Problem-Based Learning Model Based on Flipped Classroom: Effective Strategies to Increase Activity of Student Learning in Online Learning

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Abstract. The purpose of this study was to compare the learning activities of students using the problem-based learning model based on the flipped classroom compared to the problem-based learning model in online learning. This study is a quasi-experimental study using an independent sample t-test. This research was conducted on students in the sixth semester of the economic education study program in the poverty economics course for the 2021/2022 academic year. The results of this study conclude that there are differences in a student learning activity with the acquisition of Sig. 0.020 < 0.05. This means that the learning activity of students who use the PBL model based on the flipped classroom is significantly higher than that of students who use PBL in online learning. Giving study instructions and previous problem-based learning video links can move students to study independently/in groups with their peers. The result is that during online meetings, students are dominantly active and learning is more effective.

Keywords: Problem Based Learning, Flipped Classroom, Learning Activities.

1 Introduction

The Covid pandemic has changed people's lives a lot, with so many rules and restrictions on human crowds. One of the sectors most affected by the COVID-19 pandemic is the education sector. Based on data from UNESCO as of April 14, 2020, 192 countries closed national and local educational institutions which affected nearly 1.6 billion students or 91.4% of the total students in these countries, including Indonesia[1]. Around 28.6 million students in Indonesia from elementary to high school levels in several provinces have had to move from classroom learning to online learning. Not only students but the impact of online learning is also felt by students in universities.

The application of online learning in Indonesia itself still has various problems and problems that occur in students, especially the problem of inadequate internet networks for students who live in areas that do not yet have access to a stable internet network, as well as economic problems such as not having an internet quota, and lack of internet access. mastery of online learning technology. both in terms of lecturers and students who hinder the online learning

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process. As a result, all the problems faced by students and lecturers can hinder student activity in online learning[2]. The problems above confirm previous research[3] about the low level of student attendance in online learning. But the problem does not stop there, the high level of student attendance in online learning is also not necessarily in line with the level of active learning in class[4]. This means that those who attend online learning are not necessarily active in a series of lectures.

Whatever the problems that surround the world of education today, it is still necessary for teachers to be able to manage classes with active, innovative, problem-oriented learning that can create student-centered learning activities. All conditions like this must be managed properly by educators, both in offline learning, blended learning, or also online learning. One of the relevant learning models recommended by the Ministry of Education and Culture of the Republic of Indonesia is the problem-based learning (PBL) model.

PBL is a learning model that stimulates students to analyze problems, estimate answers, search for data, analyze data and conclude answers to problems[5]. PBL can involve students as a whole in the learning process to help students to think more actively, creatively, and responsibly towards the tasks given to find ways to solve problems to get optimal results and improve student achievement[6].

The syntax of the PBL model is 1)Conduct problem orientation, 2) Organize learning assignments, 3) Conduct individual and group investigations, 4) Develop and present the work, and 5) Analyze and evaluate the problem-solving process[7]. However, the problem is that PBL was originally designed for face-to-face learning. Thus, in the current online learning conditions, several obstacles are often encountered which will ultimately affect student activity and learning outcomes.

Based on the results of observations, the most perceived obstacle in implementing PBL is syntax 3. This is reinforced by the results of previous researchers, specifically, the obstacles

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experienced by teachers in implementing each stage of PBL lie in the third stage, when helping independent and group investigations, namely guiding students in individual and group investigations[8][8].

The above information was carried out in a face-to-face experiment. Whereas in face-to-face learning conditions, syntax 3 is relatively easier to do than online learning. During face-to-face learning, teachers/lecturers can directly visit each student discussion group, to guide, evaluate and also provide suggestions or input from any difficulties students encounter. Meanwhile, in online learning, teachers/lecturers will find it more difficult to monitor or guide study group investigations.

This situation reinforces that even without online learning conditions, PBL has several weaknesses, including PBL also requiring a longer implementation time[9]. Thus, in conditions of online learning, this problem gap will be even greater because it is influenced by factors supporting learning devices (laptops/smartphones), stable networks, internet data quotas, wifi availability, and so on.

One of the learning models that can be collaborated to complement this PBL model is the flipped classroom learning model. The flipped class learning method helps students to learn independently at home through information or learning videos provided by the teacher so that students have preparation when facing problems in learning activities at school. The concept of flipped class learning is when the learning that students usually do in class is done at home, and homework that is usually done at home is done at school[10]. This learning model involves students in problem-solving activities encountered in learning activities by using the knowledge that students have learned at home through learning videos provided by the teacher.

It is hoped that the collaboration of the PBL model and the flipped classroom can complete the shortcomings of the PBL model. Students can learn independently outside the classroom either individually or in group discussions in understanding problem orientation, investigating individual/group problems, developing work, and even analyzing problem-solving in the PBL model syntax. This means that before entering online classes, students have done independent study and discussions with previous study groups. Of course, this is expected to cut the long learning time in the implementation of PBL. Armed with an understanding of the results of previous independent learning, it is hoped that it can increase student learning activities when meeting in class later. And from this learning activity, it is hoped that it can improve student learning achievement.

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[8] Tyas, Retnaning. (2017). Kesulitan Penerapan *Problem Based Learning* Dalam Pembelajaran Matematika. *Tecnoscienza.* Vol. 2(1),11-2017.

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Research on the collaboration of the PBL model with the flipped classroom has been previously researched[11] [12] [13]. Some of these researchers studied the effect of flipped classroom-based PBL on critical thinking skills, creative thinking skills, and student learning outcomes. The three results show that PBL based on the flipped classroom has a significant influence on critical thinking skills, creative thinking skills, and also student learning outcomes. However, studies on the effect of PBL based on flipped classroom on student learning activities are still difficult to find before.

Learning activity is influenced by internal factors and external factors[14]. Internal factors are factors that come from within the students themselves. While external factors are factors that come from outside the students themselves. Readiness is needed because during the learning process, students are required to always be ready, and with this readiness, students will find it easy to follow the learning process. Good learning readiness can make students able to follow the learning process well and actively[15].

Based on the above study, further strengthens that student activities can be well-formed and prepared. One of the external factors that teachers/lecturers can do is to prepare relevant learning designs that support student learning activities. One of them is by designing learning that collaborates the application of the PBL model with the flipped classroom learning model, especially in the current online learning situation. For this reason, further studies are needed to analyze and compare the impact of the application of the flipped classroom-based PBL model on student learning activities in online learning in a series of studies.

2 Research Methods

The research design is *quasi-experimental*. The subjects of this study were lecturers and sixth-semester students of the Economics Education Study Program, FE Unimed, which consisted of classes in the Poverty Economics course. The purpose of the study was to compare the learning activity of students from the problem-based learning model class based on the flipped classroom in class B as treatment I as many as 28 students, and also from the problem-based learning model class in class C as treatment II as many as 33 students. The learning design in this experiment

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[11] Sinmas, W.F., Sundaygara, C., Pranata, K.B. (2019). Pengaruh PBL Berbasis *Flipped Class* Terhadap Prestasi Ditinjau dari Motivasi Belajar Siswa. *Rainstek: Jurnal Terapan Sains & Teknologi.* Vol. 1(3), 2019.

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was carried out by applying online learning, and during face-to-face meetings using Google Meet.

The learning activity instrument developed refers to the opinion of Paul B. Diedrich who explained that student learning activities were divided into 8 activities, namely a. visual activities, b. oral activities, c. listening activities, d. writing activities, e. drawing activities, f. metric or motor activities, g. mental activity, h. emotional activity. This learning activity instrument is organized into 24 questions and has been tested for validity before using expert judgment. The data generated in this data collection is in the form of dichotomous data, if Yes means 1 and No means 0. This dichotomy data is classified on a nominal measurement scale so that the analytical technique to answer the hypothesis in this study uses a non-parametric statistical approach with the Mann-Whitney U Test.

3 Results and Discussion

The general description of student learning activity describes the frequency distribution and percentage of student activity in each question item. In this experiment, they were divided into 2 groups, namely the problem-based learning model class based on the flipped classroom in class B with as many as 28 students and the problem-based learning model class in class C with as many as 33 people. From the whole series of treatments of the learning model, each student was given a questionnaire to evaluate and measure their learning activity. This learning activity questionnaire consists of 8 indicators with a total of 24 questions that have been validated by expert judgment previously.

The statistical frequency distribution of student learning activity questionnaire results can be seen in the following table:

Table 1. Distribution of the Frequency of Student Learning Activities

No	Type of Activity	PBL-FC class		PBL class	
		Total	Percent	Total	Percent
1. Visual Activities					
a	I pay attention to the lecturer's explanation	24	85.7%	18	54.5%
b	I pay attention to the group that is presenting	22	78.5%	20	60.6%
c	I watched the group presentation slides	22	78.5%	20	60.6%
2. Oral Activities					
a	I ask when there is an opportunity from the presentation group	9	32.1%	5	15.1%
b	I discuss in groups the preparation of presentation materials	21	75.0%	16	48.4%
c	I answer/respond to questions during a presentation	18	64.2%	10	30.3%
3. Listening Activities					
a	I listen to the lecturer's explanation	23	82.1%	18	54.5%
b	I listen to group presentation materials	24	85.7%	20	60.6%
c	I listen to the discussion of friends in groups	18	64.2%	16	48.4%
4. Writing Activities					
a	I jot down important information during a group presentation	20	71.4%	15	45.4%

No	Type of Activity	PBL-FC class		PBL class	
		Total	Percent	Total	Percent
b	I'm also looking for materials for group presentations	21	75.0%	20	60.6%
c	I take notes on important material from group discussions	16	57.1%	14	42.4%
5. Drawing Activities					
a	I made a graph from the collected data	18	64.2%	14	42.4%
b	I am involved in the preparation of presentation slides	20	71.4%	16	48.4%
c	I give suggestions/corrections from the results of group slides	20	71.4%	16	48.4%
6. Activity Metrics					
a	I collect data used for mini-research	22	78.5%	15	45.4%
b	I can use data processing applications (SPSS/Eviews)	24	85.7%	22	66.6%
c	I am involved in processing data for group mini-research	22	78.5%	12	36.3%
7. Mental Activities					
a	I analyze the problem presented by the presentation group	22	78.5%	17	51.5%
b	I examine the relationship of the problem to the influencing factors	18	64.2%	14	42.4%
c	I prepare answers to questions during the presentation	20	71.4%	15	45.4%
8. Emotional Activities					
a	I don't feel bored with this material lecture	24	85.7%	20	60.6%
b	I am enthusiastic about participating in the group presentation	22	78.5%	20	60.6%
c	I am happy to be involved in collaborating on group material preparation	22	78.5%	18	54.5%

Source: Research Questionnaire Data (2022)

Based on Table 1 above, it is known that there are differences in student learning activities between the PBL class based on the flipped classroom and the PBL class students. In terms of the percentage of each indicator of student learning activity, it is known that the value of the activeness of the PBL class based on the flipped classroom is higher than the activeness of the PBL class. However, to answer the hypothesis, there needs to be further data analysis.

Table 2. Student Learning Activity Rank

Ranks

	Group	N	Mean Rank	Sum of Ranks
Active	PBL-FC	28	37.54	1051.00
	PBL	33	25.45	840.00
	Total	61		

Source: Research Data (2022)

Based on Table 2. above, it is known that the descriptive statistical results show that the mean value of the FC-based PBL class activity rank is 37.54; greater than the mean value of the PBL class activity rank of 25.45. From the mean rank value, it can be explained that the activeness of the FC-based PBL class is higher than that of the PBL class.

Table 3. Learning Activity Hypothesis Test

Test Statistics

	Active
Mann-Whitney U	279,000
Wilcoxon W	840,000
Z	-2.664
asymp. Sig. (2-tailed)	.008

a. Grouping Variable: Group
Source: Research Data (2022)

Based on Table 3. above, it is known that the Asymp value. Sig. (2-tailed) of 0.008 < 0.05, then Ha is accepted, meaning that there is a significant difference in learning activity between FC-based PBL classes compared to PBL classes in online learning conditions. Or specifically, it can be explained that the active learning of FC-based PBL class students is significantly higher than that of PBL class students in online learning conditions.

The results of this study prove that student learning activities can be formed, can be designed, and can be prepared properly through learning designs that support student learning activities. The collaboration of the PBL model and the flipped classroom can complement the shortcomings of the PBL model and make students more active in the learning process. Some of the weaknesses of PBL are a) it needs to be supported by books that can be used as understanding in learning activities; b) PBL model learning takes a long time; c) not all subjects can be applied to this model[16]. In particular, the obstacles experienced by teachers in implementing each stage of PBL lie in the third stage, when assisting independent and group investigations[17].

Some of the weaknesses and difficulties in implementing PBL that can be covered from the flipped classroom learning model, including the weakness of PBL which needs to be supported by books that can be used as understanding in learning activities, takes a long time and the most difficult to apply is in the third syntax, which is helping independent/group investigations. Meanwhile in the flipped classroom model, students have been given previous work instructions and are also given relevant learning videos, both containing material and videos related to the problem being discussed. From this video, students can learn, discuss and discuss these problems either independently or in groups. This means that outside the classroom before the meeting, students have interacted, and discussed before. This condition certainly makes students already have prior knowledge and have made thorough preparations before the meeting. As a result, during lectures in online meetings, the preparations that have been made outside the previous class, will certainly cut the relatively long PBL implementation time in class, so that

[16] Sanjaya, W. (2007). *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan*. Jakarta: Kencana.

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the implementation of PBL syntax runs effectively and efficiently. In addition, through student discussion activities outside the classroom related to the video of learning problems, it is easier for teachers/lecturers to guide individual and group investigations during online learning. It will certainly reduce the relatively long time for implementing PBL in class so that the implementation of the PBL syntax runs effectively and efficiently. In addition, through student discussion activities outside the classroom related to the video of learning problems, it is easier for teachers/lecturers to guide individual and group investigations during online learning. It will certainly reduce the relatively long time for implementing PBL in class so that the implementation of the PBL syntax runs effectively and efficiently. In addition, through student discussion activities outside the classroom related to the video of learning problems, it is easier for teachers/lecturers to guide individual and group investigations during face-to-face online learning.

Based on the results of this study, the activeness of students who applied the PBL model based on the flipped classroom was significantly higher than the activeness of students in the PBL class. It is proven that the student's prior knowledge and understanding of previously studied learning problems have an impact on student learning activities. The result is that learning becomes more effective, PBL syntax runs efficiently, students are dominantly active and learning objectives are successfully achieved.

The success of this learning is certainly influenced by many things, including by the lecturers and students themselves. Effective learning is learning that runs smoothly and can optimize learning outcomes. If students and lecturers participate actively in learning, the learning will run effectively[18]. When students are active in the learning process, the percentage of learning success will increase[19].

Meanwhile, the activeness of students to express an opinion or ask questions about lecture material can be very low even though they have been given incentive points. This happens because of internal and external factors in the students themselves. The unpreparedness of students to take part in learning can have an impact on the learning process. Students who are reluctant to seek information about the material to be discussed at the next meeting can hinder the learning process[20].

Reflecting on the opinion above, the reluctance of students to seek information at the next meeting can be overcome by applying the flipped classroom model. This is because the lecturer has given instructions and provided relevant learning videos at the previous meeting, to study and discuss the problem both independently and in groups. However, providing value stimulus to active students is still important to stimulate and appreciate student learning activities.

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However, not only external factors, but internal factors are also important to increase student learning activities. This is in line with the opinion[21] that personal motivation affects activity more. So the hope is that lecturers can increase the encouragement from within students (internal factors), to increase activity in the learning process.

Of course, this information is increasingly complex and every teaching staff must continue to strive to improve student learning activities, both strengthening from internal factors in the form of providing personal motivation and also external factors, one of which is the readiness of student learning tools.

4 Conclusion

Based on The results of the study concluded that there was a significantly higher learning activity in the PBL class based on the flipped classroom compared to the PBL class in online learning. The collaboration of the PBL model and the flipped classroom turned out to be able to complete the shortcomings of the PBL model. Giving previous learning instructions and providing problem-based learning video links to be discussed and discussed by students both independently and in groups proved to be able to reduce the length of PBL implementation time, and make it easier for lecturers to guide students in independent and group investigations. The result is that dominant students are more active and learning is more effective.

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