keep students active in the learning process. This is evidenced by (Djonomiarjo, 2019) research that the role of active students is indispensable in the learning process. This aims to enable students to gain knowledge well. Research (Wulandari, 2020) emphasized the importance of learning tools that motivate student engagement. Students' ability to think critically during the educational process can be enhanced in this way.

Wordwall media also uses problem solving, collaboration among friends, and looking for accurate information so that questions can be answered correctly and correctly (Meisah & Hamimah, 2023). Wordwall media encourages student engagement, making learning more engaging. pupils and teachers, in addition to pupils among themselves, can benefit from wordwall media's presence. Activities can be designed to enhance students' critical thinking skills during learning.

The use of wordwall media is used for learning communication so that the purpose of learning and competence can be carried out, (Prastiwi & Halidjah, 2024). Wordwall media is used to help in the learning process using a PBL model. The PBL model aims to enable students to apply and analyzed new problems so that they can find solutions to these problems. Moreover, the material used in research is material that uses global problems that can harm living things. The used of a wordwall assistance model can increased students' contribution in increased knowledge and increased students' critical thinking skills. The result of previous research and research obtained turned out to has a relationship or connection between each dependent variable and indepenent variable. Thus, the model and assistance media can be used by teachers.

CONCLUSION

A discrepancy exists between Class E6 and Class E7 in terms of the outcomes produced by the empirical investigation. When contrasted with the control group, the experimental group demonstrated superior cognitive and critical thinking abilities. The research results show that the PBL approach, when combined with wordwall help media, may improve students' critical thinking skills. The study had a significant and average relationship in the higher control class. Of course, critical thinking skills must be trained continuously so that these skills become the basis for life. This study uses global warming materials so that teachers can use them to significantly improve critical thinking skills. This can be trained by student to improve critical thinking, so that teachers can used a PBL model with to help wordwall assistanced media.

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