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FKIP Uviversitas Serambi Mekkah Banda Aceh

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The Effectiveness Of Problem-Based Learning On Student Achievement In Economic Subject

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Abstract
This study aims to identify the effectiveness of problem-based learning (PBL) on achievement in Economic subject. This study uses an unequal control group design, which has been carried out for 10 weeks involving as many as 80 fourth-grade students at SMAN 1 Unggul Baitussalam, Aceh Besar. The samples were divided into the experimental group and the control group. The students in the experimental group took lessons using the PBL module, while students in the control group followed lessons conventionally. The PBL module was built using analysis, design, development, implementation, evaluation (ADDIE model) teaching design and was based on the five PBL phases. The descriptive statistics used were frequency, percent, mean, and standard deviation, while paired t-test, independent t-test, and MANOVA were used to test the hypotheses. The results showed student achievement in the experimental group experienced a significant increase, while students in the control group only experienced a slight increase. The results of the MANOVA showed there was no effect on the test scores of Basic Economics

before and after the experiment. At the same time, the results of the study also found there was an interaction effect of achievement levels on test scores before and after the experiment. However, there was no significant interaction effect between groups and achievement level on the test scores before and after the experiment. Overall, the findings of this study indicate that the PBL has had a positive impact on student achievement.

Keywords: problem-based learning, achievement; economics

INTRODUCTION

Education is the main key to the progress of a nation, the better the quality of education held by a country, the more qualified the citizens of that country will be (Yudiana 2010). The quality of education is closely related to the educational process. Weaknesses in the teaching and learning process of Economic subject at the high school have become hotly discussed issues among the Indonesian education ministry, teachers, parents and the community. These issues are generally closely related to the teaching methods. This is in accordance with the research by Frenita et al. (2013) who found that the main cause of problems in Economic subject was caused by external factors in the form of teacher teaching methods that did not vary. According to Idris & Salleh (2010), to get effective teaching, a conducive environment is needed, encouraging students to think and ask questions. However, in reality, education is still dominated by the view that knowledge is a set of facts that must be memorized (Dindin 2009; Nasruddin 2010). In conventional learning, knowledge is limited and only flows from the teacher to the students (Zikri 2009). The implementation of the traditional and less interactive teaching process resulted in students being less focused on the teacher when explaining the lesson and making students lazy to ask questions, which ultimately caused students to lack understanding of the concept of the lesson being taught (Saniah et al. 2011). Meanwhile, student-centered teaching methods encourage students to be actively involved in learning activities and not as mere recipients of information (Suhaida 2002).

Many previous studies have proven that student-centered teaching is better and makes it easier for students to understand the material being taught (Kelly & Finlayson 2008; Zikri 2009; Strobel & Barneveld 2009). One of the student-centered approaches and adapting real daily problems into teaching and learning is the problem-based learning (PBL) approach (Lynda Wee & Megan 2002; Zaharatul & Ramlee 2007). A study by Yadav (2011) found the advantages of learning using PBL were twice that of traditional learning. The review of Farah Nini Dusuki (2005) in Ramlee & Zaharatul (2008) on students of the Faculty of Law also found that when PBL was implemented the number of students who got an A grade increased and the PBL method was able to

increase student achievement from a C grade to a B grade. Research findings by Wahid et al. (2006) also found that PBL can improve student achievement in Civil Engineering courses. Previous studies conducted in Indonesia related to the application of PBL in Economic subject for secondary schools were still poorly explored, so more detailed research was carried out to determine the effectiveness of PBL on student achievement in Economic subject.

Thus, this study aims to identify the effectiveness of the PBL method on achievement in Economic subject among high school students. Specifically, this research was carried out to meet the needs of the following research objectives, namely a) identifying differences in student achievement in pre-and post-tests for the experimental group, b) identifying differences in student achievement in post-tests between the experimental group and the control group, c) identifying the impact group on Basic Economic test scores before and after the experiment, d) identify the main impact of achievement level on Basic Economic test scores before and after the experiment, and e) identify the impact of the interaction between groups and achievement level on Basic Economic test scores before and after the experiment.

In the field of education, success in the learning process is always seen in the results of student achievements. Achievement is what is produced or obtained by someone in something of learning (Azman 1994). The achievement also contains the intention of success achieved by students in lessons so that the highest level (Hanafi 1997). Achievement in theory is different from intelligence, achievement is more evidence of student progress in school (Carter 1973). Usually, this achievement is assessed in terms of raw grades, grades, and ranks for one subject or the entire course (Raha 1991). Konting (2005) also explains that achievement tests contain a set of stimuli that measure an individual's mastery and proficiency in a specific area.

According to Noor (1999), academic achievement is also referred to as the level of excellence achieved by students in lessons obtained through exams, which to take the exam is done by the students themselves and cannot be done by others. This means that a student who has studied in both formal and non-formal schools will take an exam to find out the value he/she has achieved during the lesson. This test result is called achievement which is evidence of student progress in school.

Achievement is closely related to the teaching method used by the teacher (Sohair 1990; Hawatemeh 1999; Zikri 2009). So far, the teaching strategies and methods used are not appropriate, such as the teacher-centred approach. If this weakness is not overcome, students will start to lose interest in learning. In addition to learning styles and teaching methods, factors that are always associated with student achievement include personality, gender, family environment, socioeconomic level, interests, attitudes, motivation and previous academic achievements (Alice 2011; Ismail & Othman 2012).

Past performance is the most important predictor of academic achievement (Alice 2011). With the previous knowledge, students will be easier to accept and follow the lesson. Students can also teach other friends, as well as be a driving force that motivates other students to study the subjects (Muqsith 2013). Students must have prior knowledge to allow new knowledge to be linked and stored properly in thinking, so students become motivated to integrate new knowledge (Novak 1998). Existing knowledge is very important for determining lesson objectives and lesson content and making it easier for teachers to transfer learning and determine the approach to be used in the teaching and learning process (Mok 2000).

Economic achievement in secondary schools in Indonesia was measured through weekly/monthly exam results, semester exams, and national exams (ujian nasional / UN). The value of Economic subject obtained at the UN is at a low level. Many students do not master the concept of economics. Various reasons were put forward by students why they did not master the economic materials. There are those who think that Economic subject is difficult because there is statistical calculation material, some even consider it a boring and monotonous lesson because there is a lot of memorizing material. Inappropriate material and unsupportive learning methods can cause students to have difficulty learning Economic subject.

In general, there are various factors that influence the learning process to make it look interesting and fun, so that Economic subject that have a lot of memorization and calculations no longer seem passive and difficult. In this case, Zaman & Libertina (2012) suggested one of the factors that influence the learning process, namely the teacher's ability to deliver lessons. Lessons delivered in a systematic, clear and fun way will make the lesson more liked by students. Of course in this case the teacher must choose a delivery method that is in accordance with the subject matter.

The problem of the lack of student achievement in Economic subject stems from the practice of learning methods (Chiu 2000). Economic teachers should provide opportunities for all their students to hold discussion sessions, especially to solve problems. So far, teachers have taken the easy way of telling students the answers without explanation to save time and finish the syllabus quickly (Khoo 2008). In this study, student achievement was measured through students' ability to answer an achievement test question in economic with the title Economic Problems, Human Needs and Economic Systems.

METHODOLOGY

Research Design

This study used a quasi-experimental design based on a non-equivalent control group design (Wiersma 2000; Salkind 2000; Konting 2005). This study used a quasi-

experimental because the sample was not chosen at random, but using existing classes (Johnson & Christensen 2000; Creswell 2005). Existing groups can be selected under conditions that do not allow for random sample selection (Tuckman 1999; Gall et al. 2003). Quasi-experimental research involves the manipulation of one independent variable (Dawson 1997). This method is very suitable to be used to examine the comparison of effects in various situations, while the experimental technique is completely unavailable (Neuman 1991). Meanwhile, according to Campbell & Stanley (1996), a quasi-experimental design is a study involving two unequal control groups.

Research Sample

The sample was 80 students of fourth level of SMA Negeri 1 Unggul Baitussalam, Aceh Besar. The number of samples was divided into two groups, namely the experimental group with 40 students and the control group with 40 students. According to Konting (2005), the number of samples must exceed 30 people because the assumption of a normal distribution is usually met if the sample size exceeds 30 people. Borg & Gall (1989) also proposed at least 15 samples per group for experimental research purposes. So, the number of samples consisting of 40 students representing each group, in addition to meeting the normal distribution assumption, also makes it easier for students to carry out learning activities.

Instrument

Research instruments or tools are very important in research that will be built and run. This study uses the following instruments: Economic achievement written exam questions, PBL modules, student worksheets (lembar kerja siswa / LKS) and expert and teacher legality forms. The achievement test is in the form of pre-and post-exam papers. Pre-exam papers are used to detect the level of achievement that students get in Economic subject when using conventional learning methods. Meanwhile, the post-test was also used to test the effectiveness of using the PBL method.

Data Analysis Procedure

In this study, the data obtained through the questionnaire will be analyzed using SPSS software version 15.0. According to Konting (2005), statistical data analysis using SPSS software can produce precise calculations. Before the data was analyzed, the data entered into the SPSS software is checked and cleaned first to detect errors in inputting the data into SPSS (Pallant 2007).

The quantitative data of this study used descriptive analysis and inference analysis. Descriptive analysis used was frequency, percent, mean and standard deviation (SD). The inference analysis used was a t-test and multivariate analysis of variance (MANOVA).

RESULTS AND DISCUSSION

Repeated-measurement t-test analysis was conducted to compare the mean values of the pre- and post-test of Basic Economic achievement in the experimental group. The results are provided in Table 1.

Table 1 shows that there is a significant increase in the mean value of Basic Economic achievement in the experimental group from the pre-test (mean = 67.55, SD = 5.978) to the post-test (mean = 74.08, SD = 7.134) with a t-value of 5.285, $p < 0.05$. Therefore, the repeated measurement t-test was found to have a significant difference between the pre-test and post-test. Then the null hypothesis ($H_0 1_1$) which states there is no difference in student achievement in the pre-and post-exams for the experimental group is rejected.

Table 1
Results of t-test repeated measurements of post- and pre-achievement Basic Economics for the experimental group

Variable	Test	N	Mean	Standard deviation	t-value	Df	Sig
Basic Economic achievement exam	Post	40	74.08	7.134			
	Pre	40	67.55	5.978			
	Post-Pre	40	6.525	7.809	5.285	39	.000

* Significant level 0.05
Source: research results 2021

Independent sample t-test analysis was also conducted to compare student achievement scores in the post-test between the experimental group and the control group. The results are provided in Table 2.

Table 2
Independent sample t-test results for the post-Basic Economic achievement test between the experimental group and the control group

Variable	Group	N	Mean	Standard deviation	Mean different	t-value	Df	Sig
Basic Economic exam	Experimental	40	74.08	7.134	3.40	2.280	78	.025
	Control	40	70.68	6.170				

* Significant level 0.05

Source: research results 2021

Based on Table 2, the independent sample t-test analysis found there was a significant difference between student achievement scores in the post-test between the experimental group and the control group (t = 2.280, p = < 0.05). So, the null hypothesis ($H_0 1_2$) which states that there is no difference in student achievement in the post-test between the experimental group and the control group is rejected. This means that the level of achievement of the experimental group students is greater than the control group after the experiment was carried out. The mean difference between the treatment group and the control group was 3.40.

Furthermore, to determine the homogeneity matrix of variance-covariance, the researcher conducted Levene's test and Box's M test. Levene's test was conducted to determine the equality of variance in the Basic Economic pre-achievement test. The results are provided in Table 3.

Table 3
Levene's test to find out the equality of variance in the pre-test

Variable	F value	Degree of freedom 1 (df 1)	Degree of freedom 2 (df 2)	Sig
Basic Economic achievement exam	.401	1	78	.529

Source: research results 2021

Based on Table 3, Levene's test showed a score of F = .401, p = .529 (p > 0.05). These results indicate that the variance is equivalent (homogeneous), this means that the post-achievement test in Basic Economics can be analyzed using the MANOVA test. The Levene test to determine the equality of variance in the post-Basic Economic achievement test has also been carried out. These findings are shown Table 4.

Table
Levene's test to find out the equality of variance in the post-test

Variable	F value	Degree of freedom 1 (df 1)	Degree of freedom 2 (df 2)	Sig
Basic Economic achievement exam	.669	1	78	.416

Source: research results 2021

Based on Table 4, Levene's test showed F = .669, p = .416 (p > 0.05). This result also shows the variance is equivalent (homogeneous). Box's M was used to test the homogeneity of the variance of each dependent variable for all levels of the independent variable. The results are provided in Table 5.

Based on Table 5, Box's test analysis found F = 1.441, p = 0.105 (p > 0.05). These results indicate the existence of equivalence of variance-covariance between the dependent variable for all levels of the dependent variable. This means that further analysis using MANOVA can be carried out. According to Hair et al (2010), the MANOVA test is not meaningful if the covariates in the dependent variable are not homogeneous with respect to the independent variables. However, if it is not homogeneous, the analysis can still be continued if the sample size of each group exceeds 20 people and is almost the same (the ratio of a large group to small group size is less than 1.5). This is because the effect of type 1 error (type 1 error) is very small (Steven 2001; Pallant 2007; Natrah 2012; Wan Syafie 2014).

Table 5
Box's M exam to find out the equality of variance in achievement exams

Box's M	F value	Degree of freedom 1 (df 1)	Degree of freedom 2 (df 2)	Sig
36.051	1.441	18	855.311	.105

Source: research results 2021

After all the assumptions for conducting the MANOVA test analysis have been complied with, then the MANOVA analysis was carried out to determine the significant interaction effect between groups and achievement levels on the scores of the Basic Economic exam before and after the experiment. The MANOVA test is carried out using Wilk's Lambda test because there are many educational and social science studies and it is appropriate to use Wilk's Lambda test (Chua 2008). The results of the MANOVA analysis are shown in Table 6.

Table 6
MANOVA effect of group and achievement level on Basic Economics test scores

Effect	Wilks' Lambda value	F value	df 1	df 2	Sig	η^2
Group	.947	1.805	2	64	.173	.53
Achievement level - pre	.159	48.210	4	128	.000	.601
Achievement level – post	.190	41.494	4	128	.000	.565
Group * achievement level – pre	.711	5.949	4	128	.000	.157
Group * achievement level	.816	3.434	4	128	.011	.097

– post						
Achievement level - pre * achievement level – post	.651	5.101	6	128	.000	.193
Group * achievement level - pre * achievement level – post	.956	.729	4	128	.574	.022

Source: research results 2021

Based on Table 6, it was found that the results of Wilks' Lambada test on MANOVA showed no effect on the group variable (F = 1.805, p > 0.05) with an effect size of .53. This means that the null hypothesis ($H_0 1_3$) that there is no main group effect on the test scores of Basic Economics before and after the experiment is accepted. However, there was a major effect on achievement level on pre-test (F = 48210, p < 0.05) and achievement level on post-test (F = 41,494, p < 0.05). Furthermore, the results also found that there was an interaction effect between groups and achievement levels on the pre-test (F = 5.949, p < 0.05). There was also a significant interaction effect between groups with achievement levels on the post-test (F = 3.434, p < 0.05). The overall results also showed an interaction effect between the achievement level in the pre-test and the achievement level in the post-test (F = 5.101, p < 0.05). This means that the null hypothesis ($H_0 1_4$) that there is no interaction effect of achievement level on Basic Economic test scores before and after the experiment is rejected. However, there was no overall interaction effect between groups, achievement level on pre-test and achievement level on post-test (F = 0.729, p > 0.05). This means the null hypothesis ($H_0 1_5$) that there is no significant interaction effect between groups and achievement level on the test scores of Basic Economics before and after the experiment is accepted.

The Basic Economic exam was administered to both groups to measure differences in achievement for the control group and the experimental group. This exam is given twice, namely before and after the intervention of teaching and learning economics with the topic of Economic Problems. The descriptive and inference analysis performed showed that the achievement scores of the two groups in the early stages before the intervention were at the same level, namely the intermediate level. These results are in line with the views of Bashah (2007) and Natrah (2012), wherein order to test the level of student achievement, the experimental and control class students' achievements should be more or less the same or equivalent in order to obtain more precise data legality. Equal knowledge among students is necessary so as not to influence future research findings (Nor Azian 20008; Zikri 2009).

The results of the analysis show that PBL is effective in increasing student achievement in Basic Economic subject, where the mean achievement of the Basic Economic test in the experimental group exceeds the control group. The results showed that the achievement value of the experimental group had increased after being taught the PBL method. There was a significant increase in the mean value of achievement in Economic subject in the experimental group due to exposure to the PBL method from the mean value of 67.55, which is at the intermediate level in the pre-test, to the mean value of 74.07, which is at the high level in the post-test. These results are in line with the previous study by Wan Syafii (2014), that the PBL method can improve student

achievement and understanding. The results are also supported by Albanese & Mitchell (1993), McParland et al. (2004), Kasai et al. (2006) and Herlina et al. (2016), who found the PBL method had a significant impact on student achievement.

However, the results of this study contradict the results of Mergendoller et al. (2000), Keegan (2003), Miller (2003), Maxwell et al. (2005), Mohd Ali (2008), Vicki (2008) and Mazren (2011), who found no significant difference between the experimental group using the PBL method and the control group using the traditional method in terms of achievement. Exposure to the PBL method did not provide a significant increase in the achievement scores of the experimental group of students. Natrah (2012) compared the effectiveness of PBL and conventional methods on achievement and critical thinking in the topic of Nutrition. The results of his research found that the achievement of the experimental and control group students had increased. Both methods are effective in improving academic achievement among students (Miller 2003; Beers & Bowden 2005; Carrio et al. 2011). There is no significant difference in terms of student achievement even though the PBL approach has been used in the classroom. This happens because students are only assessed in terms of the final answers to the exam questions that have been provided (Mohd Khairuddin 2004).

However, the results of this study also found that the achievement of the control group of students exposed to the traditional method also showed a slight increase from the mean score of 67.10 in the pre-test, to the mean score of 70.68 in the post-test. However, the achievement level of the control group students was still at the intermediate level. The increase in the control group was not too significant compared to the experimental group. Experimental group students got better achievement scores after being introduced to the PBL method than the control group using the usual method. This result is in line with the findings reported by Belt et al. (2002), Orhan & Ruhan (2006), Anderson (2007), Zaharatul Laili (2007) and Zikri (2009), whose research results found that the performance of the group taught using PBL was better than the group taught using the conventional method.

The PBL module which integrates the five phases of PBL has succeeded in improving students' Basic Economic achievement, especially on the topic of Economic Problems. This success certainly cannot be separated from the impact of the five PBL phases that have been organized in a structured and systematic manner in the PBL module. In addition to the PBL module factor, the way teachers teach also contributes to and determines the success of using the PBL module in the teaching and learning process of Economic subject. These results are in line with the results by Maxwell et al. (2005) that students who show high achievement in PBL classes are also influenced by the factor of teachers who can carry out PBL in a good and professional way according to module instructions. The teacher's role is important when implementing PBL for school students (Sungur et al. 2006).

Disclosure of analytical problems in the first phase, namely the problem orientation phase in the PBL module, provides opportunities for students to understand

the concept of Economic Problems more efficiently as well as to activate students' knowledge and experience. So it is not surprising that the results of this study show that students are more enthusiastic about taking lessons because students can easily understand the direction of learning. They can relate the concepts of economics they are studying to Economics Problems in their daily lives. In the orientation phase, the teacher begins to direct students to questions or problems. The orientation phase is a phase where students begin to be able to build information, categories, concepts and structures through cognitive schemas so that students can build their knowledge (Von Glasersfeld 1996, Yustina 2010). Problems require students to determine what assumptions are needed, why, what information is involved and what steps are needed to solve the problem (Duch Groh et al. 2001).

The next phase which is thought to have affected students' achievement in Basic Economics is the second and third phases of PBL. The second phase is to organize students to carry out learning activities. In this PBL phase, the teacher directs students to identify the problems that exist in the LKS related to the topic of Economic Problems. While the third phase is to help research individually and in groups. Students begin to identify problems, state problems, identify and clarify problems and describe these problems based on the facts that exist together in small groups guided by economic books, worksheets, the internet and other relevant sources. Through this activity, PBL has been effective in reinforcing students' understanding of economic concepts, because this phase it provides opportunities for students to identify problems and plan how to solve Economic Problems by connecting existing experience and knowledge. Problem-solving activities that connect existing experiences with students' everyday phenomena can facilitate students to understand the concepts they are learning, and contribute to increasing students' knowledge, understanding and achievement (Akinoglu & Tandogan, 2007; Yustina 2010).

Each PBL phase and activities in the PBL module are believed to be able to guide and direct students to connect Economic Subject with real-life economic problems, students can also understand economic phenomena that occur in real life. Understanding this concept contributes to increasing the achievement value of Basic Economic subject, especially the topic of Economic Problems. For students, the fourth and fifth phases are among the phases that also influence students in strengthening their understanding of economic concepts. At this level, students build solutions and make explanations of the solutions that are carried out. Students in groups give each other ideas to solve problems, share information, synthesize and apply the information obtained to solve problems. In the end, in the fifth phase, the teacher allowed for representatives from each group to present the results of their discussions in front of the class, in the form of solutions to problems that had been discussed in groups. At the time of presentation, students are believed to express opinions about the problems found, and try to defend and accept input from other groups (Arends 2008). This activity provides an opportunity for students to continue to think to find appropriate solutions to problems. The more often students do it, the more often students do the process of thinking about the lessons learned. This subsequent frequency of thinking can contribute to higher levels of achievement and understanding in learning these subjects (Sabaria 2003). This activity

stimulates, trains and fosters students' critical thinking and metacognition (Dochy et al. 2003).

The results of this study were as expected because many studies have shown that student-centered teaching is better (Kelly & Finlayson 2008; Nor Azian 2008; Zuraidi 2008; Strobel & Barneveld 2009). The results of this study are also in line with the results by Akinoglu & Tandogan (2007) which found the implementation of active learning using the PBL method had a positive effect on academic achievement in Science subject; Folashade & Akinbobola (2009) for Physics subject; and Sabaria (2003) in Biology subject. The PBL method is a student-centered method that provides a challenging environment and can stimulate students' motivation to be actively involved in the classroom, which causes students to have a more positive view of learning (Colliver 2000). Students show active self-involvement in the classroom and have a positive attitude towards the learning experience in the PBL class compared to classes that are not introduced to the PBL method (Major & Palmer 2001; Cerezo 2004; Sharifah et al. 2010). PBL can have a positive impact on concept development and can even minimize the level of misunderstanding among students (Orhan & Ruhan 2006). PBL is considered suitable to be used not only in increasing students' knowledge and skills but also being able to support the development of generic skills (Faridah et al. 2003; Strobel & Barneveld 2009). Meanwhile, Sungur (2006) proves that PBL students have better achievements in terms of the ability to organize and integrate knowledge compared to students who follow the traditional method. Based on research findings and student views and supported by various recent studies, it has been shown that the integration of the five PBL phases in the PBL module is effective in increasing student achievement levels.

CONCLUSIONS

From the descriptive analysis, it was shown that there was a significant increase in the mean value of Economic subject in the experimental group due to exposure to the PBL method from 67.5 in the pre-test to 74.07 in the post-test. The achievement score of the control group of students who used the traditional method also showed an increase but not too significant. The results of the inference analysis also showed that there were differences in student achievement in the post-test between the experimental group and the control group. These results indicate that the use of the PBL method has a positive impact on student achievement. This study has also proven that the use of the PBL module is effective in increasing student achievement on the topic of Economic Problems. Teaching and learning Basic Economic subject through PBL can be used as an effective vehicle for increasing student achievement. Each phase of PBL provides an opportunity to guide students in connecting economic concepts in school with economics problems in students' real lives. This is beneficial for future students to navigate daily life and the career realm. The results of this study are expected to contribute to the improvement of teaching and learning methods applied by teachers in

secondary schools by considering the use of PBL to stimulate student achievement. The use of modules, worksheets and lesson plans must continue to be implemented to realize a directed and systematic teaching process.

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