# The Effectiveness of Cooperative Learning NHT Type and Concept Mapping on the Cooperation and the Concept Master

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## ABSTRACT

The study aimed to determine the effect of 1) cooperative learning model of numbered heads together (NHT) type on the cooperation ability and mastery of concepts of the students, 2) concept mapping on the cooperation ability and the mastery of concepts of the students, 3) the combination of cooperative learning of NHT type and concept mapping on the cooperation ability of the students, and 4) the combination of cooperative learning of NHT type and concept mapping on the mastery concept of the students of SMA N I Tidore Kepulauan. This research was a quasi-experimental study design using the nonrandomized control group pretest-posttest with three variations of the treatment and the control. The results were 1) Cooperative learning model of NHT type affects the students' ability to work, with the mean score of 32.3143 (very high), but it has no effect on the students' concept mastery, the mean pretest score of 61.1429 (high) and posttest score of 71.2857 (high). 2) Concept mapping does not affect the students' collaboration ability and their concept mastery, with mean pretest score of 62.9167 (high) and posttest score of 71.2500 (high). 3) The combination of the cooperative learning model of NHT type and concept mapping affects the cooperation ability, with the mean score of 33.2812 (very high). 4) The combination of the cooperative learning models of NHT type and concept mapping affects the concept mastery, with the score of 62.1875 (high) and the posttest score of 76.5625 (very high).

## INTRODUCTION

Cooperative Learning is a learning model nowadays recommended by teachers to solve the problems of students during the learning process in the classroom such as low motivation, academic ability, social skills, and thinking skills. The problems of teachers in the classroom are believed to be easy to solve by applying the Cooperative Learning model due to, through the model, students will be motivated to learn, have the ability to solve problems, improve learning achievement, and improve student collaboration.

Cooperative Learning models can help students, among others: (1) according to Isjoni (2007: 23-24) improve academic skills, critical thinking skills, accumulate various information, increase student motivation, and improve attitudes, (2) according to Trianto (2009: 56) cooperate, find and understand difficult concepts, and solve complex problems, (3) according to Miftahul Huda (2011: 64) obtain better learning outcomes, conceptual achievement, verbal and spatial problem solving, and memory.

According to Miftahul Huda (2011: 65), many studies carried out in formal schools, from in kindergarten to high school and university, they show the ability to complete group tasks. Here, after applying the model, they have a higher academic score, increased self-confidence, social skills, and level of understanding.

The cooperative learning model is designed to create student-oriented learning and can be used in a variety of subjects. Cooperative Learning models might use in subjects, such as (1) language, literature, science, mathematics and computers (Sharan, 2012: 325-501), and (2) mathematics, reading, writing, and scientific knowledge, (Slavin, 2005: 4).

Cooperative Learning models can also use by biology teachers, because, the model not only build a sense of responsibility, attitude of competition and social interaction, but it can also facilitate the students to solve a lot of problems, such as understanding the material, difficult to cooperate, difficult to communicate, and experience of students in everyday life. Through the Cooperative Learning model, students will use to solve these problems through ideas, opinions, and information exchanging during activities in the class.

The statement in line with Sharan (2012: 378) argued that the research developed at Rutgers University named SCIENCE TEAMS in New Jersey; the results are excellent because students who study science with the Cooperative Learning model have positive attitudes changed towards science and more comfortable in conducting and doing science tests and practicing science.

Slavin (1995: 2) stated that Cooperative Learning refers to students in collaborating in small groups to help each other in learning. Arends, et.al. (2010: 306) explained that Cooperative Learning is a learning model that is characterized by collaboration, tasks, goals, and structure of rewards, as well as requires students to actively involved in discussions, debates, tutoring, and teamwork.

The collaboration of learning is a group process, in which members support each other and rely on each other to reach a consensus. Classrooms are a very good place to build the teamwork ability to work together. And, knowledge of these two things is not only enough obtained with lecturing method activities without providing activities that enable students to work in a group.

Groups might not function effectively without having the skills to cooperate. This skill needs to be possessed by each group member because many people do not realize when they carry out the individual tasks; it actually is part of a group or team. Various studies on the importance of collaboration in groups showed that by gathering people who do not have the skills to work together, teachers need to develop teamwork abilities to facilitate students in interaction and gaining knowledge from the information.

Gokhale (1995: 22) stated that the advocates of collaborative learning explained an active exchange of ideas in small groups not only increases interest among students but also promotes critical thinking. There is evidence of students who work together in thinking and storing information for longer, they reach a higher level than students who work individually. Collaborative learning provides an opportunity to engage in discussions and responsible for learning. Then, students will be more critical of what is learned.

Barros (1995: 44) explained that collaborative learning includes not only the division of job in certain tasks but also requires to completion of task in the group. It certain builds the group members of the meaning together and developing cultural and professional knowledge. It also requires a change from teacher-oriented teaching as the main source of knowledge, but teaching requires a social-constructivist approach to lead the students to achieve the main goals in the learning process.

The things needed to conduct by study groups are:

a. Teamwork activities begin with a discussion and provide alternatives by not imposing problem-solving on groups, especially for group members who are difficult to cooperate with.

b. Groups consist of three to four people because large groups make it difficult to involve everyone actively involved.

c. The teacher divides the group due to this way is better than students creating the group itself.

d. Various levels of ability, background, and experience in each individual can strengthen the group. Each group member is responsible not only for contributing the strength but also for helping a secondary understanding of their strengths.

e. The responsibility of each member in achieving the goal is determined by the distance of confidentiality among group members and it is the best way to assess students who do not participate in groups. The group is able to make decisions to fired students who do not cooperate or not participate when all the assistance fails. Dismissed students then look for to involve in other groups. Dismissed students can look for other groups that accept them. In contrast, students can stop if they feel working more and not get any help from other members.

Morgan (2012: 2) defined that cooperative learning is an approach used to improve social skills and cooperation. The objectives of the model are competitive, individual, and collaboration. Social skills can be taught at the appropriate age and resources which centered on the theme of cooperation and emphasized as an option to promote and strengthen the cooperative learning strategies.

Morgan (2012: 3) explained that cooperative learning rooted in the theory of social interdependence, cognitive development, and behavioral learning. Some studies found out very strong evidence that the results of cooperative learning in a greater effort to achieve a more positive relationship and interdependence of shared

goals which provide the essential position of a group. This interdependence creates a group that is dynamic wholeness. Collaboration must precede cognitive growth. Cognitive growth from aligning various perspectives plays as individuals to work towards common goals.

Slavin (1995: 2) explained that cooperative learning refers to a variety of teaching methods in which students work in small groups to help each other in learning the material in cooperative classes. Students are expected to help each other in discussing and debating. Understanding other students may use as a way to assess the knowledge of each other. Cooperation is rarely found in a student who works individually but collaborating with others to ensure that everyone in the group has understood the concepts.

Fatma, et. al. (2011: 331-332) stated that cooperative learning is valued from the efforts of students in groups, but, such as doing assignments if only a student who completed all the task without assistance from others, but this might not be called as group work based on the cooperative learning model. Cooperative learning group needs a sense of responsibility among group members to know that the material prepared by all group members is for group goal.

Arends, et. al. 2010: 311 explained that, in cooperative learning, students work in groups, and group members must be established. While, there are a lot of ways of grouping students such as heterogeneous, homogeneous, random, and based on student interest, but generally heterogeneous groupings have resulted in academic achievement and positive collaboration.

Ming (2012: 95) stated that cooperative learning is a structured and systematic learning strategy, which is suitable for each subject of learning and class. In general, students are assigned in heterogeneous groups according to different backgrounds, abilities, and gender. Each heterogeneous group consisted of 2-4 members, who will learn and work together to achieve group goals. Propose five characteristics of cooperative learning are heterogeneous grouping, positive interdependence, personal responsibility, promotive interaction, social skills, and group processing.

Gilies (2007: 4) stated that each group is observed and assessed based on the student discussion, orientation, selfishness, involvement, communication difficulties, attention, and accepting or rejecting other people's ideas. Moreover, the item of participants was parallel to them on the monitoring rating scale and items designed to get their views on group feelings, a number of group collaborations, group productivity, individual productivity, interest in activities, and involvement of other students.

Brakenford (2012: 47) explained that cooperative learning aims to provide students the opportunity to understand the content of curriculum through active participation. This certainly showed that students become more involved in the learning process as a result of increased motivation that is more likely to express their ideas, understand the contents and have academic success.

According to Arends (2007: 16), Cooperative Learning models with the model of the developed type consist of Numbered Heads Together (NHT) types, developed by Spencer Kangan. This model aims to involve students in reviewing various materials in a lesson. The Numbered Heads Together (NHT) type of Cooperative Learning model was modified by Kangan along with the purpose of increasing the spirit of student cooperation and providing opportunities for all students to share ideas and consider the most appropriate answers in solving a problem.

According to Anita Lie (2010: 32-35), there are five elements in the implementation of Cooperative Learning, namely:

a. Positive interdependence: group success is determined by the learning efforts of each member. Each group in cooperative learning will obtain a group score. This group will determine the type of award for the group. The score is an accumulation of the scores of all group members.

b. Individual responsibility: this element is a direct result of the first element of cooperative learning. The success of the group is determined by the efforts of each group member. Obtaining the criteria as the best group, then, all group members must be responsible for studying seriously and try to obtain the best score.

c. Face to face: provides an opportunity to have face to face meeting and discussion. This is an important step aiming the group members know each other. The knowing is not merely the name, but more knowing the strengths and weaknesses of each member. Thus, it will create an atmosphere of mutual respect for differences and use the strength and fill the weakness.

d. Communication between members: communication means that each group member communicates and interacts with each other. Communication is multi-way communication, which means, there is mutual respect between group members. Generally, not every student is good at communicating. Therefore, the teacher has a role to train students in ways of communicating, such as expressing opinions, refuting the opinions of friends, and responding to friends' opinions.

Group process evaluation: students in one group evaluate the group learning process together. The evaluation format depends on the education level of the students which evaluate the things of cooperation, group member participation, and communication between groups. These are very important because can encourage each group to increase the collaboration in groups.

The Cooperative Learning Model of Numbered Heads Together (NHT) type can be used by teachers of biological to facilitate the students in the learning process because participants will exchange and share information in the classroom. But, NHT has weaknesses in grouping ideas or terms that can regulate students' thinking flow. Here, the model needs to combine with Concept Mapping.

Villalon, et. al. (2011: 18) explained that in concept maps in a box connected by label relations of two related concepts, that create propositions or semantic units concepts are also arranged hierarchically. So, the more general thing is higher mapped and specific concepts are lower.

Kac (2012: 656) concept maps are generally known as visual processes that connecting concepts with propositions including the construction of closed concepts in the form and proposition of relationships between concepts shown by connecting words. Novak, et.al (2006: 1) explained that concept maps are graphical tools to organize and represent knowledge and concepts which usually enclosed in a circle or box in several forms that connect between concepts shown by interconnected lines between two concepts.

Santrock (2009: 164) explained that one of the cognitive and motivational formations is knowledge where successful students can connect new information with existing knowledge in a meaningful way. Santrock explained that knowledge becomes more widespread when students continue to build relationships among new information, experience, and knowledge. The nature of this relationship can be in various forms, such as adding, modifying, and rearranging the existing knowledge or skills. Teachers can assist students in acquiring and integrating knowledge through some strategies, such as concept mapping and regulation or thematic categorization.

Mclure, et. al (1999: 490) explained that using the task of concept mapping for classroom assessment will affect the teacher in three ways. First, time must be allowed to train students in the concept of technical mapping. Second, teachers must consider the time needed to create a concept map compares with traditional assessment tasks. And, third, teachers must consider the time needed to print or evaluate the concept maps created by students.

Learning of concept maps is a learning strategy that requires the students to synthesize by drawings or making diagrams with interconnected main concepts which are marked by arrow lines and write the level of relations between the main concepts.

Learning objectives of concept map strategy are: (1) developing the ability to synthesize and integrate information or ideas into one, (2) developing the ability to think holistically to see the whole parts, (3) learning the concepts and theories, and (4 ) developing the capacity to think the independence.

Based on the results of interviews with biology teachers in SMA N 1 Tidore Kepulaian, teachers have never applied Numbered Heads Together (NHT) and Concept Mapping of Cooperative Learning models and local issues regional potential-based such as sago pulp waste which it can be learned in biology learning especially on the topic of environmental pollution because very appropriate to use as a context in learning due to directly relates to the experience of everyday life of students.

Local issues with regional potential-based are one of the environmental problems today in the City of Tidore Kepulauan that have not yet been studied in biology learning, especially in the topic of environmental pollution. Local issues can be learned on the topic of environmental pollution due to very appropriate to use as a context in learning which directly relates to the experience of the daily lives of students.

Local issues, such as the issue of sago pulp from the Metroxylon sago plant that is characteristic in Tidore Kepulauan City have not been studied because of the teacher use still book-centered learning focus. So, the environmental problems related to the lives of students are not discussed in learning. Local issues need to show to students in the learning process to provide meaningful learning from biology.

The problem in this study focuses on the ability of cooperation and increasing mastery of students' concepts on the topic of environmental pollution in SMA N 1 Tidore Kepulauan. The purposes of this study were (a) to find out the effect of Numbered Heads Together (NHT) Cooperative Learning model on the ability cooperation and mastery of students 'concepts, (b) to find out the influences of Concept Mapping on the ability of cooperation and mastery of students' concepts, (c) to find out the influence of combination of Numbered Heads Together (NHT) and Concept Mapping models toward cooperative learning abilities, and (d) to find out the effect of a combination of Cooperative Learning and Concept Mapping models on the mastery of students' concepts.

The benefits of this research were (a) for teachers, as a reference for biology learning techniques for students with Cooperative Learning models of Numbered Heads Together (NHT) and Concept Mapping types, as well as motivating teachers to continue to create and innovate as a form of professionalism., (b) for students, to provide direct experience of learning with Numbered Heads Together (NHT) and Concept Mapping, and (c) for schools, contributing the idea of improving the biology learning system in Senior High Schools (SMA), generally in North Maluku and especially in SMAN 1 Tidore Kepulauan.

**METHOD**

The particular research was quasi-experimental.

**Time and Place of the Research**

The research conducted from February to April 2013 in SMA N 1 Kote Tidore Kepulauan.

**Population and Sample**

The treatment population was of the entire student of grade X consisting of 6 classes with 206 students. Cluster sampling technique was used to determine the sample. The samples were the grade of $X_2$, $X_6$, $X_1$, dan $X_3$ with 139 people.

**Research Procedures**

Data collection were (a) performance assessment to determine the students' ability to collaborate by using observation sheets, and (b) test methods to find out the mastery of students' concepts through pretest and posttest with test.

**Data Analysis Technique**

Data analysis techniques were (a) performance data of collaboration capabilities and mastery of concepts which analyzed, and continued to data interpretation into a scale of 5 and (b) to determine the effect of treatment on mastery of students' concepts through prerequisite tests including normality, homogeneity, ANOVA test and Least Significant Different (LSD).

**RESULT**

Based on the performance analysis result, the collaboration ability of students is presented in table 1.

Table 1. Result of collaboration ability of students

| No | Group | Mean |
|----|---------|---------|
| 1 | NHT_CMP | 33,2812 |
| 2 | NHT | 32,3143 |

Performance analysis result of the collaboration ability of students is presented in figure 1.
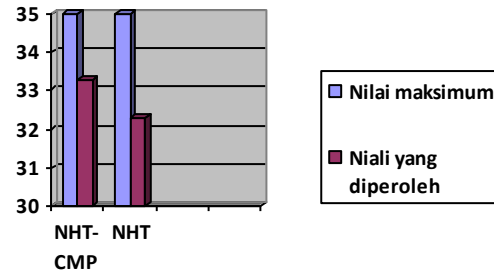


Figure 1. Collaboration Ability

Analysis result of increasing the concept mastery of students is presented in table 2.

Table 2. Result of test on increasing the concept mastery of students

| Group | Condition | Mean |
|---------|-----------|---------|
| NHT_CMP | *Pretest* | 62,1875 |
| | *Posttest* | 76,5625 |
| NHT | *Pretest* | 61,1429 |
| | *Posttest* | 71,2857 |
| CMP | *Pretest* | 62,9167 |
| | *Posttest* | 71,2500 |
| KNV | *Pretest* | 61,4286 |
| | *Posttest* | 67, 4286 |

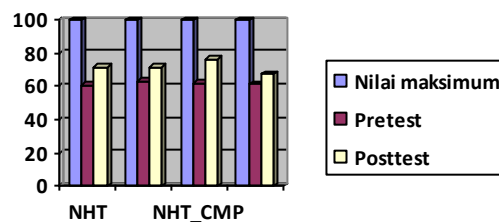Analysis result the concept mastery of students is presented in figure 2



Figure 2. Increasing the Concept Mastery

Normality Analysis result is presented in table 3.

Table 3. Normality Test result

| Condition Significance | Result | Treatment | Kolmogorov-SmirnovZ | |
|------------------------|--------|-----------|---------------------|--|
| *Pretest* | | NHT_CMP Normal | 1,315 | 0,063 |
| | | NHT Normal | 1,232 | 0,096 |

| Posttest | CMP Normal | 1,231 | 0,097 | |
|---|---|---|---|---|
| | KNV Normal | 1,353 | 0,051 | |
| | NHT_CMP Normal | 1,275 | 0,078 | |
| | NHT Normal | 0,801 | 0,542 | |
| | CMP | 1,123 | 0,161 | Normal |
| | KNV | 1,289 | 0,072 | Normal |

Homogeneity Analysis result is presented in table 4.

Table 4. Homogeneity Test Result

| Condition Result | F | df1 | df2 | Significance |
|---|---|---|---|---|
| *Pretest* Homogenous | 0,767 | 3 | 134 | 0,515 |
| *Posttest* Homogenous | 2,592 | 3 | 134 | 0,055 |

ANOVA test result of pretest is presented in table 5.

Table 5. Anova Test result of Pretest

| Source | Sum of Squares | df | Mean Squares | F | Sig |
|---|---|---|---|---|---|
| Between Group | 65,569 | 3 | 21,856 | 0,465 | 0,707 |
| Errors in each group | 6294,576 | 134 | 46,967 | 0 | 0 |
| Total | 6360,143 | 137 | 0 | 0 | 0 |

ANOVA test result of posttest is presented in table 6.

Table 6. Anova Test result of Posttest

| Source | Sum of Squares | df | Mean Squares | F | |
|---|---|---|---|---|---|
| Between group | 1404,095 | 3 | 468,032 | 8,333 | 0,000 |
| Errors in each group | 7526,339 | 134 | 65,167 | 0 | 0 |
| Total | 893,0,435 | 137 | 0 | 0 | 0 |

Test result of Least Significant Different (LSD) Posttest is presented in table 7.

Table 7. Test result of Least Significant Different (LSD) Posttest.

| Group (I) | Group (J) | Mean | Std. Error | Sig | Interval 95% |
|---|---|---|---|---|---|
| | | | | | Lower bound Upper bound |
| NHT 3,5543 | CMP | 0,03576 | 1,77903 | 0,984 | -3,4829 |
| -1,6514 | NHT_CMP | -5,27679 | 1,83302 | 0,005 | -8,9022 |

| | | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | Mean Difference | Std. Error | Sig. | Lower Bound | Upper Bound |
| | KNV | 3,85714 | 1,79152 | 0,033 | 0,3138 | 7,4004 |
| CMP | NHT | -0,03571 | 1,77903 | 0,984 | -3,5543 | 3,4829 |
| | NHT_CMP | -5,31250 | 1,82082 | 0,004 | -8,9138 | -1,7112 |
| | KNV | 3,82143 | 1,77903 | 0,034 | 0,3028 | 7,3400 |
| NHT_CMP | NHT | 5,27679 | 1,83302 | 0,005 | 1,6514 | 8,9022 |
| | CMP | 5,31250 | 1, 82082 | 0,004 | 1,7112 | 8,9138 |
| | KNV | 9,13393 | 1,83302 | 0,000 | 5,5085 | 12,7593 |
| KNV | NHT | -3,85714 | 1,79152 | 0,033 | -7,4004 | -0,3138 |
| | CMP | -3,82143 | 1,77903 | 0,034 | -7,3400 | -0,3028 |
| | NHT_CMP | -9,13393 | 1,83302 | 0,000 | -12,7593 | -5,5085 |

The collaborative ability is part of the effective assessment by teachers in schools to support learning activities in the classroom. But, this assessment has not been carried out in SMAN 1 Tidore Kepulauan during learning activities due to teachers do not have indicators of performance assessment to measure the collaborative ability of students, so that the teacher only does some assessments.

Based on the analysis results of the collaborative ability of students in SMAN 1 Tidore Kepulauan in Table 1, showed that the Numbered Heads Together (NHT) of Cooperative Learning model obtained a high score category and the combination of Numbered Heads Together (NHT) of Cooperative Learning models and concept mapping is very high compared to other groups, which are the concept mapping without the Cooperative Learning model of Numbered Heads Together (NHT) and concept mapping (conventional) do not show a collaboration. Based on the observations in classroom learning activities showed that the Cooperative Learning model of Numbered Heads Together (NHT) influence students' interaction patterns, such as students are more active and interdependent in collaborating, and motivating students to learn. The effect, the students can find the answer of problems, while treatment with concept mapping does not affect the pattern of student interaction, where the students are more likely to work individually and not motivate students to solve problems in the concept map.

Schunk (2012: 493) stated that the success of students in mastery is seen on the outcome, where students lead to do something. And, students are unable to act to obtain the impossible results due to they are not motivated. In another hand, the students are able to act because have good motivation.

Based on the analysis results of the mastery concepts of students in Table 2, obtained high category on the Numbered Heads Together (NHT) of type Cooperative Learning model, concept mapping, and without the Numbered Heads Together (NHT) of type Cooperative Learning model and concept mapping (conventional) with the different final score, where the final score of treatment with concept mapping is higher than the treatment score with the Numbered Heads Together (NHT) type of Cooperative Learning model. But, when combined Cooperative Learning models of Numbered Heads Together (NHT) and concept mapping showed an increase in concept mastery to be very high. This showed the weaknesses of the two treatments complementary.

Based on the observations during learning activities on the treatment of the Numbered Heads Together (NHT) of Cooperative Learning model, there is much dependence between students who have a low ability to students who have high ability in solving the problems, learning load that burden students, and broad concepts can confuse the students. It is different when compared to the concept mapping which does not burden students in learning; the problems are very systematic and the connection of the concepts is very clear but still weak in terms of reasoning abilities.

The combination of the Numbered Heads Together (NHT) of Cooperative Learning model and

concept mapping showed different results during the learning activities, where, in this treatment, students collaborate well because they can motivate students when learning together. Thus, positively impact the developing abilities of learners, shown by students when working the concept map quickly; it affected the mastery of students' concepts to be very high.

Based on the aspects of cooperation ability and mastery concept, the Numbered Heads Together (NHT) type of Cooperative Learning model and concept mapping in SMAN 1 Tidore Kepulauan when combined will complete each other. So, the Numbered Cooperative Learning model of Heads Together (NHT) and concept mapping can influence the collaborative ability and mastery of students' concepts becoming better. This is because when students learn with broad concepts with Cooperative Learning models with the Numbered Heads Together (NHT) type can be summarized into an interconnected concept. Then, the students can choose, define, and provide examples carefully based on the results of group discussions with the concept map.

Gilies (2007: 2) explained that, when students collaborate in learning, they will listen to what others say and express sharing ideas and views, giving and receiving assistance in finding ways to solve difficulties by actively collaborating to learn and to build new understandings. Then, the results of cooperative learning are, they create workgroups for students with other members to work, and help and support each other to develop. In the last, it can increase learning motivation for students to achieve group goals.

Novak, et. al. (2006: 10, concept map is a comprehensive teaching strategy in providing a framework of thinking and its implementation. This can facilitate the development of reasoning capabilities with the notion of reasoning thinking skills that relate to the mastery of the material subject.

According to Brakenford (2012: 4-13), the requirement to fulfill the cooperative work where the individuals work in parallel in groups is, students must help each other to complete the task. Students are expected to participate in completing the tasks for group success. According to Agus Suprijono (2012: 106) stated another way to strengthen students' knowledge and understanding of the material is through the concept map.

Schunk (2012: 555) stated the observations of conceptual on students might carry out with the standard of achievement goals and criteria in assessing the progress of goals by comparing the abilities of low and high. So, it motivates students to achieve the goal.

The Numbered Heads Together (NHT) of Cooperative Learning model has recommended by teachers in the learning process to facilitate the students to be active and collaborate in groups. And, the concept map is recommended to facilitate the students to summarize the concept from broad to be simple. But, the reality, students in SMAN 1 Tidore Kepulauan have not the ability to make concept maps to connect the concepts that have been studied before. Because, there is no good collaboration among students, and, the research found obstacles before the presentation activities began.

Presentations activities may perform after students completed the activity's sheets and making the concept maps. Because, if students that cannot make concept maps, the concept map made by the teacher will use by students to connect the concepts with the presentation. Concept maps may use well by students because concept map providing directions that lead students to fill the parts of the boxes. Based on the interviews with biology teachers and curriculum staff at SMAN 1 Tidore Kepulauan, they explained that they did not lead the students to make a presentation with a concept map due to time limitation.

The analysis results of normality and homogeneity in Table 3 and Table 4 showed that each treatment population group is normally and homogeneously distributed which is indicated by a significance value > 0.05 or (p> 0.05). So, the data continued with ANOVA analysis to determine the influence of group treatment on mastery of concepts.

The analysis results at the pretest in Table 5 showed that there was no significant effect by the significance value of 0.707 5> 0.05. It concluded that there was no effect of treatment on group treatment. Then, there did not continue to further testing.

Posttest in Table 6 showed that there was an effect of treatment on treatment group, indicated by a significance value of 0.000 < 0.05. It concluded that there was an effect of each treatment on the treatment group. And, there are significant variations or differences in each treatment group. Then, it conducted the Least Significant Different (LSD) at a significance level of 0.05 to find out the differences or variations in the average group of each treatment with controls (conventional) as a comparison.

The result of the Least Significant Different (LSD) in table 7 with a significance value of 0.05 by comparing each treatment group with conventional (control) in table 21 on page 102, showed the results;

a. Cooperative Learning model with Numbered Heads Together (NHT) had significance influence than a conventional model by significance values 0.003<0.05.

b. Concept mapping provided significant value than the conventional model by significance value of 0.034 < 0.05.
c. The combination between the Cooperative Learning model with Numbered Heads Together (NHT) and concept mapping provided significant influence than the conventional model by significance value of 0.000 < 0.05.

The analysis results of the Least Significant Different (LSD) in each treatment group concluded that each treatment group had different effects on the mastery of students' concepts. Based on the significance values obtained by the Cooperative Learning model with numbered Heads Together (NHT), showed different result compared to the conventional model because students during the learning activities, they are more listening of other people say and share ideas and explanations, as well as giving and receiving assistance in finding ways to overcome difficulties in understanding the concepts.

Concept mapping is different from conventional models because concept mapping leads the students to synthesize by making diagrams with interconnected concepts. As a result, the information is clear. And, when both combined, they will influence the mastery of students' concepts, where ideas can be grouped by students from the abstract into reality.

Arends (2007: 5-9) stated that the Cooperative Learning model with Numbered Heads Together (NHT) developed to achieve three important objectives, namely academic achievement, tolerance and acceptance of diversity, and the development of social skills. Achieving the goals of Cooperative Learning with Numbered Heads Together (NHT), teachers must grow the students' motivation since the beginning of learning and produce cooperative behavior both verbal and nonverbal than competitive behavior due to students collaborate during the learning.

Chei (2008: 376) stated that a concept map is a graph containing a sign that is interconnected with a label. It has a function as a tool of knowledge representation to reflect existing relationships between concepts in the long-term memory of students.

Kac (2012: 656-657)) stated that concept maps are generally known as visual processes that connect concepts with these propositions, including forming a closed concept in the form and proposition of relationships between concepts shown by using words. If students make concept maps using paper and pencil, then the student can find conceptual errors.

Atlle, et. al. (2007: 77) stated that today, collaboration or competition either good or bad internally supporting the learning process depends on the teacher when using strategies to improve the score of students in learning. Here, the students have time to prepare well through a balanced approach which combines collaboration and competition in encouraging a student in learning. Then, they can achieve good academic success in the group.

## CONCLUSION

### Conclusions

Based on the results and discussion, concluded: (a) the Cooperative Learning model with Numbered Heads Together (NHT) influences the students collaboration ability with the mean of collaboration is 32.3143 (very high), but is not influence the mastery of students' concepts on the topic of environmental pollution with mean pretest of 61.1429 (high) and posttest 71.2857 (high), (b) Concept Mapping is not influence the students collaboration ability and mastery concepts on the topic of environmental pollution with mean pretest of 62.9167 (high) and posttest 71.2500 (high), (c) the combination of the Cooperative Learning models with Numbered Heads Together (NHT) and Concept Mapping influence on the students collaboration ability with mean of 33.2812 (very high), and (d) combination of Cooperative Learning models with Numbered Heads Together (NHT) and Concept Mapping influence the mastery of students' concepts on the topic of environmental pollution with pretest score of 62.1875 (high) and the posttest of 76.5625 (very high).

### Suggestions

Based on the conclusions and limitations of the study, the article proposes suggestions: (a) need further research in SMAN 1 Tidore Kepulauan to carry out an assessment of collaboration abilities through performance assessment and (b) needs a further research to develop the students' ability in making Concept Map at the end of learning to facilitate the students in master the concepts after the learning.

## REFERENCES

Arends, R. I. (2007). *Learning to teach, seventh edition.* New York & London: *Mc* graw hill higher education.

Arends, R. I., & Kilcher, A. (2010). *Teaching for students learning*. New York & London : routlege taylor francis group. Newyork: the mc graw hill higher education.

Attle, S., & Baker, B. (2007). Cooperative learning in a cooperative environment: classroom applications. *International jaurnal of teaching*

*and learning in higher education*, 19 (1), 77-83.

Brakenford, W. (2012), The effects of cooperative learning on the classroom participation of students at placed at risk for social failure. Bowle state university (nama jurnal), 2 (4), 239-246.

Barros, E. H. (2011). Collaborative learning in the translation classroom: pruminary survey results. *The journal of specialized translation,* 1 (16), (halaman).

Chei, C. C. (2008). The effect of concept mapping on student's learning achievement and interest. *Innovations in education and teaching international*, 45 (4), 375-387.

Fatma, B., *et. al.* (2011). The effectiveness of cooperative learning on the reading comprehension skills in Turkish as a foreign language. *Turkish online journal of educational teknology-TOJET*, (v n4p-volume jurnal), 330-335.

Gilies, R. M. (2007). *Cooperative learning integrating theory and practice*. California: sage publication. inc.

Gokhale, A. A. (1995). Collaborative learning enhances critical thinking. *Journal of technology education,* 7 (1), (halaman).

Huda, M. (2011). *Cooperative Learning metode, teknik, struktur dan model penerapan*. Yogyakarta, Pustaka Pelajar.

Isjoni. (2007). *Cooperative Learning efektifitas pembelajaran kelompok*. Bandung, Alfabeta.

Kac, M. (2012). Pedagogical knowledge representation through concept mapping as a study and collaboration tool teacher education. *Australasia journal of educational teknologi*, 28 (4), 656-670.

Lie, A. (2010). *Mempratikkan Cooperative Learning di ruang ruang kelas*. Jakarta: Grasindo.

Morgan, M. B. (2012).Teaching cooperative learning with children's literature. Department of teaching, learning, and innovation college of education the university of Texas at Broconsville. journal 2012 (Nama jurnal); 22 (3), (halaman).

Ming, S. H., Wei, H. H., & Tsung, S. C. (2012). Design curriculum: investigation on learning effectiveness and social presence. *The turkies online of educational technology particality.* 11 (4), (halaman).

Novak, D. J. *et. al,* (2006). *The theory underlying concept maps and how to construct and use them1*. Florida Institute for Human and Machine Cognition (IHMC).

Suprjono, A. (2012). *Cooperative Learning "teori dan aplikasi paikem.* Yogyakarta: Pustaka Belajar.

Schunk, D. H. ((2012). *Teori-teori pembelajaran perspektif pendidikan.* Yogyakarta: Pustaka pelajar. (Terjemahan Eva Hamdiah & Rahmat Fajar). Person education, inc. (Buku asli diterbitkan tahun 2012)

Santrock, J. W. (2009). *Psikologi pendidikan*. Jakarta: Salemba Humanika. (Terjemahan Diana Angelicia). McGraw-Hill: USA. (Buku asli diterbitkan tahun 2008).

Slavin, R. E. (2005). *Cooperative learning teori, riset dan praktik*. Bandung: Nusa media. (Terjemahan Nurlita Yusron). Bacon: London (Buku asli diterbitkan tahun 2005).

Sharan, S. (2012). *The handbook of cooperative learning*, Yogyakarta. Familia. (Terjemahan Sigit Prawoto). Wesport: London (Buku asli diterbitkan tahun 1999).

Trianto. (2009). *Mendesain model pembelajaran inovatif-progresif*, Jakarta: Kencana Prenada Media Group.

Villalon, J., & Calvo, R. A. (2011). Concept maps as cognitive visualizations of writing assigments. *Educational technology a society*, 14 (3),16-27.