THE EFFECTS OF COOPERATIVE LEARNING STRATEGIES AND ACADEMIC ABILITY TO BIOLOGY LEARNING ACHIEVEMENT

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Abstract

The research was conducted at SMA Negeri 5 Metro on June 14 until September 30, 2017. Variables of research X1 (STAD and TGT), X2 (Upper and Lower Academic Abilities), Y (Biological Cognitive Learning Outcomes) Experimental Design of Factorial 2 x 2. Sample 56, STAD 28 students, TGT 28 students, was classified based on upper and lower academic ability. Sapling technique stratified random sampling. Documentation and test data collection model. Technique of data analysis of 2 path Anova as further test, previously conducted independent t test and paired t test.Result of a nalysis of research data concluded there is no difference between mean of cognitive biology learning result in group of STAD and TGT value of Sig (2-tailed) equal to 0,689 > 0,05. There is no difference between the mean of biological cognitive learning outcomes in groups of learners capable of upper and lower Sig (2- tailed) values of 0.891 > 0.05. There is no difference in the results of cognitive biology study using STAD and TGT model on students who have high academic ability, Sig 0.854 (p > 0,05).

Keywords: *Group Guidance; Self regulation; Mind Mapping; Mindmaple Lite*

INTRODUCTION

The main purpose of learning strategies according to Wienstein and Meyer is to teach learners to learn high volition and self-ability. Learners who can learn high volition and ability themselves with certain learning strategies are said to be independent learners. According to Arends (in Azizahwati, 2009) self-directed learning (self regulated learner) learners who can do four important things, namely; (1) Carefully diagnose a particular learning situation, (2) Select a specific learning strategy to solve specific learning problems encountered, (3) Monitor the effectiveness of the strategy, (4) Self-motivated to engage in the learning situation until the problem is resolved.

One way to improve learning outcomes in this material is by applying stretegi mastery learning to students of Class XI IPA Lesson Year 2017/2018. A thorough learning strategy developed by John B. Caroll and Benjamin Bloom. The learning strategy consists of five stages: (a) orientation (orientation), (b) presentation, (c) structured practice, (d) guided practice, and (e) training

independent (independent practice). Described learning phase according to Wena, 2009 (in Azizahwati, 2009).

Learning methods that are highly emphasized in complete learning are individual learning, learning with friends or peer (peer instruction) and working in small groups. Different types of methods (multi methods) of learning should be used for classes or groups. Complete learning relies heavily on tutorial approaches with small group session-sessions, individual tutorials, programmable learners, textbooks, games and computers.

Understanding of biology material of learners in general is still low caused by several factors, including teachers do not instill a strong understanding of the material on the learners. This can be supported by the documentation of biological learning results as follows. From the National Examination Data of the Lesson Year 2014/2015, the average achievement of biology learners of students and high school students 5 in Metro District get a score of 77.06 and some get the lowest score30. While based on the value distribution of learners for Biological materials in the low range of value 70 is still obtained by 17 students. Then the

authors look for authentic data from the results of odd semester school exams biology subjects in class XI IPA 3 and class XI IPA 4 SMA Negeri 5 Metro in the Lesson Year 2016/2017 on the cognitive aspects that of students who each amounted to 32, was which has not got the value according to KKM as many as 18 students and 16 students.

The success of the learning process in addition influenced by the learning method used, the success of the learning process is also determined by the academic ability of learners. According to Muhfahroyin (2009: 107) many experts argue that this difference in academic ability is very important in the learning. Based on academic ability, there are three groups of students with high academic ability, moderate, and low. The gap between high and low achievers should be considered by educators in learning, it is expected that the gap is further reduced in both the process and the learning outcomes through strategies that empower the potential of these different-ability learners. Bahri, et al (2012: 43-44) stated another thing to note in the learning process is the initial academic ability of learners. The results of the study note that the academic ability

affect the learning outcomes of learners. High-achieving students get higher cognitive test results than low-achieving learners.

According to Potter and Kustran, 2012 (in Erina, 2015) The results of cognitive learning are: The description of the level of mastery of the learners of the subjects taken or pengusaan learners to something in the learning activities in the form of knowledge or theory that involves knowledge of intellectual development skills that include recall or strengthening of facts, procedural patterns, and concepts in the development of the intellectual abilities and skills of learners. The cognitive learning outcomes consist of six aspects: remembering (C1), understanding (C2), applying (C4), analyzing (C4), evaluating (C5), and creating (C6) Krathwohl, 2002 (in Job, 2013).

Cooperative learning methods in the category of student learning teams are based on the principle that learners should learn together and be responsible for their own learning and learning of friends in one group. This is the reason why the learning tasks in the student teams learning methods are generally not meant to do something in the form of a team, but rather learn something in the form of a team. The methods of student teams learning have several models including Teams Achievement divisions (STAD), Team Game Tournament (TGT).

Based on the background description in the high purpose of this research is 1) To know the difference of biological cognitive learning result between STAD and TGT model. 2) To know the difference of cognitive biology learning outcomes between students with high academic ability and low academic ability. 3) To know the difference of cognitive biology learning outcomes among learners using STAD and TGT learning model in learners who have high academic ability. 4) To find out differences in biological cognitive learning outcomes among learners using STAD and TGT learning models in students with low academic ability. 5) To know the effect of interaction between cooperative learning strategy and academic ability to biological cognitive learning outcomes.

1. Formulation Of The Problem

1. Are there differences in biological cognitive learning

outcomes between STAD and TGT models in cooperative learning processes undertaken?

2. Are there differences in biological cognitive learning outcomes between students with high academic ability and low academic ability in the cooperative learning process?

3. Are there differences in biological cognitive learning outcomes among learners using STAD and TGT model learning strategies in students with high academic ability?

4. Are there differences in biological cognitive learning outcomes among learners using STAD and TGT model learning strategies in students with low academic ability?

5. Is there an interaction effect between cooperative learning strategies and academic ability on biological cognitive learning outcomes?

2. RESEARCH OBJECTIVES

1. To know the difference of biological cognitive learning result between STAD and TGT model in cooperative learning process done.

2. To know the difference of cognitive biology learning outcomes between students with high academic ability and students with low academic ability in the cooperative learning process.

3. To know the difference of biological cognitive learning outcomes among learners using STAD and TGT learning model in students who have high academic ability.

4. To know differences in biological cognitive learning outcomes among learners using STAD and TGT learning models in learners who have low academic ability.

5. To know the effect of interaction between cooperative learning strategy and academic ability to cognitive biology learning outcomes

3. Literature Review

Hamalik (2009: 27) learning is not a goal but is a process to achieve goals, learning is a modification or reinforce a good evaluation tool and qualify. While Slameto (2010: 2) states in his book about the notion of learning: Learning is a business process undertaken to gain a whole new behavioral change, as a

result of its own experience in its interaction with its environment.

Based on the theory of Bloom's Taxonomy the learning outcomes in the framework of the study are achieved through three categories of domains including cognitive, affective, psychomotor. Which of course is formulated in the instructional intention in learning. The details according to Bloom (in Usman 2007: 37-42) are as follows:

a. **Cognitive Domain**

In 2001 Anderson and Karthwohl (in Ayup Darmawan, 2013) revised Bloom's Taxonomy to: 1) remember; 2) understand; 3) apply; 4) analyze; 5) evaluate; and 6) create

b. **Affective domain**

c. **Psychomotor domain**

Johnson and Johnson (in Huda, 2015: 31) present a concise definition of cooperative learning which means working together to accomplish shered goals. According Kunandar (2008: 270) explains "cooperative learning has four elements of the principle of positive dependence, face-to-face interaction, individual accountability, skills of interpersonal relationships". According to Slavin (2005), cooperative learning model TGT consists of 5 main components: Presentation in class, team, game, tournament, and team recognition (group awards). Slavin states that "The main idea behind STAD is to encourage learners to encourage and help each other to master the skills that teachers teach" Slavin (2005: 12)

Table 1. Learning Stages of STAD and TGT Models

Learning model	STAD	TGT
Class Presentation	√	√
Group Discussion Activities	√	√
Quiz	√	√
Learning model	STAD	TGT
Tournament Game	-	√
Score Calculation	√	√
Team Award	√	√

(Sumber: Bachtiar, 2016: 23)

Learners as individuals who are unique and different among learners who are one with another in the classroom, can be seen from his academic ability. This difference in academic ability is particularly important in learning (Sidi, 2001; Winkel, 2004 (Muhfahroyin (2009: 107).) Similarly Richards 2002 (Muhfahroyin (2009: 107) that based on academic ability, then there are three groups of learners, namely students with high academic ability, students with moderate academic ability, and students with low academic ability.

METHODOLOGY

Treatment variable is learning strategy of STAD and TGT model. As an attribute variable is the academic ability that is differentiated into learners with high academic ability and low academic ability. The dependent variable is the result of biological cognitive learning. The method used experiment with 2 x 2 factorial design, as follows:

Table 2. Facts 2x2 Factorial Design

Model / Academic Ability	STAD (A_1)	TGT (A_2)
High (B_1)	A_1 , B_1	A_2 , B_1
Low (B_2)	A_1 , B_2	A_2 , B_2
Total	$A_1 , B_1 + A_1 , B_2$	$A_2 , B_1 + A_2 , B_2$

Information:
A1, B1: STAD learning model in students with high academic ability.
A1, B2: STAD learning model in students with low academic ability.
A2, B1: TGT learning model in students with high academic ability
A2, B2: TGT learning model in low academic students.

Target population in this research is all students of class XI IPA in SMA N 5 Metro Lesson Year 2017/2018. Learners who follow biology subjects in the odd semester.

Which consists of 4 classes, namely XI IPA 1, XI IPA 2, XI IPA 3, and XI IPA 4, with a total of 127 learners. From 127 students of class XI IPA Lesson Year 2017/2018. While the required sample of 56 students, then Disproporsional by Aisyah (2007): each strata taken 127/2 = 56 samples of students.

Table 3. Determination of Stratified Samples of Population Research

Class Population	50% From the number of classes	Stratified from Academic Ability	Sample Research
XI IPA 1 : 32	XI IPA 2 : 32	XI IPA 2:	
XI IPA 2 : 32	XI IPA 4 : 31	- High : 14	14
XI IPA 3 : 32		- Low : 14	14
XI IPA 4 : 31		XI IPA 4:	
		- High: 14	14
		- Low : 14	14
Amount: 127	63		56

Aisyah (2007)

To determine the needs of the research sample, the sampling of the research using Slovin formula in Sujarwanta (2015: 28) as follows.

$$n = \frac{N}{1+Ne^2} = \frac{127}{1+127 \times 0{,}01}$$

n = 55,94 dibulatkan jadi 56 peserta didik

Information:
n = number of samples
N = total population (population affordable)
E = margin of error (0.01)

From the calculation determined the number of samples used are 56 students. Sampling is high on the basis of the criteria, Sudjana (in Sujarwanta, 2015: 27) a large categorized sample is where equal to or greater than 200. The population is clear, and the sampling technique of the population is randomized.

Table 4. Composition of Member of Research Sample

Model / Academic Ability	Experiment Class	Sample	Control Class	Sample	Amount
High	14	14	15	14	28
Low	18	14	17	14	28
Amount		28		28	56

(Karwono, 2007: 80)

The basic height of this is in Table 8, then the experiment is set 28 students for each group, with the composition of the sample as follows: STAD learning model on students with high academic ability as many as 14 students. STAD learning model on students with low academic ability as 14 students. Model of TGT learning on students

with high academic ability as many as 14 students. TGT learning model in low academic ability students as many as 14 students.

Documentation method is to find data about things or variables in the form of books, magazines, documents, regulations, meeting minutes, diaries, and so on Arikunto (2006: 158). In this research, documentation method is used to obtain data of general test score of Semester Even X Class Lesson Year 2016/2017. The test method is used to measure the mastery of concepts and principles as well as the problem solving ability of students in the cell material in the form of tests that measure students' cognitive abilities in mastering the concepts and principles as well as the problem solving ability of the material learning materials of the cell. The material or topic of the cell in this study is in accordance with the syllabus.

Data analysis technique used in this research is SPSS calculation program. 16.0. Two-way analysis of variance analysis (ANAVA) and independent t test analysis and paired t test. At the end of the analysis, if the analysis results show significant differences and interactions between the independent variables, then the analysis is continued to test which groups are higher by using the Tukey test by Santoso (in Karwono, 2007: 110). Two-way anova is chosen because of its analysis characteristics, where the independent variable is more than one. For testing requirements analysis was performed by the Kormogorov-Smirnov test, for normality and homogeneity test were tested by Levene statistics test.

RESULTS AND DISCUSSION

1. Result Research

Table 5. Data on Biological Cognitive Learning Outcomes

Model / Academic Ability	STAD		TGT		Total value
High	N = 14	Std.Deviation = 6,127	N = 17	Std.Deviation = 5,207	Mean = 74,94
	Min = 62	Mean = 75	Min = 65	Mean = 74,88	Sum = 2323
	Max = 85	Sum = 1050	Max = 85	Sum = 1273	
Low	N = 14	Std.Deviation = 4,957	N = 11	Std.Deviation = 9,473	Mean = 75,12
	Min = 70	Mean = 75,57	Min = 70	Mean = 74,55	Sum = 1878
	Max = 82	Sum = 1058	Max = 80	Sum = 820	
Total value	Mean = 75,29		Mean = 74.75		
	Sum = 2108		Sum = 2093		

Table 6. Summary of Hypothesis Test Results Results 1, 2, 3, and 4

	variable		t_{hitung}	df	Sig.(2-tailed)	Information
1.	Independent Samples Test	X_1 (STAD dan TGT)	0,403	54	0,689	Tidak ada beda
2.	Independent Samples Test	X_2 (High dan Low)	0,138	54	0,891	Tidak ada beda
3.	Paired Samples Test	X_1 (High)	-0,187	13	0,854	Tidak ada beda
4.	Paired Samples Test	X_1 (Low)	0,217	10	0,833	Tidak ada beda

2. Discussion of Result

Piaget argues that children form knowledge through active environmental exploration. Individual inclined learning problems can be reduced by managing learning that allows children to interact socially. However, teachers should consider the type and model of interaction appropriate to the child's thinking level. According to Piaget (in Wulandari, 2015) there are four factors that affect a person's cognitive development: experience, maturity, social transmission and equilibration or internal balance. The interaction of these four factors becomes the basis for cognitive development or the construction of a person's mental structure.

The cognitive development in Vygotsky's view (in Wulandari, 2015) is obtained through two paths, the basic biological process and the sociocultural psychological process. The development of children's thinking is influenced by social interaction in the cultural context in which it is brought up. According to Vygotsky (in Wulandari, 2015), every function in the development of a child's culture will arise twice, initially at the social level in

interpersonal or interpersonal relationships, then appearing in the personal level in the child or in intrapsychology. This means, it is necessary to know the social and cultural processes that shape the child to understand his cognitive development. Based on Piaget and Vygotsky's theory, this research uses cooperative strategy with STAD and TGT model. According to the researchers this model is very appropriate of the theory.

Differences in Cognitive Learning Outcomes of Learner Biology STAD and TGT Models

Interpretation of SPSS output test independent sample t-test pay attention to the independent output of sample t-test, based on high output obtained sig (2-tailed) value of 0.689> 0.05, then according to decision-making basis in independent sample t-test, concluded Ho accepted and Ha rejected, which means that there is no difference between the average of biological cognitive learning outcomes in the STAD group and TGT group.

First, there is a difference in the second stages of the learning model. In STAD learning model there is no stage games and tournaments only individual evaluation using the problem while the TGT learning model there are stages of games and tournaments. At the learning stage of the TGT model the teacher can help learners to do the learning evaluation by playing the game so that learners are happy and interested in following the learning.

In the STAD learning model, learners have two forms of learning responsibility, which is learning for themselves and helping fellow group members to learn. Learning opportunities for learners to use the skills to ask and discuss a problem contained in LKPD. A more intensive investigation is done by the learner. Learners more actively join the lesson lesson and more active in the discussion according to Gusniar. While this TGT learning model instills the importance of cooperation that produces competition (competition) in achieving learning goals for both themselves and group members as well as teaching activities centered on learners so as to grow creative learners on the advantages of learning TGT model. The learning process takes place with the liveliness of learners and the motivation to learn higher Sudarti (2015).

The advantages and disadvantages of cooperative learning model type STAD according to

Roestiyah (in Gusniar), namely: Can provide an opportunity for learners to use the skills to ask and discuss a problem. Can provide opportunities for learners to more intensively conduct an investigation of a problem. Can develop leadership talents and teach discussion skills. Can enable teachers to pay more attention to learners as individuals and their learning needs. The learners are more actively joining in their lessons and they are more active in the discussion. Can provide opportunities for learners to develop a sense of appreciation, respect for their friends, and appreciate the opinions of others.

According to Suarjana (in Sudarti, 2015), which is an advantage of the TGT learning, among others:: Increases the time spent for tasks; Prioritizing acceptance of individual differences; With little time can master the material in depth; The learning process takes place with the liveliness of learners; Educate learners to practice socializing with others; Learning motivation is higher; Better learning outcomes; Improving kindness, sensitivity and tolerance.

Differences in Cognitive Learning Results of Biology Learners Based on High Academic Ability and Low

Interpretation of SPSS output of independent sample test T-test note on independent output of sample t-test, based on high output obtained sig (2-tailed) value of $0.891 > 0.05$, then according to decision-making basis in independent sample t-test, concluded Ho accepted and Ha rejected, which means that there is no difference between the average biological cognitive learning outcomes in groups of high-ability learners and low-ability group of learners.Academic ability has no significant effect on biological cognitive learning outcomes. The results of this study indicate that learners who have high ability to get the average score of postes cognitive biology learning outcomes of 74.94 is almost equal to students with low academic ability of 75.12. These results do not support the results of research conducted Bahri (2012) said that there is an influence of academic ability on the cognitive learning outcomes.

The academic ability used as the reference in this research is the value of the students' grade report of IPA in the lesson year 2016/2017. The value of the report card already includes the value of cognitive, affective and prikomotoric learning outcomes of students written

by the teacher into a report card grade. The results of this study are not in accordance with research conducted Winarni, 2006; Santoso, 2009 (in Bahri, 2011) which concluded that students with high academic ability obtained higher cognitive test results than low academic achievement students. Based on differences in academic ability possessed by each learner, learning should also be able to accommodate the difference. Principally all learners with different academic ability must be able to improve their ability from their previous ability (intake learners).

Differences in Biological Cognitive Learning Outcomes Based on High and Low Academic Capabilities Using the STAD and TGT model.

Based on Paired Sample Test describe the result of paired t test. See the sig column (2 tailed). obtained significance value of 0.854 ($p> 0.05$), meaning "there is no difference in biological cognitive learning results using STAD model with biological cognitive learning outcomes using TGT model in learners who have high academic ability". Based on the Paired Sample Test Table describes the paired t test results. See the sig column (2 tailed). obtained significance value of 0.833 ($p> 0.05$), meaning "there is no difference of cognitive biology learning result using STAD model with bioge cognitive learning result using TGT model on students who have low academic ability".

Nevertheless, there is an average score of cognitive biology learning outcomes on the interaction of STAD learning model and high academic ability of 75, while the mean score of cognitive biology learning outcomes on STAD learning model interaction and low academic ability is 75,57. Obtained average score of cognitive biology learning outcomes on the interaction of TGT learning model and high academic ability of 74.88. While the average score of cognitive biology learning outcomes on the interaction of TGT learning model and low academic ability of 74.55.

The findings also reveal that STAD and TGT learning models can minimize the distance of cognitive learning outcomes among high-performing learners and low-ability learners. The results of this study are in line with the results of Warouw's research, 2009 (in Bahri, 2012) where the interaction of cooperative learning strategies and academic ability can

minimize the distance of the cognitive learning outcomes of high-ability students and low-ability learners.

The Influence Of Interaction Between Cooperative Learning Model And Academic Ability On Biological Cognitive Learning Outcomes

Table 7. Test of Tests of Between-Subjects Effects

Tests of Between-Subjects Effects

Dependent Variable:Hasil Belajar Kognitif Biologi

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	412.418[a]	16	25.776	1.080	.404
Intercept	152707.453	1	152707.453	6.400E3	.000
Model	39.716	1	39.716	1.664	.205
KemampuanAkademik	325.535	10	32.553	1.364	.233
Model * KemampuanAkademik	116.787	5	23.357	.979	.443
Error	930.564	39	23.861		
Total	316493.000	56			
Corrected Total	1342.982	55			

a. R Squared = .307 (Adjusted R Squared = .023)

The division of a heretogenous group provides an opportunity for learners to help each other in understanding the concept of the lesson. Learners who have a better level of mastery of the material can provide understanding to other students in the group so that all members of the group can master the material well as well. According to Paul Suparno, 1997: 63 (in Rohmiyati, 2011) the effort to explain things to friends actually helps him to see things more clearly and encourages other learners to find other high-level answers. Thus, understanding of the learners will be more meaningful. The cooperative learning model consistently improves the achievement of learners, and learners who have cooperatively studied have a much larger information retrieval. Gene E.

Hall et al., 2008: 378 (in Rohmiyati, 2011).

According to Slavin (2005: 143-185) who said that STAD is one of the simplest cooperative learning strategies and is the best model for the beginning for new teachers using cooperative approach. Similarly for the learners, STAD model is more easily accepted than the TGT model. The giving of quiz gives repetitive training to the students so that learners will be more accustomed in facing the problems. This is in accordance with the cell material that aims to familiarize repetitive exercise so that learners gain a deeper understanding of the concept and know the different forms of questions that facilitate learners in solving problems in the test. In the TGT class, learners are also accustomed to facing problems

through game tournament. However, during the tournament there are still many learners who have not understood the rules of the game described earlier, so learners tend to pay more attention to the rules of the game than to do the tournament questions and time to work on the tournament was also a little because the more time spent for the game .

The implementation of cooperative learning of TGT model and STAD model cooperative learning takes a long time at the adjustment stage. This is because learners are generally already familiar with conventional learning tend to receive more material, frequently asked questions and notes, whereas in this cooperative learning students are required to more actively find their own concept of the material being studied. In this cooperative learning the teacher acts only as a facilitator and mentor.

CONCLUSIONS

1. There was no difference between the mean of biological cognitive learning outcomes in the STAD and TGT groups. By considering the output of independent sample t-test, based on the output obtained sig (2-tailed) value of 0.689> 0.05, then according to the basis of decision making in the test independent sample t-test, it can be concluded Ho accepted and Ha rejected.

2. There is no difference between the mean of biological cognitive learning outcomes in high-ability group of learners and low-ability group of learners. By considering the output of independent sample t-test, based on the output obtained sig (2-tailed) value of 0.891> 0.05, then according to the basis of decision making in the test independent sample t-test, it can be concluded Ho accepted and Ha rejected.

3. There is no difference in biological cognitive learning outcomes using STAD model with biological cognitive learning outcomes using TGT model in learners who have high academic ability. The Paired Sample Test describes the paired t test results. See the sig column (2 tailed). obtained significance value 0,854 (p> 0,05).

4. There is no difference in biological cognitive learning outcomes using STAD model with biological cognitive learning outcomes using TGT model in students with low

academic ability. The Paired Sample Test describes the paired t test results. See the sig column (2 tailed). obtained significance value 0,833 (p> 0,05)

5. Mean Cooperative Learning Strategy based on STAD and TGT model on biological cognitive learning outcomes is the same. Probability based on cooperative learning group variable is 0205. Then Ho is accepted (0.205> 0.05). The mean academic ability to cognitive learning outcomes is the same. Probability based on academic ability variable is 0,233. Then Ho is accepted (0.233> 0.05). So the decision taken is Ho. Interaction between cooperative cooperative learning group and academic ability toward biological cognitive learning outcomes (0.443> 0.005). For interaction test between variables, if probability> 0.05 then between variables there is no interaction.

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