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Effect of DLPS (Double Loop Problem Solving) Learning Strategy on Entomology Cognitive Learning Outcomes of the Students

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***Abstract*—This study aims to determine effect of DLPS (Double Loop Problem Solving) learning strategy on Entomology cognitive learning outcomes of the students of Biology Education in Faculty of Teacher Training and Education Mulawarman University. The study was conducted on February to March, 2017. Type that used for this study is quasi experiment with 60 students as samples that consist of 30 students from class A and 30 students from class B. Data analysis that used for this study is t-test. Data analysis result showed that *tcount* > *ttable* (3.26 > 1.99) with significance level 0.05. It means there is an effect of DLPS learning strategy on Entomology cognitive learning outcomes of the students of Biology Education in Faculty of Teacher Training and Education Mulawarman University.**

Keywords: Double Loop Problem Solving Learning Strategy; Cognitive Learning Outcome; Entomology

I. INTRODUCTION

Entomology is a course given to the students of Biology Education program which is in the sixth semester. Entomology is part of the science of Biology that studies on insects, which based on survey results in preliminary research, students tend to consider this course as a fairly difficult and tedious course that ultimately affects is quite low. This is most likely because students are less active in the process of thinking and solving problems that need to be addressed by implementing appropriate learning strategies, which can make students active in the process of thinking and problem-solving.

Learning strategy according to [11], can be defined as planning that contains about a series of activities designed to achieve certain educational goals. One of the goals of education is certainly the result of learning in the cognitive domain. According to Suprijono in [13], learning outcomes are patterns of deeds, values, understandings, attitudes, appreciations and skills. Jarolimek in [2] said that the purpose of cognitive domain is related to memory or knowledge of knowledge and information, as well as the development of intellectual skills. The problem that arises is what kind of strategy and how the systematic sequences can be developed so that learning becomes effective.

One of the best learning strategies to encourage active thinking and problem-solving is Double Loop Problem Solving (DLPS). According to Argyris in [14] study of DLPS is the process of comparing problems with existing solutions, questioning whether the solution is appropriate and justifying whether this is the best way to solve the problem. Current temporary solutions will be called into question to, perhaps, establish a new set of solutions. This strategy emphasizes the question and modification of solutions, procedures, policies, and objectives of problem resolution, where the process involves changing knowledge base or specific competencies. DLPS strategy facilitate learner to reflect on and inquire into previous context, whether success or failure. Learner asked to discover inhibiting or succession factor, and invent new strategy to improve a context that have been learned or discussed [10].

The DLPS strategy suggested here accommodates different levels of the cause of a problem, including the mechanism by which a problem occurs. DLPS will encourage learners (in this case students) to work on two different but interlinked loops, where the two loops are as follows [5]: 1) The solution loop 1 is intended to detect the cause of the problem most directly, and then design and implement temporary solutions. 2) Loop solution 2 seeks to find a higher-rooted cause, and then designs and implements the solution from the root of the problem.

Previous research showed that experimental class that used DLPS strategy can get higher average of gain score higher than control class and it can conclude that the use of DLPS give significant effects against student learning outcome especially in spatial thinking ability [4]. Research that conducted by [9] showed that using DLPS can improve students learning outcome as evidenced by an increase of 70% in cycle I and 80% in cycle II. The success of the DLPS strategy in influencing and improving learning outcomes based on previous research encourages researchers to know the effect of DLPS learning strategy on students who take entomology courses in of Biology Education Department Faculty Teacher Training and Education, Mulawarman University.

II. METHODOLOGY

This research was conducted at Biology Education Department, Faculty of Teacher Training and Education, Mulawarman University from February to March 2017. The population in this research is the sixth semester students in Biology Education Department which follow Entomology

course, meanwhile, the sample in this research is 60 students consisting of 30 students of class A and 30 students of class B, where class A as a class that gets treatment and class B as a control class.

The research procedure used quasi experimental Pretest-Posttest Control Group Design model, but group retrieval was not done completely randomly, only one characteristic or taken with paired or mated. The data of this study were analyzed by using the t-test because both variance is unknown and the difference of the sample number is not more than 50%. Before doing t test, please note the homogeneity of variance. The t test is given into two kinds: t test with homogeneous variance and t test with heterogeneous variance. Homogeneous/ heterogeneous two variance are known by using F test.

III. RESULT AND DISCUSSION

Based on the pretest results conducted in the experimental class (class A) obtained data in the amount of value is 1522 and the average value 38.05, and the data variant 52.27. The data obtained from the experimental class posttest (class A), for the amount of the value of 2266 and the average value of 75.53 and the data variant of 40.47. While Based on the pretest results conducted in the control class (class B) obtained data in the amount of value is 1445 and the average value of 36.12 and the data variant 49.04. Data obtained from posttest result of class control (class B), for the amount of value that is 2170 and mean value 72,33 and data variant 48,78.

Result of homogeneity test is to be homogeneous if Fcount<Ftable and if Fcount>Ftable then the data is not homogeneous. The homogeneity test of the pretest and posttest data is obtained Fcount as in table I and II. Since Fcount<Ftabel = 0.94<1.85 then the sample for pretest is homogeneous and F count <Ftabel = 1.25 <1.85 for posttest then sample is homogeneous.

TABLE I. PRETEST DATA HOMOGENEITY TEST RESULT

No.	Result	Experimental Class (Class A)	Control Class (Class B)
1.	Mean	76,13	71,53
2.	Varians	44,32	35,36
3.	F_{count}	1,25	
4.	F_{table}	1,85	

TABLE II. POSTTEST DATA HOMOGENEITY TEST RESULT

No.	Result	Experimental Class (Class A)	Control Class (Class B)
1.	Mean	76,13	71,53
2.	Varians	44,32	35,36
3.	F_{count}	1,25	
4.	F_{table}	1,85	

Hypothesis test analysis on the result shows that the data of student learning result class A and B is normal and homogeneous distributed. In this study hypothesis test using t-test, this test uses posttest result of student of treatment class and control class. Based on the calculation, the t_{count} of 3.26 is greater than the t_{table} at a significant level of 5% with df = 68 of 1.99, then the alternative hypothesis of this study received and Hypothesis null rejected, which means there is influence of learning Double Loop Problem Solving against Entomology cognitive learning outcomes. Here is the result of the hypothesis test using t-test:

TABLE III. RESULTS OF T-TEST

No.	Result	Experimental Class (Class A)	Control Class (Class B)
1.	Mean	76,13	71,53
2.	Varians	44,32	35,36
3.	t_{count}	3,26	
4.	t_{table}	1,99	

The results of data analysis test showed that treatment class get higher average value compared to control class that do not use DLPS. This evidence proves that the DLPS has an influence on student cognitive learning outcomes. This finding provided empirical support to earlier findings that there is significant improvement in students' learning outcomes after using a strategy that involve problem solving [1,3,7] DLPS isn't usual problem solving strategy, but also next step for problem solving. DLPS more complex than usual problem solving strategy and engage learner critical, innovative, and creative thinking skill to compare problems with existing solutions, questioning whether the solution is appropriate, justifying whether this is the best way to solve the problem, anticipate changes that occur with monitoring, reflecting current temporary solutions, perhaps, generating new solutions as a result of revisions from previous solutions. DLPS can improve students' thinking skill, especially for monitoring, reflecting, and revising on a problem and its solution [6]. The DLPS learning system can be seen in Fig. 1.

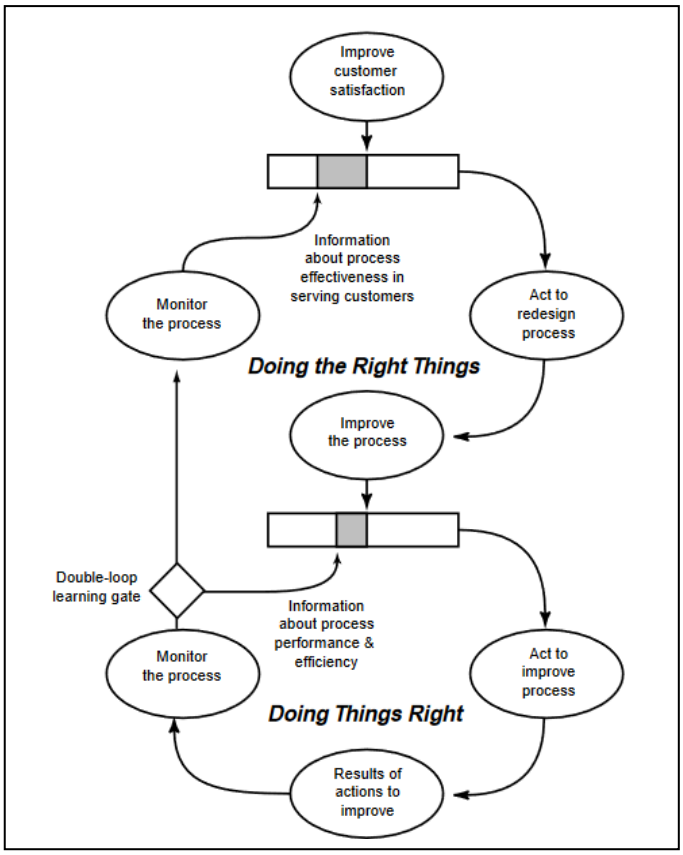

Fig. 1. DLPS Learning system.

Higher average value on experimental class that used DLPS strategy has advantages to enhance student's motivation to do simple research that is useful for the learning process and increase their learning experience. Based on Entomology learning result of students who are taught by DLPS strategy, students can relate teaching materials with daily life. The DLPS strategy shows satisfactory results when compared with student learning outcomes taught by conventional models. This is due to the full involvement of students in the learning process.

Students who learn to use DLPS can apply their knowledge to solve problems or find solutions to a problem. It does not stop until that stage, the DLPS strategy facilitates the students to be able to monitor the implementation of problem solving that has been done and then do reflection and improvement to the solution of problems that have been found previously. Learning strategies that facilitate student to express their opinion, develop ideas, train to think critically can promote student to achieve expected learning outcomes. These processes involve students' thinking skill and demands students to be active in learning activities [8].

Learning that requires students to actively greatly support the success of students to get good learning outcomes. DLPS learning strategy requires students to actively think and act to solve problems and monitor, reflect and generate new ideas to solve problems in order to anticipate changes that occur in environment. In this learning strategy students are directed to construct their own knowledge gradually through problem solving learning in loop 1 and loop 2 as well as Dooley draw the learning system. Thus the students can not only understand the material, but also can implement the theory to solve the problem. In entomology course, students can relate what has been learned in the classroom with the reality of daily life problems and can convey various ideas of problem solving related to the material being studied. Thus students who learn by using DLPS can obtain good learning outcomes compared to control class students who are learning by using conventional learning.

The general problem during this research process is less optimal use of learning strategies DLPS at the first meeting in the treatment class because students still do not understand the steps of the learning strategy. But at the next meeting the use of DLPS learning strategy is quite optimal. Difficulty in maximizing the time also becomes an obstacle, because in the discussion requires two settlements. But it can be overcome by giving time limit to the students in delivering the results of the discussion.

IV. CONCLUSION

Based on the results of research and discussion, it can be concluded that there is influence the use of learning strategies DLPS type against the cognitive learning outcomes Entomologi on Biology Education Students Faculty of Teacher Training and Education Mulawarman University. This can be seen from the results of data analysis, which shows that tcount> ttable (3.26> 1.99) for the significance level of 0.05.

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