

**IMPLEMENTATION OF BRAINSTORMING BASED ON LEARNING CYCLE 5-E
MODEL TO COMPLETE STUDENT LEARNING OUTCOME OF X-SCIENCE
STUDENTS ON THE MATERIAL OF ELECTROLYTE AND
NONELECTROLYTE SOLUTION IN SMAN 1 SIDOARJO**

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Abstract

This research aims to describe the learning implementation and student activity during the implementation of Brainstorming based on Learning Cycle 5-E model, and student learning outcome mastery after the implementation of Brainstorming based on Learning Cycle 5-E model on the material Electrolyte and Nonelectrolyte Solution. Type of this research was pre-experiment research with used "One-Group Pretest-Posttest Design". The subjects of this research were students of class X-Science SMAN 1 Sidoarjo academic year 2017-2018 which amounted to 36 students. The results of this research indicate that the implementation of Brainstorming based on Learning Cycle 5-E model was very good with average quality on the first meeting of 3.63 (very good) and the second meeting of 3.83 (very good). Percentage of students activity time that spent on Brainstorming activities was 22.5%, 70% relevant activities and 7.5% non-relevant activities. Students' learning outcomes before being treated (pretest) on the materials of Electrolyte and Nonelectrolyte Solutions are 0% to achieve individual mastery, but the learning result after being treated (posttest) on Electrolyte and Nonelectrolyte Solutions has reached 100% classical mastery. Thus, the implementation of Brainstorming based on Learning Cycle 5-E model can mastery student learning outcomes on the Electrolyte and Nonelectrolyte Solutions material.

Keywords: Learning Cycle 5-E, Brainstorming, Learning Outcome.

INTRODUCTION

Based on the learning expected in the 2013 curriculum, students are directed to find the concept. One of the chemical learning materials that is closely related to daily life is Electrolyte and Nonelectrolyte Solution material. Basic competence for Electrolyte and Nonelectrolyte Solution materials in the syllabus that attached to Kemendikbud 2016 is to analyze the properties of the solution based on their electrical conductivity and distinguishing the electrical conductivity of various solutions through experimental design.

The statement based on the results of pre-research questionnaire on November 24th 2017 in SMAN 1 Sidoarjo, sampling of X and XI science students of science class stated that the method of chemistry learning model in the classroom by listening to the explanation from the teacher. Its mean that the learning model on class still use teacher-centered approach. The results are not in line with the goal of Permendikbud number 69 of 2013 which states that teacher-centered become student-centered approach. Students are expected to become active so they are able to interest in learning and indirectly they understand the concept and its relation with the aspects of daily life.

The result of pre-research also stated that 60% of students of X-6 science SMAN 1 Sidoarjo says that the material of Electrolyte and Nonelectrolyte Solution is quite difficult. The condition shows that the concept that has been given still can not be mastered and understood by the students well. This is supported by the research of Hardiyanti (2014), the average of student learning outcomes of science class in SMAN 10 Jambi academic year 2012/2013 on the material of Electrolyte and Nonelectrolyte Solution only 60.71. Its mean student learning outcomes still get the learning outcome under the standard set by the school [1].

Learning outcomes can be interpreted as the maximum score that achieved by students after doing the process learning in certain subject matter. In this material, students of X science SMAN 1 Sidoarjo were said to complete individual mastery if the value of posttest was greater than or equal to minimum mastery criteria. The minimum mastery criteria is the learning completeness criteria determined by the educational unit that refers to the standard of graduation competency, taking into account the characteristics of the students, the characteristics of the subject, and the condition of

the educational unit [2]. The minimum mastery criteria in SMAN 1 Sidoarjo for chemistry subject is 75. Students were said to complete individual mastery on the material of Electrolyte and Nonelectrolyte Solution if can reach or exceed to minimum mastery criteria. It is certainly need an appropriate approach so that students are motivated to learn. Student-centered approaches are better than teacher-centered approaches. One of the student-centered approach is a constructivist approach [3].

The constructivist approach is one of the learning theories that demands an active role of the students in the process. Active role of students include understanding, ability, values, attitudes and interests of a subject matter. Learning based on constructivist theory research aims to form a good mindset, in the sense of student thinking can be used to analyze a problem, and find solutions in overcoming the problem [4]. One of the learning models developed based on constructivist theory is Learning Cycle model.

Learning Cycle model is an learning model that provides convenience for the mastery of new concepts and to reorganize students' knowledge [5]. The five phases of the Learning Cycle learning model consist of engagement, exploration, explanation, elaboration / extention, and evaluation.

The advantages of Learning Cycle 5-E model are: giving motivation to students to be more active and adding curiosity, training students to discover concepts through experimental activities, can provide full opportunities for students to express skills to create their own developing process of thinking, and training students to orally deliver the learned concepts. But when in the classroom, often found the active students in it only a few. A method is needed so that other passive students can actively contribute their concept/idea. One method that can be used is Brainstorming method.

Brainstorming is a simple discussion activity by discussing facts with the aim of building ideas that can used to cultivate a problem, at the same time each student releases the ideas, shares the idea, and accepts new ideas [6].

The purpose of Brainstorming activity is to help unify the different ideas of each student to create a conclusion to answer the problems presented [7]. In carrying out Brainstorming activities, all students participate actively to answer a problem. Students not only express ideas but also listen to ideas posed by other students, so there are any communication involved between students. These goals are in line with what is expected in the

2013 curriculum that directs students to discover their own knowledge.

The aim of Brainstorming-based on Learning Cycle 5-E model is to make the students more interested to pay attention to chemistry lessons especially on the material of Electrolyte and Nonelectrolyte Solution so that students can more easily understand the material learned that later impact on the achievement of the students' learning outcomes.

METHOD

This type of research is a quantitative descriptive study of pre-experiment design or the experiment characterized by a deliberately and systematically designed treatment to know the changes that occur because of the treatment. The target of this research is the students of class X science SMAN 1 Sidoarjo (without any comparison class) in academic year 2017-2018.

The research design that will be used in this research is "One-Group Pretest-Posttest Design". Researchers carry out pretest (preliminary test) to determine the initial condition of students before giving treatment. Then performed a treatment and ended with a posttest (final test) used as a result of student learning.

Students were said to complete classical mastery if there are at least 75% of students in the class that reach the completeness of the individual mastery [8]. While the individual completeness is obtained if student learning outcomes (posttest) is greater or equal to 75 (The minimum mastery criteria in SMAN 1 Sidoarjo for chemistry subject is 75).

RESULTS AND DISCUSSIONS

The Implementation of Brainstorming based On Learning Cycle 5-E model

The implementation data of Brainstorming based on Learning Cycle 5-E model is the result of the assessment on the teacher's ability to run the syntax. The result of the implementation data of of Brainstorming based on Learning Cycle 5-E model can be observed in Table 1.

Table 1 The Implementation of Brainstorming based on Learning Cycle 5-E model

Activity	Implementation quality	
	1 st meeting	2 nd meeting
Introduction	4.00 (Very good)	4.00 (Very good)
Engagement Phase	3.67 (Very good)	3.80 (Very good)

Activity	Implementation quality	
	1 st meeting	2 nd meeting
Brainstorming	3.61 (Very good)	3.86 (Very good)
Exploration Phase	3.28 (Very good)	3.85 (Very good)
Explanation Phase	3.63 (Very good)	3.50 (Very good)
Elaboration Phase	3.33 (Very good)	3.67 (Very good)
Evaluation Phase	3.50 (Very good)	4.00 (Very good)
Closure	4.00 (Very good)	4.00 (Very good)
<i>Average of overall learning process</i>	3.63 (Very good)	3.83 (Very good)

On the introduction activity both of the meetings have very good category. At the 1st meeting, the introduction included pretest to show the student's initial ability before being given treatment. Pretest students indicate 100% of the student's grades are still below the minimum mastery criteria. It can be assumed that the students have not received the previous treatment so that the posttest value will actually be the result of Brainstorming based on Learning Cycle 5-E model.

Engagement phase, for both meetings have a very good category. Teacher giving some questions that related to the previously learned material. After that teachers direct students' answers in order to relate them to the material that will be learned today with facilitating students to found initial knowledge through a phenomenon that related to Electrolyte and Nonelectrolyte Solutions in daily life. Students are given 3 minutes to think about the idea/answer of the phenomenon. However, before students answer the question verbally, the teacher introduces students to the Brainstorming method and its rules. Afterwards, the teacher gives worksheet to the students to write their ideas/answers on the places that have been provided on it before speak. Once written, the newly called students are invited to answer the questions and when students are suggesting their ideas, other friends are trained to indirectly criticize them first so that students are not afraid of their answers and the teacher is not allowed to argue directly because of the teacher's role is as moderator.

After all students have successfully argued, the teacher opens a response session. At the 1st meeting there were 6 students and the 2nd meeting there were 7 students. From the results of the

response, finally students have successfully pursued the answers of the entire class so that it can be said that students have been able to evaluate the answers and opinions that have been collected. The results of both meetings were excellent categories. At 1st meeting there is little problem on the amount of time spent when students express their opinions verbally because the sequence of students who argue is based on the presence, while for the student seat location is not arranged so to record the ideas/ideas of students takes quite a long time. That's why in the 2nd meeting, the student's opinion sequence is according to order of his seat so that time spent on recording is not wasted much. Brainstorming activities for both meetings can be said to be well executed because the quality of the implementation score is more than 2.1 or is on very good criteria.

Exploration phase obtained both meetings have very good category. The 1st meeting, teacher leads students to practice reading procedures of experiment independently still not maximal because students are get used to be explained verbally. The 2nd meeting of the students has done the practice in accordance with the procedure independently without intervention by teacher because the tool that used has been studied at 1st meeting.

Explanation phase of the two meetings have a very good category, but when viewed from the average quality of the implementation there is any decrease in 1st meeting to 2nd meeting. It cause when students classify the solution into strong electrolyte and weak electrolyte solution, they are still confused between weak electrolytes with nonelectrolytes due to symptoms obtained from experiment results of weak electrolyte solution tests in some solutions such as symptom of nonelectrolyte solution that both can not light the lamp. However, the teacher's role in giving clarification succeeds in making them understand the difference between the three types of solutions even though it takes more time to have a discussion together.

The closing activity of both meetings has a very good category. 2nd Meeting, teacher giving posttest with keeping the class conducive. Afterwards the teacher gave the task to make a report experiment that they have done.

The average quality of all learning practices has a value of 3.63 in the first and 3.83 in the second meeting in the very best category. Its indicates that the teacher has implemented a very good learning management and syntax based on Brainstorming based on Learning Cycle 5-E model.

Student Activities

The observation of this student activity as a representation that the students have activity in accordance with the Brainstorming based on Learning Cycle 5-E model to complete the student's learning outcome on the Electrolyte and Nonelectrolyte Solution material X-1 science SMAN 1 Sidoarjo for 3x45 minutes. The observation result of this activity is the average percentage of time that students use for certain activities. Student activity during Learning Cycle 5-E process based on Brainstorming from beginning to end is presented in table 2.

Table 2 The average Percentage of Student Activity's Time

Students activity	Percentage of student activity's time (%)	
	1 st meeting	2 nd meeting
Pay attention to the teacher's explanation	3.12	2.5
Give idea/suggestion	13.75	9.38
Other students do not criticize the idea/suggestion of their friends	3.75	5.62
Conclude the idea/suggestion of their friends that has been collected	5	7.5
Work as teamwork to do experiment	25	25
Discuss with their teamwork	8.13	8.75
representatives communicate the results of the experiment with their own language	10	10
Answered the question	13.75	13.75
Communicate the conclusions to the material that has been discussed	10	10

Students activity	Percentage of student activity's time (%)	
	1 st meeting	2 nd meeting
Do irrelevant activities	7.5	7.5
Total of students activity's time (%)	100	100

Activities that reflect Engagement phase along with Brainstorming activities include students paying attention to teacher explanations, students suggest ideas / Brainstorming, other students do not criticize the ideas / opinions of friends and students summarize the ideas / opinions of friends who have been collected. Percentage of student activity time to pay attention to teacher's explanation of direction to leading Brainstorming activity decrease from 3.12% to 2.5%. However, it does not mean that the students do not pay attention to the teacher, but the time taken to provide clarification related to rules and Brainstorming mechanism is shorter because the students have understood it in the initial meeting so that at next meeting not spend much time.

Percentage of student activity to express ideas / suggestions also decreased from 13.75% to 9.38%. This happens because at meeting 1, time is spent by teachers to get around one student to another to record during the Brainstorming session because student seat is not arranged according to absentee while the order of Brainstorming is based on student absence number. At the next meeting the teacher replaced the student's Brainstorming sequence in line with the seating sequence to minimize the time so as not to be wasted.

Percentage of other student activity that is not being opinion increased from 3.75% to 5.62% not to criticize the idea / opinion of his friend who was of opinion not to turn off the idea / opinion of his friend. This may mean that students have been trained not to refute an opinion when other students are arguing. Percentage of student activity to conclude the ideas / opinions of friends who have accumulated increased from 5% to 7.5%. At the 1st meeting there were 6 students and 2nd meeting there were 7 students.

The percentage of irrelevant activity also does not increase and decrease as the amount of irrelevant time is equally spent more on moving from class to chemical lab. Overall it can be explained that at 1st and 2nd meetings, the percentage of time the activities of students are

more spent on relevant activities compared with activities that are irrelevant so that it can be interpreted that the student activity can be said to run well.

Activities undertaken by students play a major role in determining student learning outcomes. There are five categories of learning outcomes, namely verbal information, intellectual skills, cognitive strategies, attitudes and skills [9]. So that learning outcomes do not rely on intellectual ability alone, but also obtained from the skills obtained by students through a series of optimal teaching and learning process.

Student Learning Outcome

Student learning outcomes on individual cognitive domains were obtained from posttest results conducted at the last meeting. Student's learning outcomes are said to be thorough when they have reached classical mastery. Classical mastery is when at least 75% of students have completed individually on the minimum mastery criteria. Mastering student learning outcomes is closely related to the efficiency of the learning model undertaken by the teacher. The affect of learning method on student learning motivation as much as 34%. Student learning motivation means generating interest in themselves to understand the concept well and correctly [10]. Raising the students' interest in Learning Cycle model is the goal of the Engagement phase, the students are conditioned in taking the next phase by exploring their initial knowledge and ideas and to find out the possibility of misconceptions in previous learning such as ionic and covalent bonds concept.

In the Engagement phase students' interest and curiosity about the topic to be taught seeks trying to be raised through the phenomenon of electrolyte and nonelectrolyte solutions in daily life such as the phenomenon of power outage in the flooded areas and the reason isotonic drinks can be examples of electrolyte solutions. To train students to be actively involved in the classroom, in this phase students are introduced to the Brainstorming method. The workings of this Brainstorming itself are almost identical to the discussion activity but the difference is when there are students who are arguing, other students are not allowed to directly respond/blame the opinion, but it will be given time when all students have succeeded in arguing. It is important to do so in order not to turn off the idea of students as well as to build student confidence so they are not afraid to give the opinion in the classroom later that can minimize the possibility of misconception.

The next phase is Exploration phase, where students are invited to do practice of electrolyte and nonelectrolyte solutions test together with their group without direct instruction from the teacher. this phase is in accordance with the goal of Permendikbud number 69 of 2013 which states that teacher-centered learning become student-centered learning. Students are expected to passively become active students [11]. In this phase the role of the teacher only as a facilitator so that whatever the outcome of the discussion is the pure result of the group.

To prove the truth of the practice results and avoid the incorrect concept, in the Explanation phase, the results of the student practice are presented in front of the class. When students classify the solutions into strong and weak electrolyte solutions, they are still confused between weak electrolytes and nonelectrolytes because the symptoms obtained from the practical test of weak electrolyte solutions in some solutions such as the symptoms of nonelectrolyte solution are equally unable to light the lamp. However, the teacher's role in providing clarification succeeds to make them understand the difference between the three types of solutions even though it takes more time to have a discussion together.

The Elaboration is given so that the students more explore the material of electrolyte and nonelectrolyte solution with given many questions about the practice contained in the worksheet. Evaluation phase is where students are invited to do Q and A (question and answer) so that teachers can predict how far the student's understanding the material so that students will not take the incorrect concept until posttest because it will affect student learning outcomes.

There are 36/36 students have achieved individual completeness for posttest result of material of Electrolyte and Nonelectrolyte Solution with 100% classical mastery completeness that means student's learning outcome can be finished thoroughly. Student learning outcomes that have been obtained from the posttest at the end of this meeting indicate that the Brainstorming based Learning Cycle 5-E model can facilitate students in completing student learning outcomes. To strengthen it at the first meeting has been inserted with pretest activities. At the beginning of the activity to demonstrate the student's initial ability before being given treatment. Pretest students indicate 100% of the student's grades are still below the minimum mastery criteria. It can be assumed that the students have not received any previous treatment so the posttest value is really the result of

Brainstorming based Learning Cycle 5-E model. Learning outcomes are the abilities that students get after learning activities. So it can be concluded, with the learning outcomes, we know how far student can catch, understand, and have certain subject matter [12].

CLOSURE

Conclusion

Based on the formulation of problems and the results of discussion above, it can be concluded that:

1. The implementation of Brainstorming based on Learning Cycle 5-E model to complete the learning outcomes of the Electrolyte and Nonelectrolyte Solution material overall at the 1st and 2nd meetings got the score greater than 2.1 with the average quality of the 1st meeting of 3.64 (very good) and the 2nd meeting was 3.88 (very good). This indicates that the teacher has done the learning process well.
2. The student activity of X science during the implementation of Brainstorming based on Learning Cycle 5-E model on the Electrolyte and Nonelectrolyte Solution material went well. Percentage of students activity time that spent on Brainstorming activities was 22.5%, 70% relevant activities and 7.5% non-relevant activities. it indicate that relevant activity is the dominant activity during the learning process. so it can be interpreted that the student have been active and study the material of Electrolyte and Nonelectrolyte Solution with implementation of Brainstorming based on Learning Cycle 5-E model well.
3. Student's learning outcomes before being treated (pretest) on the materials of Electrolyte and Nonelectrolyte Solutions are 0% to achieve individual mastery, but the learning result after being treated (posttest) on Electrolyte and Nonelectrolyte Solutions has reached 100% classical mastery. It can be interpreted that Brainstorming based on Learning Cycle 5-E model can complete student learning outcomes on Electrolyte and Nonelectrolyte Solution materials.

Suggestion

Based on the research that has been done, as for the proposed suggestion is:

1. Preparation and allocation for the time of Brainstorming sessions are more perfect so it will not wasting time during the process of

recording. It is better for teachers to arrange the student's seating positions in advance so that access to record from one student to another does not take much time.

2. In the next study is expected to Brainstorming based on Learning Cycle 5-E model can be developed again to train other student skills.

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