Improving students' critical thinking skills through Remap NHT in biology classroom

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Received 17 Oct., 2016
Revised 10 Dec., 2016

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Abstract

Previous studies in Malang, Indonesia showed that there were the failure biology learning caused by not only the low students' prior knowledge, but also biology learning model has not improved the students' critical thinking skills yet, which affected the low of cognitive learning outcomes. The learning model is required to improve students' critical thinking skills. Learning model that considered able to solve this problem is a model that combines reading, constructing concept maps, and the implementation cooperative learning type Numbered Heads Together (Remap NHT) in the classroom. This study was quasi experimental research that compared the effect of Remap NHT learning model and traditional learning in biology classroom to improve critical thinking skills at Xth grade students of senior school in Malang, Indonesia. The results showed that the implementation of Remap NHT during biology classroom showed the effect on students' critical thinking skills.

Keywords: concept map, critical thinking skill, learning model, number head together, reading

Introduction

In this 21st century, education is confronted with the knowledge era requires a range of skills that needs to be owned by the students. The 21st century skills became the driving issues of the improvement at all pathways and levels of education sectors to prepare the students. Many 21st century skills are needed to be mastered by students, including abilities to gather, regulate, use, evaluate quality and relevance of information, and to produce accurate information supported by references (PRRC, 2010). The 21st century also required a new paradigm in the learning process (Tan, 2003) including the biology lesson. Sidi (2001) stated that the paradigm must change from teaching to learning or from teacher-centered to student-centered learning. Therefore, learning should be designed in the form of active learning environment, collaborative, self-regulated and self-directed learning (Tan, 2003). Tan (2004) explained that in the learning process, students should have the self-regulation as a key to improve the thinking ability. Students who previously passive in the classroom is expected to be more active to collect diverse of information. The implementation of learning using critical thinking skills in the classroom is one of the effective ways because it can develop some skills of students, such as increasing the concentration, having a deep analysis capabilities, and improving students' learning (NEA, 2012).

Duch, Allen and White (1999) explained that some of the competencies required for success include the ability to (1) think critically, analyze, and solve the real world problems, (2) find, to evaluate, and to use appropriate learning resources, (3) cooperate in teams and small groups, (4) oral and written communication skills effectively, and (5) use of content knowledge and intellectual skills to be a continuous learner. Similarly Trilling and Hood (1999) stated that some of the skills that must be possessed in the era of knowledge includes: (1) critical thinking skills and hard work, (2) creativity, (3) collaboration, (4) cross-cultural understanding, (5) communication, (6) computing, and (7) career and independence.

One of the skills that have not been improved yet in biology learning at all levels of education in Indonesia including senior school was critical thinking skill. As stated by Sanjaya (2008) students seem less encouraged to develop thinking skills, but more guided to memorize information, and forced to recall the information without understand the information and connected with daily life. Trilling and Fadel (2009) defines critical thinking is the ability to analyze, interpret, evaluate, summarize, and gather information. Through critical thinking students are expected to have the ability to make effective reasons, use a thinking system, create and make decisions, and be able to solve the problems.

Critical thinking skills are the cognitive skills associated with the mind (Cotrell, 2005). Cognitive skills are the cores of critical thinking skills include interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 2010). According to Kauchak and Eggen (2007), metacognition, critical thinking, and content knowledge or understanding of the topics were the elements that related to each other in learning processes. Corebima (2006) stated that there was a relationship between critical thinking skills with higher thinking and metacognitive skills. It means that metacognitive skills supports higher thinking and critical thinking skills. Science is a great manner to learn using critical thinking skills because it can train the scientific way of thinking (Schafersman, 1991). The scientific methods usually used in science to compose questions, gather informations, develop reasons, resolve the tests, analyze data, and communicate results. There are several ways to assess the students' critical thinking skills in the classroom such as a pretest and posttest, case studies, story-telling, giving questions, role playing, and debate (Brookfield, 1997; Scott, 2009).

Student-Centered Learning to Improve Critical Thinking Skill

The improvement of students' critical thinking skills is very important for students to look at and face the various problems that will present in their life, and were able to apply in different situations. Critical thinking as filter in separating the relevant from the irrelevant.Teachers should help to improve students' critical thinking skills through the application of

student-centered learning model on a various subjects including biology. There are so many studies showed that cooperative learning influences development and improvement of students' critical thinking. For instance, Gokhal (1995), demonstrated that cooperative learning not only plays a key role for students to gain practical knowledge, but is also utilized as a suitable way to reinforce critical thinking. The results of previous studies reported that the critical thinking skills were affected by learning strategies or models (Arnyana, 2004; Andayani, 2008; Warouw, 2009; Muhfahroyin, 2009; & Maasawet, 2009).

The Low Students' Reading Interest

The failure of the implementation of student-centered learning in biology classroom in Indonesia was generally caused by a lack of prior knowledge of the students regarding to the learning materials. Yamin (2008) suggested that students should have the prior knowledge that would be the basic for building further knowledge. The lack of prior knowledge of students due to the low of students' reading interest on the subject matter before learning in the classroom. Corebima (2009) reported that almost all students did not read the course materials and it was affected the strategy or learning model designed difficult to apply and the students' comprehension become low.

The observations results conducted by researchers in Malang, Indonesia, showed that the students' reading interest still low because only two of 27 students who visited the library frequently to read and generally students were reading the fiction books rather than textbooks. The research related to reading were also done by researchers as described below. Prasmala (2014) found in the science Xth grade students in SMA Surya Buana Malang that were given the task to answer the questions using cognitive levels C1 and C2, but the students rarely read and understand the biology subject to find the answers on worksheets. Ratnawati (2015) declared that the science Xth grade students in SMAN 2 Malang was known more prefer playing gadgets and watching television rather than reading.

The low of reading interest of Indonesian students could have an impact on students' thinking skills, including critical thinking skills, because reading activity is one of the ways to develop thinking skills. Thyer (2013) stated that students can perform activities such as reading and writing to develop critical thinking skills. Critical thinking skills are be help ful in reading activities for students because it can change passive to active students. By reading, students would also acquire the knowledge related to scholastic success and as a source of pleasure (Wanjari & Mahakulkar, 2011).

Remap NHT to Improve Students' Critical Thinking Skill and Reading Interest

The learning that considered to be overcome those problems is a learning model that combines students activities of reading the lesson materials and constructing a concept map about the lesson materials they read before learning in the classroom, and teacher should applying of cooperative learning models in the classroom. It was given the name of those learning stages with Remap Coople, i.e. the abbreviation from reading, concept mapping, and cooperative learning (Zubaidah, 2014; Pangestuti, Mistianah, Corebima & Zubaidah, 2015). Through those activities, students are expected to read the course materials before lesson processes in the class. There are five elements of cooperative learning model that were applied to achieve maximum results, including positive interdependence, individual responsibility, face to face, communication, and the group evaluation process (Lie, 2002). At the end of the learning process, students are requested to complete the concept map that was created before. Patrick (2011) stated that the concept maps help students improve and summarize the course materials.

Numbered Heads Together (NHT) is one type of cooperative learning that could be chosen for Remap Coople, so the name of learning models is Remap NHT. The learning steps of NHT were numbering, questioning, thinking together, and answering (Arends, 2009). In NHT learning model, teacher check students' understanding from reading activity of students by using questions. NHT emphasize the contribution of each student to answer a teacher's question. Each students should be responsible to present their knowledge. Unfortunately, not all students have the opportunity to present their knowledge in every lesson due to time constraints. Therefore, NHT combined with the concept maps, in order to every student has the opportunity to express their knowledge in written.

Concept maps are often used in education as a tool for representing knowledge in learning. Concept map is an excellent method to help the visual or spatial learner understand difficult concepts and their interrelationships, and allows a student to develop the ability to organize and group information in a meaningful way (Senita, 2008). Teachers can verify and analyze the results of students' concept maps. Wei and Yue (2016) argued that by analyzing the students' concept maps, teacher can assess students learning and thinking processes including critical thinking. The basis for concept mapping is incorporated to assimilation theory (Ausubel, Novak, and Hanesian, 1978). The part of this concept includes meaningful theory as a method of identifying a process of incorporating new knowledge with existing knowledge and reordering of this knowledge until it becomes meaningful and useful for the learner.

Maasawet (2009) stated that NHT has several advantages that each student be ready for learn, can conduct discussions in earnest, and students with higher academic level could teach the students with the lower academic level as a peer. Winarni (2011) found that the implementation of NHT could improve cognitive learning outcomes of science. NHT learning models can indirectly involve students to share information, be a good listener, and able to speak with full consideration. When teacher choice any students to answer questions, the students did not know who would be selected so that there will be a sense of responsibility to each student. Good students will not dominate the group and expected that all students become more tolerant (Kagan, 2007; Munawaroh, 2015).

Previous researchers that had studied about Remap Coople models with some kinds of cooperative learning proved that those models improving students' metacognitive skills, critical thinking skills, and cognitive learning outcomes of students as described further. Setiawan (2015) stated that application of Remap TPS could increase students' reading interest and metacognitive skills. Antika (2015) also stated that application of biology learning with Remap STAD (Students Team Achievement Division) can enhance students' metacognitive skills and learning outcomes. Pangestuti (2014) showed that the application of biology-based learning Remap Teams Games Tournament (TGT) model increased students' reading interest, critical thinking skills, metacognitive, and cognitive learning outcomes biology. Hasan (2014) showed that the implementation of Remap STAD could increase students' reading interest, critical thinking skills, metacognitive, and cognitive biology achievement.

There are many topics in Biologi learning materials in secondary schools including the living creatures and the basic concepts related to the life processes. Students are expected to understand the concepts of biology and its application in everyday life. Observing these characteristics, the student is required to master the concepts and think comprehensively by analyze, interpret, evaluate, conclude, and collect information related to the phenomena of life. These skills related to the critical thinking skills (Trilling and Fadel, 2009). Through the critical thinking students are expected to have the ability to make-effective reasons, use a thinking system, create and the make decisions, and be able to solve the problems. These critical thinking skills were expected to be improved by the application of the Remap NHT learning model.

The results of this study are expected to provide the information for teachers and policy makers related to another learning model that can improve students' critical thinking skills. By giving task to read the lesson materials and to construct a concept map for students, and then implementing cooperative learning type NHT in the classroom, it should be expected that

students will have prior knowledge related to learning subjects, and show better critical thinking skills. It is also expected that the learning model will have an impact on improving the quality of learning overall.

Materials and Methods

This study was the quasi experiment designed to examine the improvement of critical thinking skills of students in biology classroom taught by Remap NHT learning model. The research was pretest-posttest control group design (Fraenkel & Wallen, 2009). There were 25 classes as a population of study, then tested their equity based on the national test scores. Analyses performed used t-test by SPSS 23.0 for Windows. The equity test results showed that there were 10 classes had the equivalence. The two classes were chosen randomly, a class as the control and another one as an experimental class. The control class taught using learning as usual with lectures, discussions, and presentations without designed with a specific learning models. An experimental class taught using Remap NHT.

The research instruments developed by the researchers include the treatment and measurement instruments. Treatment instrument consisted of a syllabus, lesson plans, sets of questions, and worksheets. Students' critical thinking skills was measured by 18 numbers of written essay tests, and then their answers were scored by rubric critical thinking skills embedded essay test refers to Finken and Ennis (1993) that adapted by Zubaidah, Corebima, and Mistianah (2015). The instrument previously was validated by experts and empirical validation. The validity of the instrument including content and construction validation was done by two senior lecture who have expert in evaluation of biology education at Department of Biology, Faculty of Mathematics and Natural Science, UniversitasNegeri Malang, Indonesia. The content validity was determined by the extent to which the question items representing all subject matter. The construction validity included quality items overall instrument based on a clear definition of operational variables. The construction validity test was done by revised learning instruments based on expert suggestions. The results of the validation from the experts indicated that the instruments was valid.

Empirical validity was conducted by testing those 18 numbers of written essay tests to 50 students from another schools. The test was carried out to determine the validity and reliability of the instrument. Validity refers to the extent of measuring instruments precision and accuracy in the conduct of measurement functions. The validity of an instrument related to the ability to measure the characteristics of the variables. The reliability related to the degree of test scores was free of measurement error or an index that indicates the extent to

which a measuring instrument was reliable. The test results showed that the instrument was valid and reliable.

The study carried out for 4 months. At the beginning of learning experiment, students were given a pre-test and at the end given a post-test in the form of 18 numbers of written essay tests. The pre-test and post-test data were scored using a rubric critical thinking skills embedded essay test as described previously, then analyzed using one way ANCOVA. Those data previously was tested by pre requisite test including normality data test using One Sample Kolmogorov-Smirnov and homogeneity test using the Levene's Test of Equality of Error Variance. Data analysis was done by using SPSS 23.0 for Windows.

Results

Tabel 1 showed the summary of ANCOVA test of the effect oflearning models on the students 'critical thinking skills. The changes of pretest to posttest scores of students' critical thinking skills in Remap NHT and traditional learning are shown at Table 2.

Table1. The summary of analysis of covariance on students' critical thinking skills

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Sig.
Corrected Model	7667.618(a)	2	3833.809	76.309	<0.001
Intercept	5107.733	1	5107.733	101.666	<0.001
XCTS	841.536	1	841.536	16.750	<0.001
MODEL	5791.906	1	5791.906	115.284	<0.001
Error	2361.304	47	50.241		
Total	125120.467	50			
Corrected Total	10028.922	49			

Table 2. The changes of pretest and posttest scores of students' critical thinking skills

Model	Mean Scores of Pretest	Mean Scores of Posttest	Difference	Corrected Scores
Traditional	30.94	36.75	5.81	32.22
Remap NHT	14.95	60.14	45.19	65.05

ANCOVA test results at Table 1 indicates that there is the differences between students' critical thinking skills were taught using Remap NHT with traditional learning ($p < 0.05$). It means that Remap NHT has the positive effect on students' critical thinking skills. The

corrected scores of students' critical thinking at Table 2 shows that the corrected scores of critical thinking skills of the students in Remap NHT 50.47% higher than the traditional learning.

Discussion

High Improving of Critical Thinking Skills Scores Using Remap NHT

The results showed that Remap NHT has the positive effect on students' critical thinking skills improvement. The critical thinking skills scores change from pretest to posttest on students were taught by Remap NHT much higher than traditional learning. It presumably was caused by the syntax of Remap NHT that consisted of reading and constructing concept maps before learning in the classroom, and discussion through cooperative learning type NHT in the classroom and in the last learning, students should completing their concept maps.

Improve Critical Thinking Skill by Reading Activity

In the early stages of learning biology based on Remap NHT, students were given the task to read the course materials that will be taught. This task could improve the students' critical thinking skills as Tierney, Soter, O'Flahavan and McGinley (1989) statement that actually the reader has the thinking skills that sometimes did not recognized or known by them self. Klimovienė and Barzdžiukienė (2006) stated that critical thinking skills could be used to develop the knowledge and skills of students through reading, writing, and presentation.

The reading assignment was given at the end of each lesson and done at home before next lesson. Aritonang (2007) explained that teachers should give students assignment to read related materials for the next lesson routinely. Reading is one way to increase and improve the knowledge, broaden views, enrich the information, and stimulate the emergence of new ideas (Nurdin, 2011). Reading is a habit that needs to train the brain with the positive things as a learning process, so that students have an obligation to read in supporting learning activities. Reading is also possible to convert explicit knowledge into tacit. For instance, by reading a particular lesson materials, the students learn from the book or other resources, thus converting the knowledge contained in the book or other resources into tacit knowledge in their mind (Handoko, Nursanti, Harmanto, & Sutriono, 2016).

Students would be easier to understand the materials that had been learned in the classroom when they already read before, because by reading the students will have a prior knowledge.

Habituation of reading will evoke the students' spirit to learn. Reading is one of study planning which can help the teacher to monitor the progress and evaluate students' learning, so that the students can change the way of learning to improve their learning outcomes by reflection process of learning. If students do not understand a concept, the students will try to find the meaning of concepts or words that are not understood, so that students will continue to read. Tung and Chang (2009) stated that reading is appropriate with an important feature of critical thinking based on the reasons as follows. First, the mental process of reading requires the ability to think critically. Reading is a complex process that requires the reader to remember, take it back and reflect on their previous experiences or memories to construct the meaning from text. Second, reading material, background and language in literatures help the reader to build a sense of self and the meaning of life gradually with various real-world scenarios.

Improve Critical Thinking Skills by Constructing Concept Map

The next step on Remap NHT, students are required to construct a concept map individually. This is according to a statement of Nesbit and Adesope (2006) that concept mapping is shown to create understanding, improve retention and critical thinking skills and is perceived as beneficial by users. The benefits of concept mapping include increased comprehension, critical thinking, and achievement (Novak & Gowin, 1984).

Concept maps could be used as a teachers' way to check who students have already read the materials. The task of constructing a concept map would make students read the course materials (Marzano, 1998). Through constructing concept maps students are expected to know the materials to be studied and understand all they had learned. Through comprehend the important concept it will facilitate students to plan and prepare the materials to be learned in the classroom. Daley (2002) suggested that using the concept maps could help the students become more aware and understand their learning and make it more meaningful. Concept maps can make students remember more information and be able to use information more effectively because the information was used as a long-term memory.

The use of concept maps in learning biology generally as an alternative to effective learning if laboratory facilities and infrastructure for the implementation of the practicum are limited. The advantages of the use of concept maps in learning biology is to facilitate teachers in preparing and planning lessons, as well as the creativity of students learning more meaningful. Wheeler and Collins (2003) suggested that concept mapping is effective in helping students develop critical thinking skills by link knowledge and practice. Senita (2008) found that the development of concept maps allows students to see how ideas are connected. It can be an

effective teaching–learning strategy that allows a student to develop the ability to organize and group information in a meaningful way. The use of concept mapping allows reorganization of information in a visual manner to promote critical thinking. Concept mapping will facilitate critical thinking and makes the learning becomes meaningful and effective (Atay & Karaback, 2012; Latif, Mohamed, Dahlan & Nor, 2016).

Improve Critical Thinking Skills by NHT

The next step in Remap NHT is the learning in the classroom using cooperative learning type NHT. At this stage the teacher divides the students into groups of 3-4 students. Lie (2002) explained that the cooperative learning can make students easy to socialize and raised more pleasant learning atmosphere because as social human beings could not live without others help. Application of cooperative learning type NHT expected to make students become active in expressing their opinions, develop ideas, to train students to think critically, and responsible for the group's cooperation so that students could achieve the expected competencies (Siregar, Djamas & Nurhayati, 2013). Kusumaningtyas (2013) stated that NHT had the procedures established explicitly to give students more time to think, respond, and help each other.

It is proved that Remap NHT enhances critical thinking from pretest to postest. It seems that NHT as a type of cooperative learning encourages students' involvement and engagement in their own learning. It provides opportunities to make the students thoughts visible to others, allows them to tell about their own ideas, and permits them to consider the ideas of others, which enhances their critical thinking skills. Klimovienė and Barzdžiukienė (2006) stated that cooperative learning could be used to develop students' critical thinking skills through: a) election of different group members, b) create a relationship of mutual dependence and has the same goals, so that students did not work individually and compete among members of the group, c) the position of each member at the group is same, d) the teacher may offer assistance to students as support in finding a solution of the problem, and e) building a knowledge. Cooperative learning is a valuable tool for developing critical thinking, for it creates the most desirable classroom environment where the learners experience psychological safety, intellectual freedom, and respect for one another as persons of worth. Winarni (2011) stated that NHT not only help students to understand difficult concept of science, but also very useful to establish cooperation and critical thinking.

The questioning stage in NHT could trained students' ability to solve the problems (Kristanti, Yudayana & Dantes, 2013). NHT is more effective than traditional learning. NHT related to the problem solving process (Misu, 2014). Student will try to find solving problems so that

students are expected to apply in everyday life by considering the benefits for the answers submitted and are accustomed to think critically. Being trained to solving problem students will be adapted to use critical thinking. At "heads together" stage, students can help each other when there are group members who do not understand the course materials. After that, on answering stage each group tries to show the best possible answers during class discussions. Siregar, Djamas and Nurhayati (2013) stated that the cooperation within the group with the numbering on each student was the main characteristic of NHT. All students are trying to understand the materials being taught and each is responsible for a number of their members. NHT preceded by numbering that requires readiness of all students. All group members must be master the subject matter because each student has a same chance to be called by the teacher randomly.

Improve Critical Thinking Skills by Completing Concept Map

After following the NHT, students completing their concept maps to recognize information. Novak and Gowin (1984) described the steps how students learn. Students break vast amount of knowledge into small parts and then reorder or rearrange them into a format that makes sense to their mind. Students then develop connections among these small sub-concepts until knowledge fully grasped. The use of concept mapping allows reorganization of information in a visual manner to promote their critical thinking. Additionally, Hyerle (1996) suggested a concept map was a learning tool that illustrates the thinking of students, allowing students to organize ideas, and better in reading, writing and thinking. Concept maps were generally used on a variety of subjects including biology that serves as a tool to help students organize information and develop higher level thinking abilities (Maas & Leauby, 2005).

The thought process in making the concept map is seems related to the competence of critical thinking (Binkley, Erstad, Herman, Raizen, Ripley, Miller-Ricci & Rumble, 2012; Rosen and Tager, 2013). Ajaja (2011) stated that concept maps help in understanding ideas by showing the connections with other ideas. The process of thinking require students to elaborate and organize meaningful information that cannot be obtained only by remembering information without understanding the sense and looking for a relationship. Concept map is a cognitive task that requires diverse thought high level thinking process which consists of assessing and classifying information, recognizing patterns, identifying and prioritizing the main idea, comparing and contrasting, identifying relationships, and making logical thinking (Kinchin, Hay & Adams, 2000).The principle of a concept map is that it provides a visual means of showing connections and relationships between a hierarchy of ideas ranging from the very concrete to the abstract (Bennett, 2003).

Enhancing the concept maps could make the students improve and summarize the learning (Patrick, 2011). Concept maps were also effective as a learning tool to study in science and to help students understand and remember materials science (Asan, 2007). Opinion was supported by Winkel (2004) stated that meaningful learning was significant if students understand the materials being studied. The good understands related to the course materials make students can memorize it better. Students who use concept maps obtained a higher score on the posttest than students who taught by conventional learning. Thus, the assignment in Remap NHT would provide a positive effect to increase students' cognitive abilities (Asan, 2007). A study conducted by Ajaja (2011) determined the effects of concept mapping as not only a study skill on students' achievement in biology, but also as a study skill retained biological knowledge longer than those who reviewed the concepts they were assigned to. He also indicated a significant and consistent improvement in biology achievement as the period of experience with the use of the method increased. All the students in the concept mapping classroom interviewed agreed that concept maps helped them not only in the determination of the relationships among the concepts but also shaped their understanding of the concepts and increased their critical thinking.

Traditional Learning didn't Adequate to Improve Critical Thinking Skill

In traditional learning, critical thinking skills are less improved optimally. Slavin (2011) stated that traditional learning reported to be less effective in improving learning outcomes. Learning activities in traditional learning tend to be verbal (Serbessa, 2006), unilateral (Khalid & Azeem, 2012), and frequently dominated by teachers that make students become passive. Traditional learning did not provide an opportunity for students to become independent learners to investigate and conduct teamwork (Kenner & Weinerman, 2011).

Individual accountability was often overlooked in traditional learning (Ahmad & Mahmood, 2010). The tasks performed only by particular members of group, while the other group members tend to be passive. In traditional learning, monitoring through observation and intervention carried out by teachers throughout the study groups take place. It did not provide an opportunity for students to exercise their creativity (Khalid & Azeem, 2012; Tsai, 2013). The assignments in traditional learning sometimes are individually thus ignoring the interpersonal relationships between students. Teachers often let students or certain groups to dominate so no collaboration and positive dependence among students in the group, and there is no interaction proportional happened.

Concept maps in this learning were prepared by students still manually with paper and pen, not use technology yet, because of limited technology facilities owned by the students or the

schools. If the infrastructure allows, preparation of concept maps can be done using technology, for example with some programs like i Mind Map, Cmap Tools, Freemind, Mind Manager and so forth. Knowledge and technology could not be separated because technologies play an essential part for building knowledge (Handoko, Smith, & Burvill, 2014), especially ICT literacy to be one of the 21st century skills that need to be mastered by students.

All in all, the results of Remap Coople improve critical thinking which is consistent with already-published results in another type of cooperative learning in Remap Coople. Based on the above, this research can be valuable information for readers, especially for teachers to choose appropriate learning models that can improve students' critical thinking skills such as learning Remap NHT model. Another Remap Coople models also could be choosen because some of them had proved to improve some skills as well as critical thinking skills as described previously.

Conclusion

Based on the results of research and discussion, it can be concluded that the Remap NHT learning models proven to improve students' critical thinking skills better than traditional learning in biology classroom. Students' critical thinking skills improvement of going through the reading, constructing a concept maps as the results of reading, discussions through cooperative learning type NHT, and to revise the concept map at the end of the learning.

Acknowledgement

This research was supported by Directorate of Research and Community Service – Ministry of Research and Technology and Higher Education of the Republic of Indonesia - General Directorate of Research, Reinforcement and Development, on research funding with a letter of assignment agreement No. 047/SP2H/LT/DRPM/II/2016 and No. 151/SP2H/LT/DRPM/III/2016.

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