

TRAIN STUDENTS' CRITICAL THINKING SKILL THROUGH THE IMPLEMENTATION OF COOPERATIVE LEARNING MODEL TYPE GROUP INVESTIGATION (GI) ON MATTER OF REACTION RATE IN SMA NEGERI 1 MANYAR

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Abstract

This study aims to determine the implementation of learning and students' critical thinking skills after the implementation of cooperative learning model type Group Investigation on matter of reaction rate. This research type is Pre Experiment (pre experimental design) and research design used is One-Group Pretest-Posttest Design. Target of this research is student of class XI MIPA 6 SMA Negeri 1 Manyar. The instruments used are an observation sheet of cooperative learning model type Group Investigation and sheet of pretest and posttest of critical thinking skill. The results showed that (1) The implementation of cooperative learning model type Group Investigation is in good and very good category with percentage in every phase is: in phase 1 was 87.5%; phase 2 was 95.84%; phase 3 which contains stage 1 and stage 2 of the Group Investigation was 87.5%; Phase 4 which contains stage 3, stage 4, and stage 5 of the Group Investigation was 95.84%; phase 5 which contains stage 6 of Group Investigation was 100%; (2) Students' critical thinking skill in terms of N-gain shows that 85% of students get high N-gain category and 15% of students get N-gain in moderate category.

Keywords: cooperative learning model type Group Investigation, critical thinking skill, reaction rate.

INTRODUCTION

Chemistry as part of the science is acquired and developed on the basis of experiments to seek answers to the question of what, why, and how about natural phenomena especially relating to the composition, structure, properties, transformation, dynamics and energetics of substances [1]. Chemical objects, how to obtain, and its usefulness are expected to be a vehicle for students to learn themselves and the natural environment so that it can be applied in life.

To be able to relate the phenomena of nature with the concept in the object of chemistry is required a critical thinking skills. This is in accordance with the demands of the Regulation of the Minister of Education and Culture No. 20 of 2016 on the competency standards of graduates, that every graduate of elementary and secondary education units have competencies in three dimensions of attitude, knowledge, and skills. Skill dimensions at the SMA / MA / SMALB / Package C level should be able to train thinking and acting skills that include creative, productive, critical, independent, collaborative, and communicative.

Critical thinking skills are an active, persistent, and conscientious consideration of a belief or form of knowledge that is taken for

granted in light of the reasons that support it and the subsequent conclusions that become its tendency [2]. Critical thinking skills are needed by every individual to address the various problems faced by life. Critical thinking can also be useful for critically evaluating what is learned in class [3]. This can help students to discuss with their students and teachers. For teachers, critical thinking skills can help to argue well when giving explanations to students. In order to define, explain, measure and evaluate the process of critical thinking, it is essential to understand the indicator of critical thinking skills [4]. Facione formulates six critical thinking components, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation[5].

To be able to train critical thinking well, students must be able to master chemical concepts well [6]. One of the materials categorized as difficult according to the students is the material of reaction rate. Reaction rate is part of the conceptual chemical material that often makes the students difficult in understanding about the various concepts that exist. The material of the factors affecting the rate of reaction is the material that has the characteristics of needing proof through experiment by asking students to investigate,

analyze, and conclude the results of the experiment.

Based on the interview result which was conducted with one of chemistry teachers in SMA Negeri 1 Manyar on 28th of August 2017, not all students reach the minimum mastery criteria at the reaction rate material. In general, there are 30% of students having difficulty on material of reaction rate. However, based on the results of pre-research which was conducted at SMA Negeri 1 Manyar on 26th of July 2017 in class XII MIPA 8 and XII MIPA 3 on 27th of July 2017, 83% of students stated the reaction rate is difficult material and 71% of students want the experiment method and the discovery of the concept itself. In addition, based on the results of pre-research tests of critical thinking is also found the fact that only 13.46% of students who are able to formulate problems and variables well, 32.69% of students are able to formulate hypotheses well, 21.15% of students able to make analysis, and 13.46% student able to make conclusion well. The low percentage of students in formulating problems, hypotheses, determining variables, making analysis and conclusions reflects the ability of interpretation, and inference which are an indicator of critical thinking of students is still relatively low.

Nonetheless, critical thinking skills can be trained on matter of chemistry. This is supported by previous research that successfully improve students' critical thinking skills with 110% percentage and obtained N-gain in the high and medium category on acidic bases [7]. The other research also concluded that students' critical thinking skills have improved with medium and high criteria on matter of reaction rate [8]

Based on the above description, one of the efforts that can be done to increase students' interest in chemistry learning and also to train students' critical thinking skill is apply a learning model that is able to motivate students and guide students to think critically. Learning model that can be used to train students' critical thinking skills is a model of learning in accordance with the characteristics of matter of chemistry, especially in the subject of the reaction rate.

Cooperative learning model is a model of learning that is widely used, to be a concern and recommended by educational experts [9]. One of the learning model that is expected to be able to train critical thinking skill in reaction rate material is cooperative learning model type Group Investigation (GI). This is supported by the result

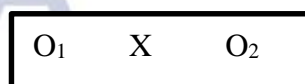
of the research found that the cooperative learning model type Group Investigation (GI) can empower students' thinking skills in conceptual mastery [10]. The cooperative learning model of Group Investigation (GI) involves many students during the learning process to discover the concepts taught themselves, so that students can acquire knowledge and build concepts uniquely as they will find themselves.

The cooperative learning model of Group Investigation (GI) consists of six stages including: grouping, planning, investigation, organizing, presenting, and evaluating [11]. The cooperative learning model of Group Investigation (GI) corresponds to the characteristics of subject matter of reaction rate which consists of sub-subjects that involve an inquiry, providing a meaningful learning experience and characterized by scientific processes. In addition, the cooperative learning model of Group Investigation (GI) provides an opportunity for students to determine their own problems and demand students to seek solutions through systematic steps, so that through this process the students' ability to think critically will be trained.

The students' critical thinking skills that trained is only three indicators of Facione's opinion which include analysis, interpretation, and inference because they correspond to the characteristics of reaction rate material that require students to weigh facts and produce conclusions based on information provided through proof. These critical thinking indicators can be trained in Phases I through Phase VI of the Group Investigation cooperative learning model.

METHOD

Target of this research is student of class XI MIPA 6 SMA Negeri 1 Manyar. The design of this research is One group Pretest Posttest Design. The design is as follows:



Description:

O₁: pretest to know students' critical thinking skills before implemented cooperative learning model of Group Investigation type

O₂: posttest to know students' critical thinking skill after implemented cooperative learning model of Group Investigation type

X: implementation of cooperative learning model of Group Investigation type on subject matter of reaction rate.

Learning devices used in this study include: (1) Syllabus; (2) Lesson Plan; (3) students worksheet. The worksheet used in this research is adapted from Rohaniyah & Azizah [12]. The research instruments used are: (1) Activity gaze of cooperative learning model of Group Investigation type; (2) Sheet of critical thinking skills test.

Data collection methods used in this study are the method of observation and test. Observation method is used to observe the implementation of cooperative learning model of Group Investigation type. The test method is used to know students' critical thinking skill after applying cooperative learning model of Group Investigation type on reaction rate material. This test is given before and after the learning.

The study was conducted two times. The first and second meetings are used to implement the cooperative learning model of Group Investigation type to trained students' critical thinking skills using students worksheet that oriented critical thinking skills. Data analysis technique used is descriptive quantitative analysis.

RESULT AND DISCUSSION

The results of the implementation of cooperative learning model of Group Investigation on reaction rate material are as follows:

Implementation of Cooperative Learning Model of Group Investigation (GI) Type

The implementation of cooperative learning model of Group Investigation is observed by three observers by using observation sheet of the implementation of cooperative learning model of Group Investigation. The following table shows the implementation of the cooperative learning model of Group Investigation's syntax for two meetings:

Aspects that are observed	Implementation			
	Meet I (%)	Cri	Meet II (%)	Cri
Phase 1	75	G	100	G
Phase 2	100	VG	91,67	VG
Phase 3 (Stage 1, Stage 2)	75	G	100	VG
Phase 4 (Stage 3,	100	VG	91,67	VG

Aspects that are observed	Implementation			
	Meet I (%)	Cri	Meet II (%)	Cri
Stage 4, Stage 5)				
Phase 5 (Stage 6)	100	VG	100	VG

Table 1. Implementation of cooperative learning model of Group Investigation' Syntax

Description:

Meet : meeting G : Good
Cri : criteria VG : Very good

Based on table 1, it can be seen that the teacher executes the syntax of learning with good and very good criteria obtained by the average percentage in each phase in two meetings. Percentage average of implementation in phase 1 (Explaining Objectives and Opening Lessons) was 87.5%; phase 2 (Present Information) of 95.84%; phase 3 (Arranging Students into the Learning Team) containing stage 1 (Identifying Topics and Adjusting Students into Groups) and Stage 2 (Planning a Lesson to Be Learned) of 87.5%; Phase 4 (Assisting Team Work and Study) containing step 3 (Investigate), stage 4 (Preparing Final Report), and stage 5 (Presenting the Final Report) of 95.84%; phase 5 (Trial of Material) containing stage 6 (Evaluation) of Group Investigation of 100%.

Phase 6 of cooperative learning is giving rewards. Awarding aims to provide feedback to students for their cooperation that has been done which is expected to be a motivation for students to learn. Awarding in this study was conducted outside the hours after the posttest score of students' critical thinking skills was obtained.

Cooperative learning model of Group Investigation type is a learning model that has many enough learning stages so that required a good time management in the implementation. At the first meeting, the teacher was slightly in hurry delivering the explanation because the learning was done in the first hour where in the first hour there was a literacy activity required by the school to be done by all of the students so that the time of effective learning is reduced because the teacher has to wait for students to be ready to start learning. The second meeting was held during the third hour so that when the teacher entered the classroom, all the students were already in the classroom to begin the lesson.

Critical Thinking Skill

Critical thinking skills of students are known from the tests with reference to the indicators of critical thinking namely interpretation, analysis, and inference. The tests performed are pretest and posttest. The problem used to assess students' critical thinking skills is in the form of a description. Each of these critical thinking skill indicators has been improved by the pretest and posttest of critical thinking skills conducted before and after the implementation of cooperative learning model of Group Investigation type. The improvement of each indicator of critical thinking skill that trained can be seen in Figure 1.

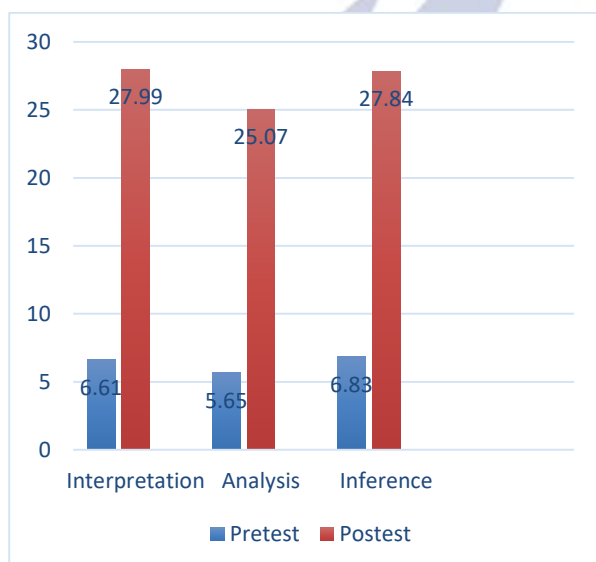


Figure 1. Percentage improvement of Pretest and Posttest Student Critical Thinking Skills

Based on Figure 1, the critical thinking skills on each indicator that was trained during two meetings increased. The highest increasing occurred in the critical thinking skill indicator of interpretation, the improvement from the pretest and posttest results that have been done is 27.99% followed by the increasing of critical thinking skill indicator of inference that is equal to 27.84%. While critical thinking skills on the analysis indicator had the lowest increasing among the three indicators of critical thinking skills trained, which amounted to 25.07%.

The students' ability of interpretation can be seen when students answer questions relating to make problem formulas and determine variables. The pretest result shows that all students have not been able to make the problem formulation and determine the variable exactly because the

student's answer does not cover the three criteria in the formulation of the problem and the determination of the variable. This can happen because students have not had the knowledge of how to make formulating problem and determine the variables appropriately. The improvement of students' ability in interpretation occurs when was done posttest after implementing cooperative learning model of Group Investigation type. Posttest results show that all students have good progress, meaning that all students experience improvement in making problem formulation and determine the variables. This can happen because during the learning, students were trained to formulate the problem and determine the variables correctly through the provision of students worksheet which was done in groups with teacher's guidance. This is in accordance with the theory of constructivism which assumes that knowledge is the construction of knowing something. The constructivist approach in cooperative teaching is broadly based on the theory that students find it easier to understand and understand difficult concepts if they discuss each other with their peers [13].

The students' ability of analysis can be seen when students analyze the data presented in the phenomenon. The pretest results show that students' analytical skills are still very low. Students have not been able to analyze the data correctly because the students' answers do not cover the three criterias in making the analysis. This can happen because students have not had the knowledge of how to analyze data well. However, after the learning process, students' analysis skills increases, it can be seen from the posttest result of students' critical thinking skill in which each student has a good progress improvement in answering the problem related to analyzing the data. This can happen because during the learning process, students are trained to analyze the data well through the provision of questions in the students worksheet to encourage students to find explanations which was done in groups with the guidance of teachers. The teacher applies the scaffolding process in helping the student to direct the answers to the questions given to the worksheet. The teacher's assistance aims to achieve Zone of Proximal Development (ZPD). ZPD is a zone where a child can not do something on his own but requires the help of a group or an adult [14].

The students' ability of inference can be seen when students answer questions related to constructing hypotheses and making conclusions. The pretest results show that students' inference ability is still very low. Students have not been able to construct hypotheses and make conclusions appropriately because students' answers do not include all three criterias in constructing hypotheses and making conclusions. This can happen because students have no knowledge about how to construct hypotheses and make a good conclusion. After the learning, the students' ability of inference increases which can be seen from the improvement of posttest value of the students which is higher than the pretest value of the students. This improvement can occur because during the learning took place, students were trained to make inference through the provision of worksheet which was done in groups with teacher guidance.

The following figure 2 is a major improvement of students' critical thinking skills so that able to know the success of training critical thinking skills with the implementation of cooperative learning model of Group Investigation on reaction rate material.

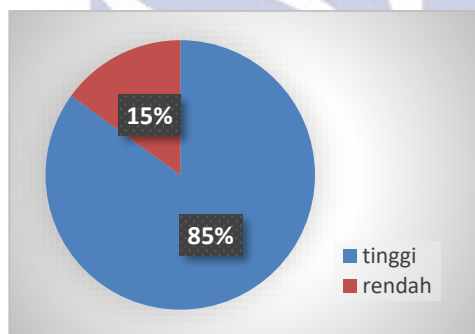


Figure 2. The Improvement of Students' Critical Thinking Skills

Based on Figure 2 above, critical thinking skills are successfully trained with the increasing in posttest value. an increase with high criteria of 85% and a moderate increase of 15%. The existence of the N-gain category differences from the pretest and posttest results that have been made is due to individual differences in the progress of development on each learning undertaken. The process of training critical thinking skills is only done in 2 meetings, so students are poorly trained in critical thinking skills. Piaget stated that all students grew and passed the same developmental sequence, but the growth took place at different

speeds [15]. Therefore teachers should not assume the ability to manage each student's information equally but teachers should compare students as different individuals and understand the differences between each student.

Nevertheless, overall the students' pretest and posttest values are increased per item of questions. In general it can be stated that the implementation of cooperative learning model of Group Investigation type on the material of factors that affect the reaction rate can improve students' critical thinking skill which consists of formulating the problem, constructing hypothesis, identifying variables, collecting data, analyzing data, and concluding. The success of this critical thinking skill enhancement was observed from the gain of N-gain where the accumulation of N-gain score was in medium and high category $\geq 61\%$.

CLOSURE

Conclusion

Based on the results and discussion, it can be concluded that: (1) The implementation of cooperative learning model type Group Investigation is in good and very good category with percentage in every phase is: in phase 1 was 87.5%; phase 2 was 95.84%; phase 3 which contains stage 1 and stage 2 of the Group Investigation was 87.5%; Phase 4 which contains stage 3, stage 4, and stage 5 of the Group Investigation was 95.84%; phase 5 which contains stage 6 of Group Investigation was 100%; (2) Student's critical thinking skill in terms of N-gain shows that 85% of students get high N-gain category and 15% of students get N-gain in medium category.

Suggestion

1. Teachers should be able to manage the time as efficiently as possible because cooperative learning model of Group Investigation type has a fairly complex learning stages.
2. The critical thinking skills trained in this study cover only three indicators of critical thinking skills according to Facionne, namely interpretation, analysis, and inference so that needed other researches that can trace the indicator of other critical thinking skills.

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