

Conference Paper

Implementation of Distance Learning Based on Problem-Based Learning to Increase Critical Thinking Skills

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ORCID:Septi Kuntari: <https://orcid.org/0000-0001-9105-7480>**Abstract**

Problem-based learning (PBL) is a learning model that requires the active participation of each individual, who in the learning process all help to determine the subject matter. The PBL model can foster students' critical thinking skills through solving various real-world problems found in the environment where they live. This research aimed to improve students' critical thinking skills through PBL-based online learning. Quantitative experimental methods were used. A one group pretest-posttest design was employed: a preliminary test (pretest) was carried out, followed by the treatment, and finally the final test (posttest). There were two experimental groups: A and B. The results showed that students' critical thinking skills increased in both group A and group B and this change was significant, as measured through a t-test ($p < 0.05$ in both groups).

Keywords: distance learning; problem-based learning; critical thinking skills; sociology of education.

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1. Introduction

In the world of education, implementing a learning model is a must as an effort to make it easier for educators to convey their knowledge to students. The primary key to the success of a learning process is by delivering material using a specific learning model. An educator is required to master various kinds of learning methods and models to facilitate the process of providing information and knowledge to students. The advancement of technological developments that are increasingly rapid at this time requires a high level of creativity for educators in delivering learning material in lectures.

According to article 1 paragraph 2 of the Law of the Republic of Indonesia Number 14 of 2005 On Teachers and Lecturers, lecturers are professional educators as well as scientists who have the main task of transforming, developing, and disseminating science, technology, and arts through education, research, and community service to the community.

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Educators must be capable of developing creative power in teaching activities. As an effort to improve the creativity of an educator is to apply a learning model during learning activities. Various learning models are useful for increasing students' knowledge skills, including a learning model based on a real problem in life around them.

Currently, we are dealing with the conditions of the Covid-19 pandemic in the world, including the Indonesian people. Pandemic social conditions and situations force educators to be able to carry out lecture activities from their respective homes (popular with the term work from home). Especially because the government requires that every teaching and learning activity be carried out temporarily from home, educators must be able to adapt the conditions that oblige to carry out online distance learning activities. Because of current social conditions that limit physical in-person meeting activities in the context of prevention transmission of COVID-19 [1]. Face-to-face learning is the most frequent practice in the lecture process in class. In its implementation, the learning process organized using various learning models, one of the learning models is the PBL model. Currently, directly face-to-face learning cannot be held in the lecture class because it is to anticipate the spread of the coronavirus so that lecturers use PBL-based online learning to improve student's critical thinking skills even though it is carried out online without face-to-face directly. The use of PBL which is usually done face-to-face can be applied in the online learning process could help lecturers to activate student's interactions, with an aim to improving sociological critical thinking skills. The implementation of distance learning based on Problem-Based Learning (PBL) considered most appropriate. PBL is used as a learning method in online classrooms with the current conditions where online learning is mandatory. The application of online PBL-based learning methods can be an alternative in fostering critical thinking skills in students and can be applied by educators, especially those who carry out the learning process to raise activity in the classroom. So, the design of this study is to foster and improve students' critical thinking skills through PBL-based online learning so that this can also be followed by further research. The learning process using the PBL model is usually carried out face-to-face in class, with research related to the application of the PBL model online. The study can become new information for other educators to vary PBL learning to foster critical thinking skills through online learning.

Urgency (priority) research:

1. PBL can be applied in the learning process in the classroom through online learning.

2. Application of PBL in online learning can improve students' critical thinking skills in solving various problems that exist in their lives.
3. PBL can increase students' skills and knowledge in the online learning process, especially in dealing with real problems.

2. Related Works/Literature Review

There have been many kinds of research regarding the implementation of PBL in online learning. Like Cho and Jonassen, who tested the influence of using scaffolding on the results of problem-solving and student motivation using the online PBL learning method. Respondents who were participants in the introductory logic course first divided into small groups randomly and then divided into experimental groups (scaffolding) and control groups (verbal). Although this study found that there was no significant difference between the control group and the experimental group in the learning motivation of students, this study found that there was a considerable difference between the pretest and posttest scores in terms of problem-solving. This study also found that the use of this learning method increased the intensity of students in solving problems, where students discussed online and then reviewed it again in-depth in actual offline discussions [2]. This finding is similar to Dennis (2003), who found that there was no difference in achievement between students with online PBL and offline PBL. The difference found was in the time spent, where the experimental group (online PBL) spent more time in learning when compared to the control group (face-to-face PBL) [3, 4].

There is also McLinden's research that applies PBL principles to design and design and evaluate flexible online learning in a virtual ecosystem. This research conducted on students with special needs. Furthermore, this study explores how the development of using the design that has made. As a result, the study found that students can access online learning materials comfortably. The study also provides recommendations as an effort to improve the effectiveness of PBL implementation in online learning, where the use of this method must also encourage collaborative learning and intense interaction between students and supported by careful preparation and excellent teaching capabilities [5]. Cho and Jonassen's research and McLinden's research show that the use of PBL in improving students' problem-solving abilities is appropriate, although other resources must also support its use.

Meanwhile, regarding comparative research in online PBL implementation, conducted by Özdemir (2005), who found the advantages of critical thinking in students who are learning subjects using collaborative PBL when compared to those who are teaching

subjects with individual PBL models [6]. Online PBL implementation concerning personal cognitive flexibility has revealed by Battig (1979). He interprets cognitive flexibility as a set of skills in selecting effective alternative learning strategies for each material to convey, as well as expertise in preparing problem-solving steps for each different problem [7]. Regarding the cognitive flexibility of online PBL, there is also a study conducted by Alper (2003) that seeks to find out its effect on student achievement and attitudes using the Ren Test. The study found that the implementation of online PBL would increase the level of student's performance and outlooks. Still, there was no significant relationship on the effect of the level of cognitive flexibility [8].

Stepien et al. explained that PBL is a learning model that requires students' active participation in solving various social problems through multiple stages so that students have knowledge related to a problem and can solve the problem [9]. PBL is a learning model that emphasizes the active participation of every student involved in learning to be able to solve a problem through various systematic stages. The aim is that students can reinforce knowledge related to real issues, and students can think critically in dealing with existing social issues [10]. PBL has several characteristics, including a learning model based on social problems in social reality, discusses the topic of the subject discussed before; small groups formed where each group had to describe the work of each group.

So, this research adheres to the meaning of the learning model PBL as a form of learning that is motivated by real problems under the social reality in the surrounding environment by going through stages in obtaining knowledge related to the existence of the issues faced as an effort to develop students' abilities on critical thinking. In contrast to previous studies that examined PBL on objects planned online and offline, this study looked at the implementation of PBL on research objects that were unplanned to be carried out online. In principle, this study will complement previous research by looking at the PBL implementation with dynamic improvisation by the object of research due to the Covid-19 pandemic condition.

3. Material & Methodology

3.1. Data

The object of this research was students of the Department of Sociology Education, FKIP Untirta. Purposive sampling technique used to determine respondents by selecting classes that have carried out intense online learning. Based on these criteria, the sample

to be taken was the MK class of Modern Sociology Theory, namely 30 respondents in class A (group A) and 30 respondents in class B (group B). All students who took the Modern Sociology Theory of MK lectures became respondents because research carried out in line with the lecture activities that attended by all of these students according to the lecture schedule of the Department of Sociology Education, FKIP Untirta. This research begins by giving pre-test to students to determine the initial ability before being given treatment using PBL-based distance learning (online). Students who become respondents will take the initial test, then proceed with the implementation of PBL-based distance learning for students. The results of the treatment in the form of student post-tests used to determine the effect of the application of PBL based online learning to improve the critical thinking skills of students of Sociology Education.

The data obtained in this study were in the form of:

1. Observation. An observation used to describe and find out the real conditions in the field, related to the implementation of PBL-based online learning to improve critical thinking skills in one of university in Indonesia. Research observation was conducted during the learning process followed by sociology education students at the Modern Sociological Theory lecture.
2. Documentation. Data is required to collect data related to research, including the initial value before treatment, the final result, and supporting data in the research process.
3. The test. Data in the form of pretests made to determine the ability of the students before the beginning of the treatment using distance learning (online) based PBL. The test created for the pre-treatment (pretest) pre-test with a check that made to determine the final ability (posttest) after treatment using PBL-based distance learning (online). The test instrument that made first was subjected to a validation test (expert judgment) before it later used to see the effect of PBL-based distance learning (online). Explanation of how data was collected/generated, explanation of how data was analyzed explanation of methodological problems and their solutions or effects. We need to know how the data was obtained because the method affects the results. Knowing how the data was collected helps the reader evaluate the validity and reliability of your results, and the conclusions you draw from them.

3.2. Method

The research design used was one group pretest-posttest design. This study did not use a comparison group but used a pretest and a final test (posttest) so that it could see the effect of using the PBL model. The limitation of this study is the absence of a control class because it has a single focus on the experimental group. This study used an experimental research design using one group pretest-posttest design, as shown in table 1.

TABLE 1: Research Design (one group Pretest-Posttest Design)

Group Experimen	Pretest	Treatment	Posttest
Class	V	V	V

Adapted from Arikunto [11]

4. Results and Discussion

4.1. Result

The expected results in this study were an increase in the critical thinking skills of students of FKIP Untirta Sociology Education after implementing online learning using PBL. Critical Thinking Skill (CTS) Indicators:

1. Provide a simple explanation, including:
 - (a) Focusing on the questions,
 - (b) Analyzing arguments,
 - (c) Asking and answering questions about an explanation and challenges.
2. Building fundamental skills include:
 - (a) Considering the credibility of a source,
 - (b) Observing and consider the results.
3. Concluding includes:
 - (a) Construct deductions and considering the results of deductions,
 - (b) Arrange induction and consider the results,
 - (c) Make decisions and consider the results.
4. Provide further explanation:

- (a) Define terms and consider definitions
 - (b) Identify assumptions
5. Set strategies and tactics:
- (a) Decide on an action

4.2. Statement of results

TABLE 2: Statement of results

PBL steps	Explanation of CTS indicators
Orient students to the problem	Provide a simple reason include: 1) focus on the question 2) analyze the argument 3) asking and answer questions about a statement and challenges
Organizing learning activities	Build Basic Skills include: 1) considering the credibility of a source 2) observing and considering the results of observations
Guiding independent and group investigations	Concluding includes: 1) Construct deductions and reviewing the results of deductions 2) Arrange inductions and viewing the results of induction 3) making decisions and evaluating the results
Developing and presenting the results of the work	Providing further explanation includes: 1) defining terms and find definitions 2) identify assumptions
Analysis and evaluation of the problem-solving process	Set strategies and tactics include: 1) decide on an action;

The observations result during the eight sessions learning process indicate student competencies change primarily concerning critical thinking skills. Observation of initial lecture sessions, when the lecturer tried to apply the PBL-based PJJ learning model, showed that many students were confused and unable to optimal levels on following the learning steps. One of the initial obstacles faced in learning is that the student's attitude is still inactive and have not focused on the course. This condition makes the application of PBL less optimal because students who should actively participate as learning subjects put lecturers as the central source of information on teaching materials. This condition is influenced by student's conditions who are unfamiliar with the materials presented by the lecturers. Students do not have enough experience in learning related to the material, even they still do not know the reference for lectures. The result showed that just a few students actively participated in the first to fourth sessions, mostly still in the process of adapting to the learning model applied by the lecturers. Even though it looks less smooth, the PBL-based PJJ learning shows an increase in which the number

of students who are willing to volunteer in give respond to issues that are oriented by lecturers has increased at each session.

At first, the lecturer gave the opportunity freely for students to submit their opinions, but starting at the sixth sessions there was a slight change in technique in which the lecturer immediately pointed to the names of the students who were asked to respond. This aims to stimulate students so that each of them is more focused on learning. As a result of this change in technique, at the seventh session, it observable that almost all students when the lecturer allowed them to have an opinion, immediately volunteered independently without named by the lecturer. Even students who previously seemed passive also began to participate in giving responses by autonomous volunteering. The student's responses at the initial sessions sounded like they were repeating those in books and other reference. Despite that repeatedly at subsequent sessions, especially after the fourth session, it observable that students can respond more critically by making explanatory narratives use his sentence.

Student's capability in giving these responses was inseparable from their changing attitudes in attending lectures were at the initial sessions not many of them knew and had reference related to the material. These conditions can find out from the ineffective discussion session in the second step, namely organizing learning activities so that students' CTS ability at the initial sessions is not optimal, especially concerning the credibility of a source, observing, and considering the results of the observation. The lack of reference prepared and owned by students also influence the third learning step, namely guiding independent and group investigations to be less than optimal. However, this condition began to improve after the fifth to eighth sessions where students were able to adapt to the PBL learning model so that they tried to find and prepare various reference that supported learning. At first, students seemed to be relying on random references from the internet, but this began to change when in the sixth sessions they preferred reference from various scientific books and journals. This ultimately increases students' CTS because they know from credible sources, proposes them to make assumptions with more credible sources of information. The result is the discussion process becomes more interactive when students exchange and share information to construct teaching materials where lecturers no longer dominate as the central source of teaching material. Their ability to respond to the problems presented has become increasingly critical and can reflect the reality and theoretical concepts more logically and critically.

The positive developments in the first, second, and third steps also had an impact on the fourth and fifth stages were shown that the student's ability to present results

and analyze and evaluate problems increasingly led to the CTS indicator. The ability of students to process the information they collect from various references that is increasingly credible makes them better at analyzing. This can be seen in the fifth session where each student no longer begins to depend on his opinion on his friends, they have started to have their respective opinions according to the results of their observations and processing of information. When lecturers provide opportunities to present their work, students are seen to be more enthusiastic and ready to give their opinions. The results of the analysis submitted by students, especially those related to CTS competencies in the form of providing further explanations and arranging strategies and tactics, also seemed to increase because at the initial sessions many students only chose or expressed repeating opinions from those conveyed by their friends who were considered "smart" but at the initial sessions. At the end of the sessions, they were able to respond to each other's views so that they were no longer just following what their friends had said. Students can provide further explanations for proposed action choices or solutions based on their understanding. This condition shows that the application of PBL-based PJJ in the Modern Sociology Theory of the Court was able to improve CTS for Sociology Education students as seen from the changes in attitudes and skills shown by students in eight sessions which researchers continued to observe intensively. The difference between the pretest and posttest values that have been tested through SPSS shows the results of an increase in students' critical thinking skills. Based on the hypothesis test using the t-test at the 5% significance level, it obtained $0.000 < 0.005$ in each group, it can be stated that there is an increase in students' critical thinking skills which also showed through their attitudes and behavior. For more details, see the table below:

The test result table shows that the sig. equal to 0.000 in group A and the value of sig. of 0.000 in group B. The results of hypothesis testing at the 5% significance level for group A and group B indicate an increase in critical thinking skills, which is seen from $0.000 < 0.05$.

4.3. Explanatory text

Before conducting research, first, a preliminary study related to the implementation of lectures is undertaken. The results of the initial study indicate that students tend to be passive and less involved; this raises a condition in which the lecture process becomes less active. Lack of activity judged by the attitude of students who have not been able to develop their critical thinking skills. This condition, coupled with the learning model used

TABLE 3: Group A T-test results

Paired Samples Statistics									
		Mean	N	Std. Deviation	Std. Error Mean				
Pair 1	Posttest	75.33	30	7.303	1.333				
	Pretest	53.50	30	8.525	1.556				

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Posttest & Pretest	30	.321	.083

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Posttest - Pretest	21.833	9.274	1.693	18.370	25.296	12.895	29	.000

TABLE 4: Group B T-test results

Paired Samples Statistics									
		Mean	N	Std. Deviation	Std. Error Mean				
Pair 1	Posttest	74.00	30	8.502	1.552				
	Pretest	53.20	30	11.339	2.070				

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Posttest & Pretest	30	.120	.527

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Posttest - Pretest	20.800	13.330	2.434	15.823	25.777	8.547	29	.000

in the lecture process, not all of them use the PBL model. The PBL model considered to be able to improve students' critical thinking skills because they have the freedom to demonstrate their ability to analyze a problem in the lecture process.

The lecture process using the PBL model is considered capable of increasing the knowledge and critical thinking skills of sociology education students because they equipped with experiences in solving real problems in life. Learning with the PBL model can add insight, knowledge, and student skills for the future. This study uses the PBL model which helps lecturers in delivering learning material to students in online classes will lead to student's active participation in online learning, in other words, PBL implementation involves interaction with each student in jointly solving a problem.

4.4. Discussion

Analogous with the research results of Cho and Jonassen [2], Dennis (2003) [3, 4], this study also found that the use of the PBL method saw an escalation in the activities of students who were actively learning outside of lectures. This can be known from the observation that shows an increase in student activity in preparing references from the internet, various books, and scientific journals. Likewise, with the findings of McLinden [5], in the process of implementing PBL in this study, it appears that the dynamics of adaptation both from lecturers and students are an effort to increase involvement in the learning process. Furthermore, concerning the findings of Özdemir (2005) [6], Batting (1979) [7], Alper (2003) [8], this study found an increase in students' cognitive flexibility in the social domain. These findings appear with an escalation in both sociological analytical skills and sociological imagination overtime during PBL implementation.

5. Conclusion

Implementation of online learning with PBL can increase the critical thinking skills of FKIP students, which recognized from the changes in student attitudes and skills before and after the implementation of PBL-based online learning. The implementation of the PBL model also has weaknesses, when online PBL is not directly face-to-face it results in interaction only through the virtual world without direct supervision by the lecturer. Also, the PBL model that is applied in the learning process requires patience considering that activating students through the PBL model requires several meetings because the activity is formed if learning is accustomed to being accepted by students through the PBL model. Students can show the ability and knowledge in critical thinking to solve a problem because they are used to every meeting in class, carried out with discussions that trigger active participation of each student through the PBL model. In the future, it is hoped that the development and continuation of PBL-based research, specifically able

to involve the active participation of each student in the learning process, is expected by applying it through face-to-face learning so that there is a better discussion process through direct interaction.

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