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Enhancing Scientific Process Skill forColloid Material through Free Experiment Using Micro scale(A Study on the Eleventh Grade Students of Science Program at SMAN 7 Malang)

[1)] Hairil Anwar, [2)] Budi Eko Soetjipto
1) Teacher at SMA Negeri 7 Malang
2) Corespondence author, budi.eko.fe@um.ac.idUniversitas Negeri Malang

Abstract:*Based on the analysis of daily tests for colloid chemistry subject that has been made by a chemistry teacher at SMAN 7 Malang, the eleventh grade students still have unsatisfactory learning achievement. Another problem faced by the chemistry teacher is the student's skills in using the tools of simple laboratory practices that are still heterogeneous. To solve these problems, the researcher needs a proper approach to learning so that students are interested and excited to learn. The learning approach uses free experimental methods using micro scale givethe students chance to try, do, follow the process, observe an object, analyze, demonstrate, and draw conclusion by themselves according to the indicators requested in process skills. This study aims to increase students 'scientific processing skill through free experiment using micro scalemethod.This type of research is the Classroom Action Research (CAR) in which its implementation through two cycles. Subjects in this study are the eleventh grade students of science program of SMAN 7 Malang in academic year of 2013/2014 which amounted to 31 people. This study found that the use of free experiment usingmicro scale method can improve students' science process skills. This can be seen in the increase in the acquisition score of the average score of cognitive and psychomotor science process skills from the first cycle to the second cycle. The average score of cognitive science process skills daily test results (post-test) further increased and the average score of science process skills Psychomotor Practice Exams (response) reached 87.08 and is expressed by the predicate Good (B). Likewise, the use of micro scale free experimental method can improve students' responses. It can be seen at the end of the second cycle of learning, almost all students (94%) expressed pleasure, the subject matter of colloid easily understood, motivated to learn, and can work with a friend in the study group.*

Keywords: *Scientific Processing Skill, Free experiment using micro scale Method, Colloid*

I. Background

Quality learning should be able to implement in any kind of subjectas well as for chemistry. Chemistry learning activity should be conducted through skill processing which can be seenin the lesson planby considering the characteristics of standard competence, basic competence, students' potential, andenvironment.Based on the results of Chemistry daily tests and unstructured interviews with students, the conclusion stated that most of the eleventh graders of science at SMAN 7 Malang consider the chemistry is a difficult subject. The results of the analysis of daily tests on colloid chemistry still unsatisfactory.Another problem faced by chemistry teacher is that the students lack of processing skills. For example: teacher found students who used a pipette without being washed after use, 3) wash equipment in less clean and negligence for the damaged or broken, 4) weak record observation data, 5) difficult to classify the data and 6) constrained to communicate the results of experiments.

Based on this fact, chemistry teacher (researcher) is trying to resolve these issues by implementingfree experimental method. In this method, students are given the opportunity to try, do, follow the process, observe an object, analyze, demonstrate, and draw their own conclusions, according to the indicators requested in process skills. Thisfree experiment using micro scale method can be designed by the teacher. In addition, the school has a large number of classrooms that can be done individually, can be repeated, and will be able to improve science process skills.The research focused on how the experimental method can improve science process skills, and students' responses on Colloid material.

II. Literature Review

ScientificallyProcessing Skills

Scientifically process skills approach in learning is a learning approach that gives students the chance to actually act as a scientist. With the implementation of the process approach to skills students are expected to arranging formulation of the problem, formulate hypothesis, specify independent variable, response variable,

control variable, writing tools and materials, arranging working procedure, interpreting the data, drawing conclusions and communicating findings.

Colloid Materials and Free experiment using micro scale

Colloid is a form of a mixture whose state lies between the solution and the suspension or coarse mixture. Examples of colloidal often can be seenevery day is milk, coconut milk, smoke, paint, jelly, fog, and others. This method is an experimental method that gives students the chance to design their own research without much influenced by the direction of the teacher, plan an activity for the procedure followed in the experiment, use chemicals in small quantities and using simple equipment, and without compromising the essence of the experiment. Learning activities includes introduction activity and core activities (exploring/digging up information): 1) students read a chemistry book, discussing and designing free experiments through the following steps:formulating, problems, formulating hypothesis, defining variables, determining the tools and materials, writing a sequence of steps by means of experimental work sheets for student discussion, 2) each group presents the formulation problem and hypothesis to teachers; 3) one of the groups of students communicating the results, students of other groups can ask questions and provide input; 4) together with the group, student do free experiments that have been revised, enhanced, adapted to an approved laboratory facilities and teachers; and 5) each group of students write data from free experiment.

Next, together with his/her group, students discussing the interpretation of free experiment using micro scale data and draw conclusions, students in each group concluded free experiment using micro scale, students discuss and ask for things that are not yet understood, and closing activities (arranging learning conclusion).

III. Research Method

This type of research is the Classroom Action Research (CAR) which is part of the action research. CAR design refers to the Model of Kemmis and M.C. Taggart (1988) which stated that there are four components in CAR, including planning, action, observation, and reflection.

The study took place at SMA Negeri 7 Malang and held on in the academic year of 2013/2014. The subjects were the eleventh grade students of science1 consisting of 31 people: 21 females and 10 males. Data are collected using 1) performance evaluation, 2) observation, 3) interviews, 4) reflecting the observer, 5) test, and 6) practice exams. While the data collection tools used are: cognitive evaluation sheet, psychomotor evaluation sheets, observer observation sheets, interview sheets, evaluation test sheet, and practice test sheets (response).

IV. Research Findings

According to the explanation that has been presented in research procedure on colloid learning through free experiment using micro scale method, it gained the following results:The meanscore for cognitive skill for scientific process in cycle I andcycle II in detail can be seen in table 1below.

Table 1: mean score for cognitive skill in cycle I andcycle II

NO	Aspect of Scientifically Process	Cycle I		Cycle II		Increase
		Score	Predicate	Score	Predicate	
1	Arranging Questions	70.80	C	92.71	**A**	21.91
2	Arranging Hypothesis	61.42	**C**	86.67	**B**	25.25
3	Arranging Independent Variable	72.50	**C**	94.17	**A**	21.67
4	Arranging Response Variable	76.87	**B**	99.79	**A**	22.92
5	Arranging Control Variable	70.34	**C**	82.50	**B**	12.16
6	Writing Tools and Material	68.91	**C**	87.08	**B**	18.17
7	Arranging Working Procedure	60.08	**C**	74.17	**C**	14.09
8	Data Interpretation	59.27	**D**	81.67	**B**	22.40
9	Drawing Conclusion	51.58	**D**	77.92	**B**	26.34
Mean Score		**65.75**	**C**	86.16	**B**	20.41

Description: Predicate A = Very Good (91- 100), B = Good (75- 90), C = Good Enough (60- 74), D = Poor (40- 59), E = Fail (< 40).

The mean psychomotor score incycle Iandcycle II can be seen in Table 2below:

Table2: The Mean ofPsychomotor Score in Cycle IandCycle II

NO	Psychomotor Aspect	Cycle I		Cycle II		Increase
		Score	Predicate	Score	Predicate	
1	Preparing and choosing the tools	87.56	**B**	92.42	**A**	4.86
2	Preparing the material	85.95	**B**	86.67	**B**	0.72
3	Cleaning the tools before conducting research	55.72	**D**	74.56	**B**	18.84
4	Cleaning the tools after conducting research	89.31	**B**	85.00	**B**	-4.31
5	How to use pipette	81.45	**B**	81.25	**B**	-0.20

6	How to measure liquid volume	79.88	**B**	82.50	**B**	2.62
7	How to pour liquid	87.50	**B**	89.17	**B**	1.67
8	How to heat up the liquid	82.26	**B**			
9	How to measure the liquid temperature	74.19	**C**			
10	How to observe E. Tyndall	99.17	**A**			
11	How to measure the material	83.06	**B**			
12	Measuring when there is no Coagulation/Emulsion			85.42		
Mean		**82.37**	**B**	**84.64**	**B**	2.27

Description: Predicate A = Very Good (91- 100), B = Good (75- 90), C = Good Enough (60- 74), D = Poor (40- 59), E = Fail(< 40).

The learning incycle Iwhich was held onJuly 22,2013 with the material as follows. 1) Creatingsolution $Fe(OH)_3$ solution, 2) creatingjelly solution,and3) colloid identification by using Tyndalleffect creating process and observation below:

No	**Reflection**	**Problem and Obstacle**	**Solution**
1	Teachers have made the learning process conductively, active and serious students in learning, there is interaction from students in one learning group, work harmoniously, clear job description	Students take longer time to arrange**:**Formulation of the Problem, Hypothesis, variable, working procedure on experiment.	Student are given the task to read and conclude the colloid characteristics that has been doneoutside learning hour
No	**Reflection**	**Problem and Obstacle**	**Solution**
2	The meanscorefor cognitive domain in Cycle Ionly achievepredicateof Good Enough(C),while data interpretation and drawing conclusion only get poor predicate (D).	There still students who get difficulty to arrange**:**Formulation of the Problem, Hypothesis, variable, working procedure on experiment.	Teachers should make copies of the step well, good cognitive evaluation rubric and psychomotor for all students
		Some students have not been skilful in data interpretation and drawing conclusion	Maximizing teachers' ability in making questions in order that students will easily develop the Formulation of the Problem, Hypothesis, variable, working procedure on experiment well and skilful in interpreting the data and drawing conclusion.
3	The mean for psychomotor skillincycle IisGood(B),yet, in cleaning up the tool before doing the lab work is still poor (D).	Each student in a group doesn't clean the tools before doing the lab work.	Teachers remind the students to clean the tools before doing the lab work.

Learning the in the cycle II which was started July 31, 2013 with the material: 1) Coagulation of Colloids and 2) Oil in Water Emulsion make the most of the students have adjusted to the circumstances of the demands of learning using the experimental method micro scale free. This is supported by the acquisition of the average score of Cognitive science process skills in experiments that increased from the first cycle to the second cycle which is equal to 20%. Similarly, the average score of the psychomotor science process skills has increased the score of the first cycle to the second cycle unit which is equal to 2:27.The increase in score is also strengthened by the acquisition of the average score of science process skills Psychomotor Practice Exams (The response) = 87.08 and is expressed by the predicate Good (B).

Increase in the average score of learning science process skills at the second cycle due to: 1) students are getting used to the mindset required in science process skills; 2) teachers put in writing rubric assessment of cognitive and psychomotor assessment rubric to students to serve as guidelines; 3) teachers put in writing the steps that true science process skills that have been discussed in the first cycle of learning for the student to be guided; and 4) the time required teachers to provide direction, explanation, and convey how to use the correct tools.

V. Discussion

Indications of learning successcan be explained as follows: cooperation between students in one study group and trained to think critically. Student learning success achieved in this study because it can create a sense of togetherness. Study together with a group can foster critical thinking skills for students thinking together so as to produce a lot of opinions. Thevarious opinions of these students will be selected for the best presented as an answer. Critical thinking is required in science process skills mainly to formulate the problem, hypothesis and define variables, and cannot be obtained in a short time during a lesson (instant), but must look for reference, first read, learn and understand, as well as intensify the learning by doing practice;b)the realization of high student motivation to learn. Learning using guided experiment makes the students have not been motivated to think creatively in doing experiments. This is where the need for teachers to develop freely micro scale experiments with train students to ask questions that allow answered by using experiments. In addition to design their own, students should be responsible for the design and the results of his experiments; c)high students' learning activities. Student activity is indispensable in learning activities because students will act as experiment in accordance with a predetermined topic and implement practices designed. High student activities make learning a heavy burden will be lighter, the material is easy to remember, and the difficulty can be reduced; d)high student discipline. This can occur because of high student willing to follow the learning colloid, think the method is interesting, a lot of work on positive things more easily understand the material, require accuracy, precision, and discipline. The success of free micro scale experiments must be preceded by a lot of discipline so that the process is easy and the next will take place in accordance with the planned program; e)students are more familiar with doing experiments intensively. Learning colloid by way of free micro scale experiments easier to understand, because the students determine which tools and materials, write the workings of his own for his experiments, so they are not bored, and easy to remember; and f) there have been efforts to improve the skills of the teachers' students. Efforts are: 1) the teachers prepare themselves optimally in serving Colloidal learning materials; 2) the teachers work with harmonious relationships in a way to serve students well and attentive; 3) the teacher creates a fun learning environment, such as providing tools and materials which can immediately be taken by a student or group for practice purposes.

At the beginning of the first cycle, a number of 71% eleventh grade students of science 1 at SMAN 7 Malang expressed fun and easy to learn colloids through free experiment using micro scale method and likewise at the end of the second cycle, 94% of students said the same thing. It can be concluded that almost all the students respond positively to the learning Colloid shown by the increasing students' response to the implementation of this learning through Free experiment using micro scale method.

The increase in this response as a result of curiosity practice results obtained from the experiments that have been designed. Curiosity is very close to the students' interest towards the lesson. An interest will increase the concentration of attention to the lesson. With interest,students can also generate excitement in learning effort. Excitement will increase the power capability of learning, and not easily be forgotten.

VI. Conclusion and Recommendation

From the overall discussion of this CAR can be summarized as follows: 1) the use of the free experiment using micro scale method can improve science process skills on colloidal material for the eleventh grade students of science program 1 at SMAN 7 Malang, 2) the use of the free experimental method micro scale smoking can increase response for eleventh grade students of science program 1 at SMAN 7 Malang on Colloid material.After looking at this learning process, the researcher recommend that: 1) colloid learning which usesfree experiment using micro scale method should be applied to the concept of other material or science learning with regard to the readiness of students, teachers, and supporting infrastructure which is owned by the school and 2) the implementation of the free experiment using micro scalemethod should be published by the teacher to get feedback from other communities such as science teachers, and MGMPs in Chemistry Education.

Reference

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