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The Effect of the Problem-Based Learning Model on Learning Outcomes in the Course of Learning Strategy at Sttiaa Pacet Mojokerto

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The purposes of this research are (1) to test the differences in the learning outcomes of the students' concepts of applying *problem-based learning* and *direct instruction* study models on learning strategy course at STTIAA Pacet, Mojokerto, (2) to test the differences in the results of learning in understanding the concept of students between those who have high *self-regulated learning* and low *self-regulated learning* in the learning strategy course at STTIAA Pacet, Mojokerto, (3) knowing the interaction between problem-based learning and student self-regulated learning models on the learning outcomes in the learning strategy course at STTIAA Pacet Mojokerto. This research is using a factorial design with a 2x2 design. It is conducted at STTIAA Pacet, Mojokerto. The number of the research subjects is 40 students, 20 students for the control class, and 20 students for the experimental class. This research uses three kinds of variables, an independent variable, a moderator variable, and a dependent variable. The independent variable is the *treatment* of this study, which is the application of a *problem-based learning* model. The moderator variable is self-regulated learning and the dependent variable is the learning outcomes. Two data techniques were used; observation and test. Observation is used to determine the activities of lecturers and students. Tests are used to determine the learning outcomes. The data analysis techniques used are the normality test, homogeneity, and hypothesis testing that is used in a *univariate bivariate analysis of variance.* The results of the analysis and research are as follows: (1) the result of the *univariate analysis of variance* shows that sig counts 0,000 < 0,05, and it can be concluded that there is a difference in the learning outcomes between students who have applied the *problem-based learning* and *direct instruction* on the learning strategy course at STTIAA Pacet Mojokerto. (2) the result of the *univariate bivariate analysis of*

variance shows sig. counts SRL 0.166 > 0.05, and it can be concluded that there is no difference in the result of learning outcomes of students between having high *self-regulated learning* and low *self-regulated learning* in the learning strategy course at STTIAA Pacet Mojokerto. (3) the result of the *univariate bivariate analysis variance* shows sig. counts method * SRL 0.131 > 0.05, and it can be concluded that there is no interaction between *problem-based learning* and *self-regulated learning* model towards the learning outcomes in a learning strategy course at STTIAA Pacet Mojokerto.

Key words: *Problem Based Learning (PBL), Self-Regulated Learning (SRL), Learning Outcomes*

INTRODUCTION

Education is the key to all progress and quality development because with education humans can realise all their potential, both as individuals and as a global community. The education process is required to prepare and produce quality human resources to process this information properly (Depdiknas 2006). Therefore, to realise self-potential, one must go through an educational process that is implemented in the learning process.

Learning is a process of changing behaviour to gain knowledge, abilities, and something new and directed at a goal. Learning is also a process of acting through various experiences by seeing, observing, and understanding something that is learned (Khanifatul, 2013). From this learning process, it is expected that students are active in learning and that their thinking process skills are trained. Thinking is a process of combining perceptions and elements in the mind, as well as mental manipulation activities due to external stimuli that form thinking and reasoning (Costa, 1985). Khanifatul (2013: 23); thinking skills in line with the discourse improve the quality of education through a learning process that is by the demands of the objectives or learning outcomes. A learning process as stated in the Republic of Indonesia Government Regulation Number 32 of 2013 that "the learning process in educational units is held in an interactive, inspirational, fun, challenging manner, motivates students to actively participate and provides sufficient space for initiative, creativity, and independence accordingly. with the talents, interests, and physical and psychological development of students".

Religious Higher Education is a higher education level after secondary education which aims to develop the potential of students to study religious knowledge with the insight into the integrity of science, spiritual power, self-control, personality, intelligence, noble character, and skills needed by themselves, society, the nation, and country. The main mission of STTIAA is to provide quality theological higher education in spirituality and intellectuality based on the

teaching of Reformed Theology, carrying out research activities in the fields of theology, Christian education, and missions and organizing community service activities through activities that serve churches, Christian schools, and the general public, as an application of a missionary understanding of Reformed Theology. For this mission to be realised, higher education institutions as providers of higher education must be free from any influence, pressure, and contamination such as political and/or economic forces, so that the Tridharma of Higher Education, namely education, research, and community service can be implemented based on freedom and academic and scientific autonomy. The main task of the state in implementing higher education is to guarantee the quality of higher education so that the interests of the community are not harmed. Meanwhile, the main task of the state in managing higher education is to ensure that the autonomy of higher education can be realised. Based on the above framework, this Government Regulation is designed and stipulated to regulate the duties and authorities as well as the implementation of the state's duties by the Government.

Abdi Allah Evangelical Theological Seminary is one of the organisers of Theological Higher Education in Indonesia with a boarding system, which is effective and strategic to support the success of education. It is interdenominational, does not differentiate between ethnic groups and races, and bases its teachings on Reformed doctrine, committed to equipping the children of God who are called so that they are ready to be sent as pastors, evangelists, and teachers throughout Indonesia and abroad. Open to change and continuing to take steps to form an education system that can maintain the quality of education in the future.

Based on the results of observations and interviews with lecturers and students at Abdi Allah Evangelical Theological Seminary, several problems were found. Student activeness is still low. This was proven when the student learning process was passive, namely only listening to the explanations given by the lecturer. Lack of students' understanding of the learning strategy material, causes the allocation of learning time needed to belong because it has to be repeated and the learning outcomes obtained are not as expected.

Learning outcomes are changes in a person's behaviour that can be observed and measured in the form of knowledge, attitudes, and skills after receiving the learning experience. The expected learning achievement in the learning strategy course is that students can explain the essence, definition, and components of learning. Students can explain the concept of learning strategies, be able to define various learning methods, be able to explain how to choose and determine learning methods, be able to explain the characteristics of teaching and learning success, and be able to analyse, practice, and develop learning strategies.

To realise the condition of student learning outcomes that are by learning outcomes, the appropriate reference for learning theory is problem-based learning (PBL). PBL is a learning approach that involves students facing problems through real practice in everyday life (Barrows, 1980). PBL is a learning model designed and developed to develop problem-solving

abilities (Mustaji, 2009). By applying a problem-based learning model to students, it is hoped that it can increase their activeness and stimulate their participation in a learning process so that it is expected that their learning outcomes will increase.

PBL uses the various kinds of intelligence needed to confront real-world challenges, the ability to deal with anything new and problems that arise. PBL is often done with a team approach through an emphasis on building skills related to decision making, discussion, team maintenance, conflict management, and team leadership. According to Howard Barrows and Kelson (Amir, 2009: 21), PBL is a curriculum and a learning process. In the curriculum, problems are designed that require students to gain important knowledge, make them adept at solving problems, and have their learning strategies and participate in teams. The learning process uses a systematic approach to solve problems or face challenges that are needed in everyday life. So PBL is giving problems related to daily life to students, then students in groups look for alternative solutions to solve these problems. Meanwhile, according to Dutch (in Amir 2009: 21), problem-based learning is an instructional model that challenges students to learn to learn, work together in groups to find solutions to real problems. This problem is used to remind curiosity as well as analytical skills and initiative on the material; learning. PBL prepares students for critical thinking and analysis and to find and use appropriate learning resources. This opinion is reinforced by Pusdiklatkes (2004) that learning based on problems or PBL is a learning process that begins with problems found in an environment. PBL is a learning environment in which problems are used to learn. Before learners learn something, they are required to identify a problem, both faced in real-time and in case studies. The problem is posed in such a way that students find the learning needs necessary so that they can solve the problem.

Self-regulated learning (SRL) in students can be described by levels or degrees which include active participation, be it metacognitive, motivational, or behavioural in the learning process (Zimmerman, 2012). According to the results of research conducted (Marzuki, 2014), it shows that the SRL level that students have is very influential on their learning outcomes. Another study conducted by Jumino (2016), also found that SRL affected learning outcomes. Several research results using self-regulated learning show positive results as research conducted by Adnyani et al. (2015) concluded that there are significant differences in learning outcomes between students who take self-regulated learning and students who take conventional learning. Research by Lestari, et al (2017) concluded that there is an effect of self-regulated learning strategies on students' abilities.

Based on the background described, the problems raised in this study are: (1) Are there differences in learning outcomes between students who follow the problem-based learning (PBL) and direct instruction (DI) models in the learning strategy course at STTIAA Pacet Mojokerto? (2) Are there differences in student learning outcomes between those who have high self-regulated learning and low self-regulated learning in the learning strategy course at

STTIAA Pacet Mojokerto? (3) Is there an interaction between the problem-based learning and self-regulated learning models of students on learning outcomes in the learning strategy course at STTIAA Pacet Mojokerto?

METHOD

This research approach uses a factorial design with a 2 x 2 design, the use of this design is because the researcher knows the interaction between variables (Fraenkel, 2006). The research design used a quasi-experimental type of research. The research design used was the nonequivalent control group design. With this design, both the control class and the experimental class are selected and placed without going through randomisation. Both groups were given a pretest, then given treatment, and finally given a posttest. The design form can be described as follows:

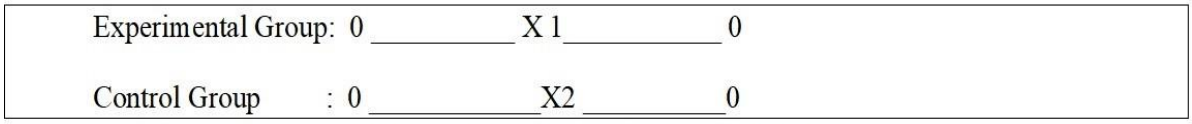

Figure 1. The quasi-experimental design

Notes :

O : *Pretest and postest*
X^1 : Perlakuan pada kelas eksperimen dengan model pembelajaran *problem-based learning*
X^2 : Treatment of the control class using the direct instruction model
….. : This line means that the class is not done randomly but uses an existing class.

At the end of the learning activity or after the students were given treatment, then a postest was held to find out the student learning outcomes after being given treatment.

Table 1. 2 x 2 Factorial Design

Self Regulated Learning (X)	Learning Model (y)	
	PBL (Y_1)	DI (Y_2)
High (X_1)	$Y_1 X_1$	Y_2X_1
Lowh (X_2)	$Y_1 X_2$	Y_2X_2

Notes:
Y1X1 = interaction of PBL with high SRL
Y1X2 = interaction of PBL with low SRL
Y2X1 = interaction of DI with high SRL
Y2X2 = interaction of DI with low SRL

The research subjects were undergraduate students of Christian Religious Education, Absi Allah Evangelical Theological Seminary. The subjects of this study were taken from 2 classes (1 class in the experimental group and 1 class in the control group), each of which consisted of 20 students. Both the control class and the experimental class were selected and placed without going through randomisation, so the class selected to be used as the experimental class was class A while class B was used as the control class.

Data collection instruments are tools that are selected and used by researchers in their activities to collect data so that these activities become systematic and simplified (Arikunto, 2013). The following is a table of instrument identification in this study.

Table 2. Identification of Research Instruments

No.	Instrument	Construct Validity	Content Validity	Advance Validity	Item Validity	Reebility
1	Student SRL questionnaire sheet	Write down items according to the construct measured through indicators	Based on a lattice analysis of the instrument	Expert judgment	Bilateral point correlation, item difficulty level, and differentiation power	Sperman Brown
2	Test sheet	Write items according to the construct measured through indicators	Based on the analysis of the instrument grille	Expert judgment	Bilateral point correlation, item difficulty level, and differentiation power	Sperman Brown

Table 3. Self Regulated Learning (SRL) Questionnaire Grid

No	Dimensions	Indicators	Question Number
1	*Strategy of Repetition*	Attempts are made to remember learning material by repeating it over and over again.	1,5,8,14
2	Strategy of *elaboration*	The act of using one's own sentences to summarize learning material.	2,3,9,13
3	Strategy of *organization*	Have a strategy of taking notes, drawing diagrams or charts to organize the subject matter.	4,7,11,15
4	Strategy of *metacognition regulation*	Able to coordinate planning, monitoring and regulating learning such as, determining the goals of reading activities or making changes so that the task is progressing.	6,10,12

Table 4. Criteria for Self Regulated Learning

Score Interval	Interval	Criteria
(M + 1,0 ?) = X	55 = X	High
X < (M + 1,0 ?)	X <55	Low

Table 5. Test Grid

No	Indicators	Achievement	Question Item
1	Restate a concept	Students are able to repeat the concepts of learning methods	
2	Classify objects according to certain properties	Students are able to classify learning methods according to their function.	
3	Give examples and non examples of concepts	Students are able to provide examples of the correct application of learning methods and examples of application the wrong learning method	
4	Present the concept in various forms of representative	Students are able to present the steps of the learning method in a flow chart.	
5	Implement problem solving concepts	Students are able to analyze learning problems by choosing appropriate learning methods	

The validity of the instrument was carried out by two learning design experts and material experts. The validity of the face of student LT is determined by expert validation including subject matter experts and learning experts. Face validation aims to get input about the expert validator's assessment of the research tools that researchers have made. The research was conducted by assessing each component of the student training program that the researcher had prepared including material, construction, and language/culture aspects. The validator assesses each item by affixing the SV sign if it is very valid, V if valid, VK if it is not valid, TV if it is not valid in the assessment column. There is an analysis of the validity of the research instrument in the form of student LT using the average calculation of the assessment given by the validator.

The data collection technique was carried out, namely the preparation stage and the experimental implementation stage. The experimental preparation stage is the preparation of learning tools and research instruments. The activity of preparing learning tools includes RPS in the learning strategy course. For the application of the PBL learning model, the research instrument prepared was an acquisition test using an understanding of the concept and the SRL instrument. Experiments will be carried out on students with PBL learning-based teaching

modules. The stages of implementing the experiment in this study are: (1) Implementing the SRL test on students at the first meeting, to find out which student groups are based on high and low SRL levels. (2) At the second meeting, giving a pretest to students in 2 classes in the form of an experimental class or a control class, which aims to determine the initial knowledge that students have and to determine the level of student homogeneity, by testing the acquisition of learning outcomes using conceptual understanding. (3) Implementing the learning treatment by providing learning strategy material with the PBL learning model to students in the experimental group, and for the control group being given the DI learning model. (4) Providing posttest to all groups after treatment, using the learning acquisition test of learning strategy material. (5) The experiment was conducted 4 times.

The data analysis technique used bivariate univariant descriptive data analysis including mean, standard deviation, and graphs. Data descriptions for the dependent variable learning outcomes were carried out on pretest and posttest data for the independent variables using PBL and SRL learning models as moderators, and the interactions between the two variables are Prerequisite Analysis (Distribution Normality Test and Variance Homogeneity) and Hypothesis Test to answer the hypothesis formulation of the dialysis statistical test using SPSS 24 which is used, namely univariate bivariate analysis of variance. The basis for decision-making is if Asymp.Sig <0.05, then H0 is rejected and HI is accepted, on the other hand, if Asymp.Sig> 0.05, then H0 is accepted and HI is rejected.

RESULT

To measure the difference in learning outcomes between students who follow the problem-based learning (PBL) and direct instruction (DI) models, high self-regulated learning and self-regulated learning, as well as the interaction between student's problem-based learning and self-regulated learning models, the research results include (1) analysis of normality and homogeneity test data, (2) analysis of SRL results, (3) differences in learning outcomes between students who follow the problem-based learning (PBL) and direct instruction (DI) model, (4) differences in student learning outcomes between those who have high self-regulated learning and low self-regulated learning, (5) the interaction between problem-based learning and student self-regulated learning models on learning outcomes.

Analysis of Normality and Homogeneity Test Data

In the analysis of the normality test, the results were normally distributed to both the control class and the experimental class. The homogeneity test obtained homogeneous results for both the control class and the experimental class in table 6 and table 7 below.

Table 6. Normality Test for Control and Experimental Class
One-Sample Kolmogorov-Smirnov Test

		Score
N		40
Normal Parameters[b]	Mean	38,8750
	Std. Deviation	9,02188
Most Extreme Differences	Absolute	,191
	Positive	,150
	Negative	-,191
Test Statistic		,191
Asymp. Sig. (2-tailed)		,128[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Table 7. Homogeneity Test for Control and Experimental Class Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
,025	1	38	,875

Based on table 6 and table 7, both the control class and the experimental class are said to be normal because the sig value is greater than 0.05. Meanwhile, in table 7, the control class and experimental class are said to be homogeneous because the sig value is greater than 0.05. The two classes depart from the same situation so that researchers can provide different treatments. For the experimental class, learning uses the problem-based learning (PBL) model, while the control class uses the direct instruction (DI) model.

Analysis of Self-Regulated Learning (SRL) Analysis

The validity and reliability of the SRL instrument can be seen in table 10 and table 11 below:

Table 8. Results of SRL Instrument Validity

No	r count	r table	Information
1	,440	0,3061	Valid
2	,396	0,3061	Valid
3	,471	0,3061	Valid
4	,388	0,3061	Valid
5	,377	0,3061	Valid
6	,418	0,3061	Valid
7	,374	0,3061	Valid
8	,466	0,3061	Valid
9	,418	0,3061	Valid
10	,362	0,3061	Valid
11	,484	0,3061	Valid
12	,396	0,3061	Valid
13	,368	0,3061	Valid
14	,466	0,3061	Valid
15	,386	0,3061	Valid

According to the number of respondents in the validity test, namely 15 students, the value of the r table is 0.3061. As seen in Table 8, all items are declared valid. In table 11 the instrument is declared reliable because Cronbach's Alpha is above 0.6.

Table 9. Results of Reliability (Reliability Statistics)

Cronbach's Alpha	N of Items
,827	15

By the criteria for self-regulated learning, students who have a score of 55 ≤ X have a high level of self-regulated learning and a score of X <55 has a low level of self-regulated learning. Students who have high self-regulated learning in the experimental class are 13 students. Meanwhile, 7 students had low self-regulated learning. Students who have high self-regulated learning in the control class are 6 students. Meanwhile, 14 students had low self-regulated learning. This data can be seen in the appendix.

Differences in Learning Outcomes between Students Who Follow the Model

Problem Based Learning (PBL) and Direct Instruction (DI)

1. Results of PBL and DI pretest t-test analysis

The control and experimental class pretest was given before learning began. There were 20 students or research subjects from the Christian Religious Education study program. The similarity test of the two pretest averages was to determine whether the students' initial abilities are the same or different. From the results of the pretest given, the following results were obtained:

Table 10. Test Results Mean (Mean) PBL and DI Pretest

	Kelompok	N	Mean	Std. Deviation	Std. Error Mean
Score	Experiment	20	40,0000	9,45905	2,11511
	Control	20	37,7500	8,65645	1,93564

Table 11. Results of PBL and DI pretest t-test analysis

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Method Conventional	Equal variances assumed	,025	,875	,785	38	,437	2,25000	2,86712	-3,55419	8,05419
	Equal variances not assumed			,785	37,705	,437	2,25000	2,86712	-3,55568	8,05568

Based on the calculation results of Table 10 and Table 11, it is known that the mean (mean) for the control class pretest is 37.7 and for the pretest experimental class is 40. Then the results of the calculation by t-test analysis obtained a significance value based on the asymp column. 2 tailed) of 0.437 or significance> 0.05 (0.437> 0.05). From these calculations it can be seen that the same treatment or treatment of learning materials, facilities, surprise, and lecturers is the same, there is no difference in the average pretest score of the control class and the pretest value of the experimental class. Thus, it can be concluded that the pretest scores obtained in the control class and the experimental class are the same.

2. Results of Univariate Bivariate Analysis of Variance PBL and DI

Giving posttest to the control and experimental classes after the treatment, where the experimental class was given PBL treatment and the control class was given DI treatment. There are 20 students or research subjects from the Christian Religious Education study program. The results of the analysis using univariate bivariate analysis of variance are as follows:

Table 12. Tests of Between-Subjects Effects

Dependent Variable: understanding of the concept

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2917.738[a]	3	972.579	13.066	.000
Intercept	191291.781	1	191291.781	2569.819	.000
Method	2323.781	1	2323.781	31.218	.000
SRL	12.381	1	12.381	.166	.686
Method * SRL	178.781	1	178.781	2.402	.130
Error	2679.762	36	74.438		
Total	229100.000	40			
Corrected Total	5597.500	39			

70. R Squared = .521 (Adjusted R Squared = .481)

The test criterion used in this study is the Sig. Coefficient, with the provision that H0 is rejected if the calculated sig value <0.05 and H0 is accepted if the sig value. Count> 0.05. Based on table 12 in the method section, shows that the sig. The count is 0.000 <0.05, so it is stated that H0 is rejected.

Table 13. Grand Mean

Dependent Variable: understanding of the concept

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
73.988	1.460	71.028	76.948

Based on table 13 Test of Between-Subjects Effects, it is found that the method * SRL is 0.131>

0.05, it is stated that H0 is accepted. So, it can be concluded that there is no interaction between problem-based learning and student self-regulated learning models on learning outcomes in the learning strategy course at STTIAA Pacet Mojokerto.

Table 14. Method

Dependent Variable: understanding of the concept

Method	Mean		Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
PBL	82.143		2.022	78.041	86.244
DI	65.833		2.105	61.564	70.102

Judging from the Estimated Marginal Means, table 14 shows that the mean PBL with a high SRL is 85,000, while the mean PBL with a low SRL is 79.286. The mean DI with SRL is high, 64.167, while the mean DI with low SRL is 67.500.

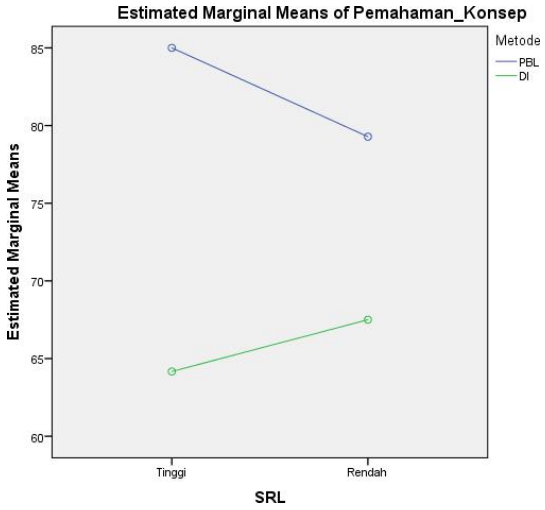

Figure 2. Interaction of PBL and SRL

Based on Figure 2, shows that there is no interaction between problem-based learning and student self-regulated learning models on learning outcomes in the learning strategy course at STTIAA Pacet Mojokerto.

DISCUSSION

The results are presented regarding studies or empirical findings related to relevant previous theories and research on learning outcomes that apply problem-based learning (PBL) and direct instruction (DI) models as well as self-regulated learning.

Discussion on Learning Outcomes Differences between Students Who Follow the Problem Based Learning (PBL) and Direct Instruction (DI) Model

Based on the results of the calculation using the univariate bivariate analysis of variance test, the significance value is based on the method column of 0.000 or significance <0.05 (0.000 <0.05). From these calculations it can be seen that the only difference in the learning process is the problem-based learning (PBL) treatment, so what causes the difference in the posttest scores of the experimental class is the treatment. From the analysis of the results of the experimental class pretest using direct instruction (DI) and the analysis of the results of the posttest in the experimental class using problem-based learning (PBL) treatment. Based on this description, it can be concluded that problem-based learning (PBL) can improve learning outcomes in the implementation of learning strategy courses so that researchers can say that there are differences in learning outcomes between students who follow the problem-based learning (PBL) and direct instruction (DI) models on learning strategy courses at STTIAA Pacet Mojokerto.

This is in line with research conducted by Ahmet Gurses, Cetin Dagor, Esen Geyik (2015), Farhad Kasemi, Masoud Ghoraishi (2012), and Tomi Utomo, Dwi Wahyuni, Slamet Hariyadi (2014). The results showed that the problem-based learning (PBL) model has an effect on student learning outcomes, PBL helps students to improve their abilities in the process of understanding knowledge (Gurses, et al., 2015). Lai and Tang (Kazemi & Ghoraishi, 2012) stated that the main characteristics of PBL are using real problems, encouraging students to actively participate, integrating broad perspectives, encouragement from themselves in learning, encouragement in working with friends and improving the quality of education. Some of the characteristics of PBL can function to improve student learning outcomes (Kazemi & Ghoraishi, 2012). According to Eunyoung Choi's research, learning outcomes were significantly positively correlated, but the results did not differ statistically between groups. Students in the PBL group improved in all measured abilities, while the scores of students in the lecture group using the conventional model decreased in problem-solving and independent learning (Choi, et al., 2014).

Problem-based learning is focused on problems where students can build their knowledge, develop inquiry skills, and think to a higher level. Students must be able to formulate temporary answers to problems that require logical intelligence, courage, and active solutions in real situations. Students also need to increase their independence, confidence, and resilience to solve problems (Thalib and Kailani, 2014). According to Sanjaya (2007), Problem Based Learning (PBL) is a series of learning activities that emphasise the problem-solving process faced scientifically. According to Glatthorn and Craft-Tripp (in Pecore, 2012), Problem Based Learning is a learning model based on constructivism theory that attracts students' interest in learning and participates actively in the learning process. According to Muraray Harvey, Pourshafie, and Reyes (2013), one way to make learning activities is to apply a problem-based

learning model. Sudjana (2011) states that learning outcomes are abilities that students have after receiving their learning experiences.

Husnindar, et al (2014) state that one of the learning models that can be used to improve the quality of the process and learning outcomes is the Problem Based Learning model. Problem-based learning has characteristics such as learning begins with giving problems, problems that have a context with the real world; students in active groups formulate problems and identify gaps in their knowledge in learning and look for material related to problems and report problem solutions. Meanwhile, educators facilitate more. The problem solving method is not just a teaching method but also a method of thinking, because, in the problem solving method, other methods can be used, starting with finding data to conclude (Djamarah & Zain, 2010: 91). Research conducted by Saputra (2020) concluded that the PBL model has a significant effect on learning outcomes.

PBL seems promising in overcoming real-world challenges, higher-order thinking skills, communication skills, problem-solving skills, and independent learning (Pistanty, 2015). The approach and structure of the PBL method may be different, but the general objectives tend to be similar. PBL begins with the assumption that learning is an active, integrated, and constructive process. Using this place, the study is contributed to by implementing a five-step problem-solving strategy.

Problem-based learning encourages students to think and solve problems in a limited amount of time (Cotton, 2011) and provides authentic experiences that encourage active learning, support knowledge construction, and naturally integrate school learning and real-life (Wulandari, 2015). The goal of PBL is to apply critical thinking, problem-solving skills, and knowledge content to real-world problems (Levin, 2001) and to develop self-developed, reflective, lifelong learners who can integrate knowledge, think critically, and work collaboratively with others (Barrows, 1996). The advantage of PBL is that students become more aware of how they can use the knowledge they acquire to (Hallinger & Lu, 2011).

According to Botty & Shahrill (2015), Problem-Based Learning is learning that is oriented towards giving problems to achieve the desired learning goals. The giving of problems which is the orientation in this learning is a simulation for them in facing problems in everyday life so that they are encouraged to learn independently. According to Sudarman (2007), the Problem Based Learning model is a learning model that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills, as well as to obtain essential knowledge from the subject matter. The PBL model is characterised by the use of real-life problems as something students must learn. With the PBL model, it is expected that students get more skills than memorised knowledge, starting from problem-solving skills, critical thinking skills, group work skills, interpersonal and communication skills, as well as information search and management skills.

Pramudita (2020) states that the PBL learning model is a learning model that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills, as well as to obtain essential knowledge and concepts from the subject matter. This model can actively optimise all the potential that exists in students, both physically and mentally. PBL learning can train students to be active and think critically; besides that there is cooperation in groups to achieve the same learning goals and students gain their own experience to solve a problem.

In achieving the goal, PBL has a way, which lies in a problem both given by the lecturer and found and resolved by the students themselves. This problem is of course a problem in the real context. Learning that takes place in a real context has a great opportunity to become meaningful learning and in this meaningful learning, thinking skills have a great opportunity to be empowered. (Corebima, 2010: 164). Problems in the real context are problems that occur related to learning strategies.

From the theory and results of several studies, it can be concluded that PBL can help students to develop critical thinking skills and problem-solving skills, so that the learning process of learning strategy subjects that apply PBL affects learning outcomes, especially to improve the ability to improve conceptual understanding of the subjects being studied.

Discussion of differences in student learning outcomes between those who have self-regulation High Learning and Low Self-Regulated Learning

SRL in students can be described by levels or degrees which include participatory activeness both metacognition, motivation, and behaviour in the learning process (Zimmerman, 2001). SRL is seen as the ability of an active-constructive individual to regulate the interaction between cognition, motivation, and behaviour (Malmberg, 2014). SRL is the ability of individuals to monitor their abilities, to plan and monitor to complete tasks well (Corno & Mandinach, 1986). The results of this study indicate that there is no difference in student learning outcomes between those who have high self-regulated learning and low self-regulated learning in the learning strategy course at STTIAA Pacet Mojokerto.

In this study, students who had high self-regulated learning in the experimental class were 13 students. Meanwhile, 7 students had low self-regulated learning. Students who had high self-regulated learning in the control class were 6 students. Meanwhile, 14 students had low self-regulated learning. The mean calculation result between high and low SRL is not too much different. Based on the results of the calculation using the univariate bivariate analysis of variance test, the significance value based on the SRL column is 0.686 or significance> 0.05 (0.166> 0.05). These results indicate that there is no difference in student learning outcomes between those who have high self-regulated learning and low self-regulated learning in the

learning strategy course at STTIAA Pacet Mojokerto. This could be because the learning outcomes do not touch the 3 factors of self-regulated learning, namely self-motivation, self-efficacy, and self-evaluation. Meanwhile, Zimmerman & Schunk as cited by (Mudjiman, 2011: 64) defines SRL as a process in which learners move, change, and maintain learning activities both independently and in their social environment, in an informal and formal instructional context. Meanwhile, Mudjiman (2011: 9) defines that SRL or independent learning as an active learning activity, which is driven by an intention or motive to master competency to solve a problem and is built with the knowledge or competencies that you already have.

This research is in line with the research of Reni, et al. (2017) where the results show that Self-Regulated Learning (SRL) has no significant effect on learning outcomes. It is hoped that the learning process for students is not only teaching and learning activities during college but also filled with other activities outside the campus such as joining organisations so that students' knowledge can also increase. For this reason, good self-regulation is needed; the goal is that students can develop and manage plans during the education process in tertiary institutions and carry out other activities outside of academia. In learning outcomes in this study, students who have high self-regulated learning are not different from students who have low self-regulated learning. Thus, the results of this study prove that SRL is not particularly sustainable in the acquisition of student learning outcomes in the learning strategy course at STTIAA Pacet Mojokerto. According to Pintrich (Wolters, et.al, 2003), self-regulation strategies in learning generally include three kinds of strategies, namely cognitive regulatory strategies, motivational regulatory strategies, and behavioural academic regulatory strategies. According to Stone, Schunk & Swartz (Cobb, 2003), self-regulated learning is influenced by three main factors, namely self-efficacy, motivation, and goals. Based on this opinion, it can be concluded that self-regulated learning is an individual learning process that is carried out independently and in a planned manner in arranging a series of learning activities by predetermined goals. After the goal is achieved, they then proceed with evaluating the results so that they can be improved to achieve optimal results in the future. Self-regulated learning is a condition in which individuals develop an understanding of which responses are appropriate and which are not, as well as control and monitor individual behaviour.

Discussion on the Interaction between Problem Based Learning and Student Self-Regulated Learning on Learning Outcomes

Based on the calculation of the Test of Between-Subjects Effects, the sig. count method * SRL 0.130> 0.05, so it can be concluded that there is no interaction between problem-based learning and student self-regulated learning models on learning outcomes in learning strategy courses at STTIAA Pacet Mojokerto. This is not in line with the findings in other studies conducted by Sofie Loyen, Joshua Magda, Remy Rikers (2008), with the research title "Self-Directed Learning in Problem Based Learning and its Relationships with Self-Regulated Learning", found that self -directed learning and self-regulated learning have similarities concerning active

involvement, goal-directed behaviour, metacognitive skills, and intrinsic motivation. While there is a relationship between problem-based learning, and self-directed learning and self-regulated learning, there is a boost to the relationship between the two from previous studies (Sofie et al., 2008). The research that initiated the relationship between PBL and SRL was also put forward by (Sungur & Tekkaya, 2006), from Middle East Technical University, who stated that PBL improved students' SRL skills.

Delisle in Abidin (2014: 159) states that the PBL model is a learning model developed to help lecturers develop thinking skills and problem-solving skills in students while they are studying learning material. This model facilitates students to take an active role in the classroom through thinking about problems related to their daily lives, finding the procedures needed to find the information needed, thinking about contextual situations, solving problems, and presenting solutions to these problems. Kemendikbud (2013b) in Abidin (2014: 159) views the PBL model as a learning model that challenges students to "learn how to learn", working in groups to find solutions to real-world problems. This given problem is used to bind students to curiosity about the intended learning. Problems are given to students before students learn the material about the problem to be solved.

Referring to Marchis (2011) learning that emphasises problem-solving, one of which PBL learning influences the formation of the learner's SRL. Self-regulation related to academic activities according to Zimmerman, Bonner, & Kovach (1996) is a reference to self-generated thoughts, feelings, and actions intended to attain specific educational goals, such as analysing a reading assignment, preparing to take a test, or writing a paper. SRL is related to independent individuals as efforts to think, feel, and act to achieve goals in learning, such as reading analysis tasks, test preparation, paper writing assignments, and so on.

PBL aims to integrate knowledge related to problems and develop or apply problem-solving skills. Learning includes the process of planning, monitoring, problem-solving, and evaluation. According to Perry, Vande Kamp, Mercer, & Nordby (2002) a learning environment will be provided that can develop a learner's SRL. The characteristic of SRL development is that in learning, students develop an awareness of what is being studied, what strategies are appropriate, and how to understand the material, which can be obtained from PBL reflection activities. The lecturer's job is to raise this awareness.

CONCLUSION

In the end, this research was taken to be concluded as follows: *First*, there are differences in learning outcomes between students who follow the problem-based learning (PBL) model and direct instruction (DI) in the learning strategy course at STTIAA Pacet Mojokerto. *Second*, there is no difference in student learning outcomes between those who have high self-regulated learning and low self-regulated learning in the learning strategy course at STTIAA Pacet

Mojokerto. *Third*, there is no interaction between problem-based learning and student self-regulated learning models on learning outcomes in the learning strategy course at STTIAA Pacet Mojokerto.

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