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Problem-Based Learning Model with A Flipped Learning Approach and its Effect on Critical Thinking Skills of Al Muhafizhoh High School Students, Blitar City

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Abstract
The purpose of the study was to obtain empirical data on the PBL model with a flipped learning approach that can improve students' critical thinking skills. The research subjects were Al Muhafizhoh High School students in class XI IPA, two classes, totaling 46 children, Pancasila education mapel. Type of quantitative research, using an experimental approach. Research data initial test scores and final tests and questionnaires. Experimental design one group pre test and post test. From the results of hypothesis testing using the t-test formula the results obtained t (count) > t (table), where t count = 3.14 while t table = 2.02, with a significant level of 0.05, it can be concluded that PBL with a flipped learning approach at Al Muhafizhoh Senior High School in Blitar City has an effect on students' critical thinking skills.

Keywords: PBL, Flipped Learning, Critical Thinking

1. INTRODUCTION

The 21st century learning activities is more humanizing the learners. In this century, Learning activities is student-centered, encouraging students to be active in exploring, discovering and building knowledge. Students are given space and opportunities to discuss, cooperate, and collaborate in solving problems. Developing critical thinking skills in solving problems, communicating, collaborating to work together and synergize. However, in fact, the teachers prefer to apply conventional learning models. From the initial observations at Al Muhafizhoh High School, the following learning problems were found: the delivery of material is more lecture so that

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it is monotonous and boring, the subject matter is a lot of memorization; assignments and practice problems do not challenge students to think critically and the solutions tend to be textbook; questions of the High Order Thinking Skill category (C4, C5, and C6) are rarely used; if given an assignment, the answers given copy directly from the internet; do not have the courage to ask questions and convey their thoughts.

If the problems above is not solved, it will have an impact on low critical thinking skills. Students have difficulty solving problems, think monotonously and tend to rely on text book in overcoming problems, have difficulty searching and finding alternative ways out of solving problems, increasingly lack confidence, become passive and resigned to circumstances, think irrationally often experience mistakes in making decisions, dependence on others is very high, difficulty understanding theory causes errors in defining the theory appropriately. If this continues there will be a mental decline in the younger generation and in the future it will be difficult to face global competition.

Critical thinking is one of the fundamental skills needed in 21st century learning. Indicators have the ability to find the core of the problem, the reasons given are rational accompanied by appropriate arguments, the conclusions drawn are clear and logical, alternative ways out in solving problems are very diverse (Jacob and Sam, 2008). From the theoretical and empirical exposure above, it motivates researchers to conduct research with the aim of obtaining empirical data on the implementation of PBL with a flipped learning approach and its effect on students' critical thinking. The uniqueness of the research is to get out of the comfort zone of traditional learning that has been used by teachers. The novelty of this research is to apply the PBL model with a flipped learning approach and its effect on critical thinking skills where previous research still uses traditional learning.

2. LITERATURE REVIEW

Critical thinking skills can be improved through the application of innovative learning models, one of which is PBL with a reverse learning approach. PBL begins with students being faced with a problem, then asked to discuss, cooperate and collaborate with fellow friends to find a way out of the problem. Enok, Et.all. (2019), Et.All. (2022), Hayuna (2018), Eka and Indra (2019) explained, PBL is considered effective in improving students' critical thinking. Kronberg and Griffin (2005) PBL can train critical thinking. Desania et al., (2020) PBL is student-centered learning so that it can improve critical thinking.

The syntax of PBL is explained by Erawanto (2016), starting with presenting contextual problems for students to understand , students are asked to discuss to plan problem solving and find supporting data, exchange ideas between friends, make conclusions and convey the results of the discussion, and review the results of work

The flipped learning model according to Bergmann and Sams (2012), Kozikoğlu (2019) is a combination learning model carried out by studying teaching materials outside the classroom, for tasks completed in class by discussing, questioning and collaborating. The characteristic of flipped learning is that the learning that was originally carried out at school is carried out by students at home. Tasks that are usually done at home, are done at school both independently, discussing and collaborating (Oakes, Davies, Joubert, & Lyakhova, 2018). Not only streamlining face-to-face time in class but can improve students' understanding and critical thinking skills.

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The reason why flipped learning needs to be implemented is that students are actively involved in learning, can improve and strengthen performance-based skills teams, student activities in class such as discussions are more focused, students are given space and opportunities to be free to be creative, providing guidance to students can be done personally (Schmidt & Ralph, 2015)

Research by Maemanah, S., Suryaningsih, S., & Yunita, L. (2019), inverted learning is very efficient and effective in improving critical thinking.Ruhimat, & Dewi (2017) inverted learning can improve students' critical thinking and improve student achievement. The syntax of flipped learning according to Bergman & Sams (2012) is as follows: share the subject matter on line; work on tasks in groups; provide reinforcement of material that has been discussed together to improve student understanding.

3. METHODS

Using an experimental approach that aims to see whether there is a change after being treated using two learning models that are not the same. The type of research is quantitative because the data are numbers and the analysis uses statistical counts. The research subjects were all students of class XI IPA SMA Al Muhafizhoh in the 2023/2024 school year totaling 46 students, the sample selection used a purposeful sample technique, the data were in the form of initial and final test scores and student critical thinking questionnaires.

One group pre test and post test experimental design. At the beginning of learning before being given treatment both groups were given an initial test. At the end of learning after being given treatment, the final test was also given. The paradigm is described as follows:

Table 1. Research Design

Kelas	Pre test	Perlakuan	Post test
No treatment	O_1	X	O_2
Treatment	O_1	Y	O_2

Keterangan:
O_1 : Results before the treatment
O_2 : Result after the treatment
X : Conventinal Model
Y : PBL with a flipped learning approach

4. RESULTS

The research site was SMA Al Muhafizhoh Blitar City, the class that received the treatment was XI IPA-A with 23 students, the class without treatment was XI IPA-2 with 23 students. The instruments used were teaching modules with Pancasila democracy material, student worksheets, initial test questions, final tests and questionnaires.

The teaching module validation results for classes using PBL with a flipped learning approach were 3.15 (79.40%) while classes using conventional models were 3.10 (77.50%). Both are categorized as feasible because they have met the aspects of practicality with indicators of teaching module implementation and teacher activities and aspects of module effectiveness with indicators of learning completeness and student

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responses to the use of teaching modules. A material is said to be of high quality if it meets the aspects of validity, practicality and effectiveness (Nieveen, 1992).

The results of the validation of the questionnaire 3.85 (75.80%) are categorized as feasible, because they have fulfilled the aspects of science content (including the suitability of questions with competencies, objectives and indicators), construct (the formulation of questions is clear, firm and easy to understand, language (the language used is standard, not multi-interpretation and not double meaning, clarity of commands and filling questions, clear scoring criteria).

The results of the validation of the Learner Worksheet 3.85 (80.30%) with a feasible category because it fulfills all aspects, namely written in detail and systematically instructions for working, the material is appropriate, standard language, adequacy of working time. The validity of student worksheets includes sub-concept organization, representation and proposed problem solving, learning activities, and closing activities (Hobri, 2010).

The results of the validation of the initial and final tests were 3.02 (75.50%) with a decent category because they were in accordance between the grids, indicators and items, the instructions for doing the questions were clear, using standard language. The validity assessment of the test is reviewed from 3 aspects, namely material, construction and language (Hobri, 2010).

The implementation of the PBL learning model with a flipped learning approach is as follows: first the subject matter and the Learner Worksheet are uploaded on Google Classroom as student learning materials at home, the material is contextual, task completion requires analytical skills, dividing work groups and problems are done in class. Teacher activities at this stage overall achieved a score of 78.78%, in the good category Demirel (2016) the principles of flipped learning are flexible, student-centered, the material is prepared first, the teacher determines the material to be taught to students.

During classroom learning, students were asked to work on their own tasks and remain in their respective groups. The next stage, doing group work by discussing and exchanging ideas to solve problems. Student activity at this stage reached 76.79%, in the good category. PBL helps solve problems, think critically, involve students in real experiences, independent and autonomous personalities (Nurhadi et al, 2004)

Furthermore, representatives of each group were asked to present the results of the discussion in their own language in turn, other groups were asked to respond. Student activity at this stage reached 75.80%, in the good category. At the end of the activity, they are asked to review the results of their work by looking at, analyzing and reviewing the results of their work. Student activity at this stage reached 74.77%, in the good category. In order for learning to be meaningful, it needs active involvement of students in building knowledge from the information obtained. (Hobri, 2010).

Table 2. Pretest and Posttest learning outcomes

Class	N	Score		Std. Deviation (SD)	
		Pre test	Pos test	Pre test	Pos test
Treatment	23	32,28	85,14	11,33	11,44
No Treatment	23	32,28	74,41	10,46	13,15

From Table 2, it is known that the pre-test value of the PBL and inverted learning model class is 32.28 and the post-test value is 85.14, while for the conventional model class pretest value is 32.28 and post-test value is 74.41. In conclusion, there is a difference

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in the final test scores for the treated and untreated classes, where the class that applies PBL with an inverted learning approach has higher critical thinking than conventional learning.

Table 3. Data Normality Test Results

Kelas		N	L_{count}	L_{table}	Description
Pretest	Treatment	23	0,147	0,173	Normally Distributed
	No Treatment	23	0,114	0,173	Normally Distributed
Postest	Treatment	23	0,111	0,173	Normally Distributed
	No Treatment	23	0,118	0,173	Normally Distributed

From Table 3, it is known that the L_{count} value of both classes is smaller than table which is 0.173, so through the normality test, the data is normal.

Tabel 4. Data Homogenity Test Results

	Kelas	N	S^2	F_{count}	F_{table}	Description
Pretest	Treatment	23	128,59	1,174	2,084	Homogen
	No Treatment	23	109,62			
Postest	Treatment	23	130,99	1,321	2,084	Homogen
	No Treatment	23	173,02			

From Table 4, it is known that both classes have homogeneous variants, because when the pre-test is carried out, it gets a value of 1.174 and when the post-test is 1.321, meaning that $F_{(hitung)} < F_{(table)}$.

Tabel 5. N-Gain Result

Class	N-Gain	Description
Treatment	0,79	High
No Treatment	0,62	Medium

From table 5, it is known that each class has a difference in N-gain. classes using the PBL model with a flipped learning approach have an N-gain of 0.79 with high criteria. While the class using the conventional model has an N-gain of 0.62 including medium. In conclusion, the application of the PBL model with a flipped learning approach is very effective for improving students' thinking skills.

Hypothesis testing activities to test whether the PBL learning model with a flipped learning approach has an effect on students' critical thinking skills.

Table 6. Results of Hypothesis Test Analysis of PBL Model with a flipped learning approach

Class	N	Mean	S	T_{count}	T_{table}	Description
Eksperiment	23	84,13	5,95	3,14	2,02	H^o is rejected
Control	23	73,40	7,86			

From table 6, it is known that the PBL model with a flipped learning approach has an effect on students' thinking skills where the tcalculated value is > $t_{(table)}$, with a significance level of 0.05. Selvia Erita (2023) used the PBL-FC model when learning to

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have stronger critical thinking skills than students who did not. Dhesi, et.all., (2022) method of flipped learning with PBL can improve student knowledge. Gunawan (2023) the application of problembased learning supported by an inverted learning approach is effective in improving students' collaboration skills. Farhan (2018) inverted learning model with PBL the ability to solve problems is higher than those using conventional models.

PBL using a flipped learning approach are two complementary learning strategies, oriented to constructivism learning theory. Both emphasize student-centered learning, optimizing critical thinking skills in solving problems, providing space and opportunities for discussion, cooperation and collaboration in finding problem-solving solutions, providing opportunities to build knowledge by utilizing technology-based learning resources, learning is not limited to the classroom, getting students used to studying material at home that has been sent previously via the internet, followed up by working on and completing class assignments together.

The emphasis of problem-based learning with a flipped learning approach is that students are given contextual materials and tasks, sent in advance by utilizing technological devices for students to learn at home. When in class students have understood the material, they just need to do the tasks independently and in groups, discuss and collaborate to solve problems with teacher assistance and guidance. The results of student work are presented through group representatives in turn, others are asked to respond. The lesson ends with an evaluation and reinforcement of the material that is still considered incomplete during the class discussion.

The role of the teacher as a motivator, inspirer and facilitator keeps the learning process running as expected, producing students with critical thinking skills. Success in producing students with high-level thinking skills requires hard work, synergy, gradually, even habituation. Even the tasks and problems faced by contextual students and their solutions require high-level thinking.

6. CONCLUSION

From the results of hypothesis testing, the results obtained $t_{count} > t_{table}$, where $t_{count} = 3.14$ while $t_{table} = 2.02$, with a significance level of 0.05, it can be concluded PBL with a flipped learning approach at Al Muhafizhoh Senior High School in Blitar City has an effect on the critical thinking skills of students in class XI-IPA Pancasila Education subject with Pancasila Democracy material, odd semester 2024/2025. This illustrates that the PBL learning model is student-centered, faced with contextual problems, provides space and opportunities to discuss, communicate and collaborate to find a way out of problem solving, and build knowledge by utilizing technology-based information sources can not only improve students' critical thinking skills, but can also improve students' understanding and learning achievement.

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