The Effect of Cooperative Learning Model and Belief About Science On The Biology Learning Achievement By Controlling The Initial Ability Of Students (Experiment Study on Eighth Grade Students of Public Junior High School in Minahasa Regency)

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Abstract

The objective of this research is to investigate the effect of cooperative learning model, and the belief about science toward the achievement students' in biology by controlling the students' prior ability. The method used in this research is experimental with treatment by level design 2 X 2. The research was conducted at SMP Negeri 1 Tondano on 8th graders State Junior High School Students. The sample of this research are the students of SMPN I Tondano and 80 students were chosen by multistage random sampling technique. The results of the research indicate: The achievement of students which is taught by script cooperative learning model is higher than the achievement of students using STAD cooperative learning model, after controlling the students' prior ability. The finding imply that in the biology learning, the teachers are expected to administer the cooperative learning model as the reference in teaching, by noticing the students' belief about science.

Keywords: cooperative learning, belief about science, students' achievement in biology, students' prior ability

1. Introduction

Biology at Junior High School is a subject that is less favored by students because there are many Latin terms that are difficult to be memorized, and also boring, which may causes the Biology learning achievement lower than other subjects.

Speaking about learning achievement, it cannot be separated from the learning process that occurs in learners' selves. The characteristic of subject in learning process, and the characteristic of student also will determine maximal learning achievement.

The student's low Biology ability is influenced by many factors, e.g. the learning is still conventional and does not touch the dimension realm of the students themselves. This means that the learning process is still giving teacher dominance and not giving opportunity to the students to develop independently through discovery and the process of thinking. The student learning achievement is the result of the conventional learning process dominance. Where this learning atmosphere tends to be teacher-centered so that the students be passive, but teachers prefer to use it because it does not require a learning tool and practice material, it is enough just to explain the concepts that exist in the textbook. However, achieving the desired objectives in teaching and learning in fact is very difficult to be fulfilled as desired in the curriculum, because they relate to the not-satisfying student achievement, the number of students who receive low grades.

The data which is obtained from Minahasa Education, Culture and Sport Department shows that the average scores of Natural Science National Examination in the last three years, as follows: in 2008/2009 it was 5.78, in 2009/2010 it was 5.50, and in 2010/2011 it was 5.75.

Therefore, in determining the learning model, a teacher must understand the compatibility of subject matter and students' characteristics, besides the innovative learning models that may be used by the teacher. Then, the thing that must be considered is about their *belief* to success. The strong belief brings all required factors for success.

To measure the students' learning achievement, it may be conducted through exam or known as *achievement test.* According to Sudjana (2001:22), learning achievement is ability that students have after they receive their learning experience. This learning achievement is obtained when the students have involved in the learning activities. The same is stated by Abdullah *http://www.spesialis-torch,com/conten/view/12* (accessed on December 19th, 2011) that in every process, there will be always real result that can be measured and stated as learning achievement of someone, while according to Suryabrata (2005: 12) that learning achievement is included in

cognitive attribute group, which the measurement result response is grouped as *judgement*, that is response which can be declared as true or false. Furthermore, Ade Sanjaya (2011) states that learning achievement is something that is reached or acquired by students due to the efforts or thought which expressed in the form of mastery, knowledge and basic skills that are in various life aspects, so that it appears behavior change quantitatively.

The theory that relates to cooperative learning model which is stated by Sugiyanto (2010: 38) that cooperative learning model is a learning that focus on the student small group usage to work together in maximizing the learning condition to achieve learning objective. In line with the statement of Slavin (2010: 8) that cooperative learning is a learning method where students work together in a heterogeneous group, has four or five members to master the material which is taught by the teacher. The group member cooperation will improve the mutual aid to one another to complete academic tasks, giving feedback in order to obtain good results, and can give rewards.

The theory that describes the script cooperative by Suprijono (2009: 123) states that the skript cooperative learning is explicit learning contact between teachers-students and students-students about ways to collaborate. This means that in a scripts cooperative learning there is agreement among students with students and teachers with students to collaborate to solve a problem in learning. Next, in http://edutechwiki.unige.ch/en/CSCL_script (accessed on January 12, 2011) it explained that the skript cooperative consists of at least five components, i.e.: (1) Learning Objectives, (2) Activity type, (3) Ordering or sequencing part, (4) Tasks or roles distribution, and (5) Presentation mode. Jacobs (1996: 20) argues that scripts cooperative can boost students' comprehension and memory.

STAD cooperative learning model which is suggested by Kunandar (2010: 364) states that this model is used to teach new academic information to the students every week, whether through verbal or written presentation. The students in the classroom are divided into some small groups of 4 or 5 members heterogeneously in the sex, race, ethnic, and capability through learning objectives, lesson achievement, group activity, quiz and group appreciation. According to Ibrahim (2000: 20), teacher who uses STAD refers to student group, presenting new academic information to each student each week. The students in class are divided in 4-5 members groups. Each group must be heterogeneous which consists of male and female, from various ethnic group, have high, medium, and low ability. The group member use another activity sheet or learning tools to decide the lessons and then help each other to understand the lesson through tutorial, quiz, and/or discussion. So, it is asserted by Slavin (2005: 123) that during the group learning, the students help each other to accomplish the lesson. The teacher monitors each group to see if the students need some help.

The theory that also explain the *belief* about science which is suggested by Prabowo (1999: 17) states that science or natural science is knowledge about natural phenomena that may be defined as the way of thinking to understand the universe, how to conduct an investigation, and the knowledge as the result from the investigation. Furthermore, Sharan (2009: 319) states that to understand science, students should experience science as conducted by scientists. After that they can only see science as a mixture of reasoning and logic to transition erroneously, the false allegations, errors and fatal errors, and often hostile behavior.

A person who has high self-perception abilities in general have a strong desire and high fighting spirit to face the challenges, huge expectations, obtaining powerful results from his struggle which can lead to a sense of self-esteem. Sigel (1985: 351) beliefs "mental constructions of experience - often condensed and Intregrated into schemata or concepts" that are held to be true and that guide behavior. That means the belief as "mental constructions of experience - or often condensed and integrated into the scheme or concept" is considered true and a guide behavior.

Furthermore, Pajares (1992: 314) argued that "all beliefs have a cognitive component representing knowledge, an affective component capable of arousing emotion, and a behavioral component activated when action is required." All beliefs have the knowledge that represent cognitive component, affective component which is able to develop emotional, and behavioral components that activated when action is needed. In addition, Ghufron (2010: 34) said that self-confidence is the belief that a person is able to cope with a problem with the best situation and can provide something fun for everyone else.

Prior ability is knowledge and skills as an integral part of a person. Initial behavior or early ability are not just what students know and do, but also the skills that is necessary to start learning. The same thing is expressed by Cecco (1968: 59) that the prior ability is knowledge, and relevant skills which the student has been held at the time when he is going to start attending a course. Therefore, the initial ability becomes an important part of subsequent cognitive abilities. Students who have prior knowledge that hinted at the possibility of having to follow and carry out subsequent learning tasks.

According to Reigeluth (1983: 88), the initial ability is the entire lower level of competence that students should have mastered before starting a series of subsequent learning. This means that the initial ability is a prerequisite that must be mastered before students studying higher knowledge. In line with this, according to Dick and Carey (2005:73-74), the initial ability is the knowledge or skills of the students before he followed the subjects will be given. Similarly expressed by Degeng (1995: 85), the students who have prior ability will receive the next subject matter which is taught by teacher without any trouble.

Based on the discussion above, the goal of this study is the effect of cooperative learning and belief about science on biology learning achievement after controlling the initial ability of students in junior high. And the cooperative learning model is script cooperative learning model STAD cooperative learning model.

2. Research Method

"Holonic" is derived from the word "holon" introduced by a Hungarian philosopher Arthur Koestler (1967). The method of this research uses *treatment by level* 2 x 2 design. With the following design:

		Cooperative Learning Model	
		Script Cooperative A_1	STAD Cooperative B_2
Belief about science	Positive	$(X,Y)_{11k}$ $k= 1,2……n_{11}$	$(XY)_{12k}$ $k=1,2……n_{12}$
	Negative	$(X,Y)_{21k}$ $k=1,2……n_{21}$	$(X,Y)_{22k}$ $k=1,2……n_{22}$

Table 1. Experiment Design

Where   :   X= Initial ability of Student

Y= Biology learning achievement

k= Respondent total of each cell

Y (Biology learning achievement variable) is response variable, and X (initial ability of student) as covariate.

The population of this research is all student of SMP Negeri 1 Tondano in Minahasa Regency. The sample amounts to 80 students which are determined by using *multistage random sampling* technique. The developed research instrument is the initial ability of students and Biology learning achievement instrument in the form of 4 *options* multiple choice, *belief* about science in the form of questions using Likert scale and involves 45 students at each instruments. The initial ability instrument has 25 question items, the biology learning achievement instrument has 45 question items, and belief about science instrument has 33 question items using Likert scale. The instrument development is conducted through theoretical stages and empirical validity. Based on the validation test calculation, it obtains result: among 25 question items of students' initial ability, there are 20 valid question items with reliability coefficient of 0.799. For the Biology learning achievement instrument, based on the calculation, it obtains result: among 45 question items, there are 40 valid question items with reliability coefficient of 0.889, and for the belief about science instrument, among 33 question items that are tested, there are 30 valid question items with reliability coefficient of 0.8189.

The data analysis technique uses ANKOVA with the help of SPSS program version 17.00.

3. Research Result and Discussion

Table 2. Students' Initial Ability Result and Biology Learning Achievement at All Research Groups Based on Statistical Measurement.

BELIEF (B)	Statistic	COOPERATIVE LEARNING MODEL (A)				TOTAL	
		SKRIP (A$_1$)		STAD (A$_2$)			
		X	Y	X	Y	X	Y
Belief Positif (B$_1$)	N	20	20	20	20	40	40
	Mean	14,700	31,250	14,500	26,150	14,600	28,700
	Std, Dev	3,180	4,241	2,975	3,617	3,081	4,670
	Minimum	9	23	9	19	9	19
	Maximum	19	37	22	32	22	37
Belief Negatif (B$_2$)	N	20	20	20	20	40	40
	Mean	13,200	24,750	13,100	23,350	13,150	24,050
	Std, Dev	2,768	4,007	3,113	4,404	2,946	4,248
	Minimum	9	16	7	13	7	13
	Maximum	20	31	18	30	20	31
Total	N	40	40	40	40	80	80
	Mean	13,950	28,000	13,800	24,750	13,875	26,380
	Std, Dev	3,074	5,265	3,124	4,223	3,100	5,015
	Minimum	9	16	7	13	7	13
	Maximum	20	37	22	32	22	37

3.1 Hypothesis Testing

1. Hypothesis 1

   The Biology Learning Achievement Result of The Student Group who is Taught using Script Cooperative Learning Model is Higher than The Student Group who is Taught using STAD Learning Model after Controlling The Initial Ability of Student.

   The obtained calculation result shows that H$_0$ is rejected based on F-test, where F$_{count}$ = 12.934 is greater than F$_{table (0.05:1.75)}$ = 3.96. Therefore, it can be concluded that there is difference between the Biology learning achievement of the student group who is taught using script cooperative learning model and the student group who is taught using STAD cooperative learning model after controlling the initial ability of students.

2. Hypothesis 2

   The Interaction Effect of Cooperative Learning Model and Belief about Science on The Students' Biology Learning Achievement, after Controlling the Students' Initial Ability.

   The calculation result shows that H$_0$ is rejected based on the F-test, F$_{count}$ = 4.251 which is greater than F$_{table}$ (0.05:1.75) = 3.96. Therefore, it can be concluded that there is interaction effect between cooperative learning models with *belief* about science on the Biology learning achievement after controlling the initial ability of students.

3. Hypothesis 3

   The Students who Have Positive Belief about Science in Particular, The Biology Learning Achievement of The Student Group who is Taught using Script Cooperative Learning Model is Higher than The Student Group who is Taught using STAD Cooperative Learning Model.

   The calculation result shows that H$_0$ is rejected based on the t-statistic-test, which t = 4.001. This value is

greater than $t_{table\ (0.05,\ 75)}$ = 1.67. The results show that for the student group who have positive belief about science, the biology learning achievement of the student group who is taught by script cooperative learning model is higher than the student group who is taught with STAD cooperative learning model after controlling the influence of prior ability.

4. Hypothesis 4

The Students who Have Negative Belief about Science in Particular, The Biology Learning Achievement of The Student Group who is Taught using Script Cooperative Learning Model is Lower than The Student Group who is Taught using STAD Cooperative Learning Model.

The calculation result shows that H_0 is accepted based on the t-statistic-test, which t = 1.086, and $t_{table\ (0.05,\ 75)}$ = 1.67 is in the H_0 acceptance area. It means for the student group who have negative belief about science, there is no difference of the biology learning achievement of the student group who is taught by script cooperative learning model and the student group who is taught with STAD cooperative learning model after controlling the influence of prior ability.

3.2 Research Result Discussion

The hypothesis 1 test result shows that the Biology learning achievement of student group who is taught using script cooperative learning model is higher than the student group who is taught using STAD cooperative learning model after controlling the initial ability.

The script cooperative learning model usage that is conducted in the research can improve the students' biology learning achievement. The script cooperative learning model in Biology learning can be proved with the research result that was conducted by Warouw (2010: 95) which shows that students who are given script cooperative learning model generally have higher Biology average score than the average score of the students who are taught using conventional strategy.

The empiric fact has supported the theoretic truth that Biology learning using script learning model in Junior High School will improve the students' learning achievement. This is in accordance with the statement of Dansereau (1985: 236) that script cooperative learning model will be able to improve the students' learning achievement, and also with the statement of Jakobs and Bill (1996: 236) that it can improve comprehension and memory of students.

The discussion above shows that the script learning model will give more stimulation for students to be able to have higher ability in understanding what should be done at each aspect of learning activity, meaningful and can be accumulated well in the learning process and when this script learning is conducted well, it will give good and true concepts in learning the given lesson. While even in the learning process they have same form of cooperative class, the result of the student group who is given the STAD cooperative learning model shows that the given STAD cooperative learning model is still not optimizing the learning yet, maybe because this learning model has not been meaningful enough for student when they are given the task related to the academic activity. This is contrasts with what is expressed by Kusnandar (2010: 364) that each student in the group is given a score of the lesson mastery, and students in groups who achieve high achievement or perfect scores will be awarded. Thus it can be said that what was done on STAD cooperative learning model gives less effect to the improvement of Biology learning achievement. STAD cooperative learning model that is used in the classroom may not provide the opportunity for students to correct their weaknesses, e.g. during the group discussion, they get less attention or chance to develop their ability.

Research result also shows that there is interaction effect of cooperative learning model and *belief* about science on the Biology learning achievement after controlling the students' initial ability. This result proves that among cooperative learning model and students' *belief* about science greatly affect and determine students' success in getting good and optimal learning achievement. It means the interaction effect will be meaningful and maximal if it is conducted at effect of each treatment level, adapted to the condition and circumstances between cooperative learning model and *belief* about science. The mentioned treatment levels are: 1) The students who have positive *belief* about science in particular, the Biology learning achievement of the students in the group which is given script cooperative learning model is higher than the Biology learning achievement of students in group which is given STAD cooperative learning model after controlling the initial ability of the students, and 2) The students who have negative *belief* about science in particular, the Biology learning achievement of the students in the group which is given script cooperative learning model is lower than the Biology learning achievement of students in group which is given STAD cooperative learning model after controlling the initial

ability of the students

The students who are given cooperative learning model have advantages that in the learning implementation which more emphasize on cooperation among group members, they can make all group member have same comprehension about the lesson and obtain nearly the same learning achievement because in the learning process which use cooperative learning model, it is expected that all students will obtain same ability.

In the implementation of cooperative learning that is treated in two groups, it is seen that: the student group which is taught using script cooperative learning model and the students group which is taught using STAD cooperative learning model will provide interaction on learning achievement. This is supported by the opinion suggested by Trianto (2007: 41-41) that cooperative learning arises from the concept that students will more easily find and understand difficult concepts if they are in discussions with their friends. Students routinely work in groups to help each other solving complex problems. During in the group, the task of group members is to master the lessons that are presented by teachers, and help their group member each other to master the lesson, collaboratively achieve a common goal, then the students will develop skills that relate to our fellow human beings which will be very useful for their life outside of school .

According to Weiner quoted by Slavin, individuals who perceive that their success or failure is caused by their self-features which cannot be changed or their environments, have less motivation than the students who feels their success or failure was caused by their own efforts. According to Slavin (2005:128-129), the students' belief degree that their academic success depends on their own efforts (internal control locus) has been demonstrated on various occasions as a single personality variable which consistently most associated with high academic performance. Some studies have found that internal control locus has positive effect on the cooperative learning methods, STAD improves the feelings of the students that the results they spend depends on the performance and not on luck.

Based on the research result, it may be judged that the group of students who are taught by script cooperative learning model is more challenged because each students who are learning will get a turn as speaker and listener that serves to provide a correction to any given lesson (according to the basic competence) to make a good summary and can provide corrections to the content, in forms of: concepts, facts, or principles contained in the materials provided. Thus, students will strive to be able doing the assigned tasks well, which in turn can acquire learning achievement.

Furthermore, for a group of students who have a positive belief about science has faith that everything that is done will surely reach maximum results or obtain success. Thus, the positive faith about science of the students, who do script cooperative learning model, will allow the students to complete each task to be "speaker" or "listener" well. In the other hand, the students who have a negative belief about science will have a tendency to perform better in STAD cooperative learning activities that do not require academic results are made to be accountable to peers in the group and are able to argue against what is summarized, and can accept suggestions and criticism from fellow friends in the group in order to be repaired.

From the discussion result above according to Sharan (2009: 473-474) that the cooperative learning model struggles so that the students have high responsibility for their own learning, rather than accept learning as given by others, in a group of students to participate in regulating the activity of their own, including implementation of learning, plan learning, students are empowered to play a role in directing their behavior at school and work.

According to Woolfolk (2009: 221), people who have a strong belief about their ability will strive to carry out the challenging task when compared to those who doubted their abilities, while those who have high self-efficacy perception have great expectations of success, which usually leads to great results. Thus, in this study there is an interaction effect between the cooperative learning and belief about science on Biology learning achievement after controlling the initial ability of students.

The results also show that the students who have positive belief about science in particular, the biology learning achievement of students who are taught using script cooperative learning model is higher than the learning achievement of the group of students who are taught using STAD cooperative learning model after controlling for initial ability.

This result is consistent with what is proposed by Woolfolk (2009: 215) that the most powerful beliefs that affect motivation in school is a belief about ability, and the people who has it, has stable characteristics and cannot be controlled – individual characteristics that cannot be changed. Whereas in the other hand, the ability is not stable and controllable—skills and knowledge repertoire is constantly expanding, with hard work, study, or training, knowledge can be improved. The research results by Sharan (2009: 320) suggests that students who run the

cooperative learning with environmental science show more positive attitude towards science and considers science more attractive than the students in the control group.

Students with more positive belief about science is ready to enhance their abilities, optimistic, rational, responsible in facing difficult tasks, because they believes that they will be able to complete the given tasks properly so that they can get higher achievement in learning. This is consistent with the results of research conducted by Suthar and Tarmisi (2010: 146-152) that there is a significant relationship between students' beliefs about mathematics and belief in one of mathematics skills on mathematics achievement. Also, the results of research by Lunstrom (2010: 146-152) that there is a correlation of science and scenic, beliefs about pseudoscientist and knowledge about Biology.

The discussion above shows that for the group of students who have a positive belief about science, the Biology learning achievement of the group of students who are taught using script learning achievement is higher than the group of students who are taught using STAD cooperative learning model after controlling the initial ability.

Research results also showed that the students who have a negative belief about science in particular, the Biology learning achievement of students who are taught using cooperative learning model is lower than the group of students who are taught using STAD cooperative learning model after controlling for initial ability. Thus it can be concluded that the results of this study do not support the truth of the hypothesis, it means for the group of students who have negative belief about science, the Biology learning outcomes of the group of students who are taught using script cooperative learning model are not different with the group of students who are taught by the STAD cooperative learning model after controlling the initial ability.

The conclusion of the hypothesis testing results above may occur due to various factors that may affect the students' learning process, e.g. factors that the STAD cooperative learning on the groups of students who have negative belief about science would be more meaningful to understand the learning materials, that at STAD cooperative learning, there are learning stages at the group of students who work together in teams are awarded (Sharan, 2009: 7-8). Groups of students who have academic barriers and are effective both to increase the students' knowledge and behavior and to improve their reception by their classmates. So this STAD cooperative learning model is a cooperative learning model that also ensures full involvement of students to increase individual responsibility in group work. In addition, these models emphasize students to work together in groups, so that each member in the group knows what the responsibilities in order to produce a group's work. Therefore, the students realize that their presence in a group has a role influencing the success of an activity, especially in learning and also the relationship with the surrounding environment.

The obtained data to support the empirical truth above is that students who have a negative belief about science shows that the average score of students who are taught using script cooperative learning model is significantly higher than students who are taught using the STAD cooperative learning model. This learning can benefit students, both of which have a positive belief about science as well as students who have a negative belief about science, which work together completing academic tasks. Students who have higher academic ability will help students who have less academic ability by becoming a peer tutor. So the result will be the same.

4. Conclusion

Based on the results of research and discussion, the conclusions are as follows: 1) The Biology learning achievement of the group of students who are taught using script cooperative learning model is higher than the group of students who are taught using STAD models after controlling the students' initial ability; 2) There is an interaction effect between the use of cooperative learning and belief about science on Biology learning achievement after controlling the initial ability of students; and 3) For particularly the students who have a positive belief about science, the Biology learning achievement of the students who are taught using script cooperative learning model is higher than the group of students who are taught by STAD cooperative learning model after controlling the initial ability of students.

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