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Students' learning activities in mathematics learning using scientific approach in class XI MIA 4 of SMA Negeri 10 Yogyakarta

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ABSTRACT. Learning process of Kurikulum 2013 in Indonesia is implemented using scientific approach. SMA Negeri 10 Yogyakarta implements scientific approach in learning process since academic year of 2014/2015 when this research was done in class XI MIA 4. This research was a descriptive quantitative research and aimed to know the students' activities during the implementation of the scientific approach in mathematics learning using the topic of composition of functions. The results of this research showed that the students were quite active in the scientific approach which was use in the lesson, where overall average number of students who undertook observing activity was 95.88% being in the "very high" criteria, questioning activity was done by 54.64% of students being in the "sufficient" criteria, collecting information activity was done by 9.44% of students being in the "very low" criteria, associating activity was done by 72.66% of students being in the "high" criteria, and communicating activity was done by 53.55% of students being in the "sufficient" criteria.

1. Introduction

Most of the learning process problem is teacher-centered. The teacher has to determine materials and learning method. Meanwhile, students' learning activities are just taking a note, listening to the teacher's explanation and answering questions from the teacher. Thus, the learning process does not encourage students to think and do activities. Traditional approaches of science teaching are not successful for a large proportion of our students to understand conceptual, but a few research-based approaches that achieve much better learning such as scientific approach [6].

In Kurikulum 2013, students demanded more active, creative, and innovative in any problems solving that they find in the school. Kurikulum 2013 using scientific approach requires that students are do a series of steps in the learning activities starting from observing, questioning, collecting information, processing information until to communicating what they have observed and they earn [3]. In this learning process, students have to do variety of learning activities. So, they can realize to the stage of learning to communicate what they have acquired. Thus, the learning process change from the students who were told becomes finding out by themselves and the teacher as the only source of learning becomes a facilitator.

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So, students have to be actively involved in the learning process and they have to observe for themselves what they have to learn, not only listening but also reading and observing. In addition they also have to ask a question, whether to the teacher, to the friends or to the other sources in order, not only answered questions from the teacher. Questioning activity aims to collecting information and materials that are not or less they understand. Each student is also has to do mental activities by responding about questions from the teacher and friends, solve a given problem, analyzing the solving problem, make conclusions, and communicate the results of observation or conclusions that they earn. So the learning process will be students-centered.

Scientific theories seek to achieve a deep understanding of particular events or circumstances rather than theoretical understanding that will generalize across situations or events [5]. Thus, it is expected of each student is actively involved directly in the process of discover knowledge. Active learning can increase student performance in mathematics [1]. So, when the students get used with scientific approach in learning mathematics, they will be comfortable anyway to be active in learning process and increase their learning outcomes.

2. Research Method

Subjects of this research were the students in class XI MIA 4 of SMA Negeri 10 Yogyakarta consisting of 32 students. Objects of this research were the students' activities in mathematics learning using scientific approach in topic composition of function. This descriptive quantitative research was held in September 13, 2014 until October 11, 2014 with observation method and documentation method.

Observations were done three times. Data collecting by observation consisted of the observation of the student activity sheet by observers and observation of the student activity sheet by friend on the same table. The observation by observers was a nonparticipant observation and the observation by friend on the same table was a participant observation. There are 4 (four) observers who observed students' activities during the learning process. Two observers observed students who sat in the first and second columns. The other two observers observed students who sat in the third and fourth columns. The observer could be more focused to observe student activity because the number of observed students is not too many, which is about 16 students. Observation by friend on the same table was used as data triangulation if there are two observers who get different data.

Documentation methods used to amplify the data obtained from the results of observation is the video recording and photographs. Researches data was analyzed with counting the number of students who do activities of each item in accordance with aspect are observed. After that, counting the number of percentage score of each activity. The numbers of students who do activities on each indicator were determined using triangulation techniques [2]. The last is determining the overall student engagement criteria [4].

3. Results

Analysis of student learning activities are based on the number of students involved in the learning every indicator. The following is an indicator of student learning activities.

Table 1. Grating of student activity observation sheet

No	Step Learning Activities	Indicator	Item Number
1	Observing	Give attention to the explanation, observing	1, 2
2	Questioning	Asking question	6, 7
3	Collecting Information	Reading textbooks or instructional materials	3
4	Associating / Information Process /	Solve the problems, responds to questions or concerns, opinions, write up the results	4, 5, 8, 9, 10

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No	Step Learning Activities	Indicator	Item Number
	Reasoning	of work in the paper	
5	Communicating	Write up the results of work on the board, give attention to the presentation, responding to the presentation, write important material	11, 12, 13, 14

Based on the results of observations conducted by the observer during the three meetings following data is obtained shown in **Table 2**.

Table 2. The number of students involved in learning activities

No	Indicator	The number of students involved in meeting		
		1	2	3
1	Students give attention to the teacher's explanation	28	29	25
2	Students observing the problem or student activity sheets supplied	28	26	26
3	Students read textbooks or instructional materials related to the material provided	2	2	4
4	Students work on the given problem	28	27	28
5	Students respond to questions if there are questions from other students in the group	20	18	13
6	Students ask questions on other students in the group	21	23	16
7	Students ask questions to the teacher if there has problem	11	12	10
8	Student give opinion when a group discussion	18	21	12
9	Students give comment or feedback to the opinions of other students in the group	23	16	11
10	Students write up the result of the work on the sheet that has been provided	23	29	22
11	Students communicate the results of the lesson or discussion by writing (board) or in oral	4	5	13
12	Students give attention for the presentation of the other students or other groups	25	22	22
13	Students give feedback on the work of other students or other groups	5	7	3
14	Students write important matters concerning the material provided	20	28	28

The first meeting was attended by 28 students because there were 3 sick students and a student permitted. The second meeting was attended by 29 students because there were 2 sick students and a student permitted. Whereas at the third meeting was attended by 28 students because there were 2 sick students, a student permitted and a student without explanation.

The results of this research showed that the students were quite active in the scientific approach which was used in the mathematics learning because students needed an adjustment with a new learning approach. Furthermore, the teacher was still using lecture method to provide material and followed by exercises. So, students took a long time to find out about what is going to be studied by themselves from any sources such as textbooks, internet, and journal. Students' learning activities using scientific approach are observing, questioning, collecting information, associating, and communicating.

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3.1. Observing

In observing, everything is done by students with the aid of their senses and their mind in order to acquire or absorb information from outside. In the first meeting, average number of students who undertook observing activity was 100%. In the second meeting, average number of students who undertook observing activity was 96.55%. And the third meeting, average number of students who undertook observing activity was 91.09%.

The percentage has been decreased because in the second meeting and the third meeting there are members in several groups that were not complete. Then, it made students in group reluctant to do observing activity. Besides, discussion about previous materials in the second and the third meeting are not in accordance with the allocated time. Therefore, the observing activity conducted on the eve of break and after break. Thus, it made students less concentrate while in the observing activity.

In the implementation of mathematics learning, the observing activity undertook by students was a regular observation because the student is the subject of a fully observation, where students didn't get involved with subject, objects, or situations are observed. Students just observed the problems that exist on the student activity sheet. Meanwhile, based on how the involvement of self-observation of the students is a structured observation. It is caused of the subject, object, or situation they had observed was student activity sheet. Where, student activity sheet has been planned systematically guided by the teacher.

3.2. Questioning

Questioning activity is a follow-up of the observing activity stage. Questioning activity also developed curiosity of students. These questions form the basis of students to search for information. But, questions from student that posed to a friend in the group could not be known by the teacher. In the first meeting, average number of students who undertook questioning activity was 57.15%. In the second meeting, average number of students who undertook questioning activity was 60.35%. And the third meeting, average number of students who undertook questioning activity was 39.59%.

Questions asked by students to the teacher about the problems in student activity sheet such as "What is relation with composition of function?" and "What can be solved using the composition of function?" When students ask like that, the teacher returns the question to the whole class and guide students to solve using composition of function. When students ask "If there is an easier method, why we must solve it using composition of function?", the teacher tried to motivate students to find composition of function for solving the problems in daily activity. When students ask, "Is $(f\ o\ g)(x)$ is equal to$(g\ o\ f\ )(x)$?" the teacher encourage students to solve it first and give conclusion for their answer. Finally, students understood that $(f\ o\ g)(x) \neq (g\ o\ f)(x)$. Then students ask, "How to solve$(f\ o\ g\ o\ h)(x)$?" the teacher encourages students to solve composition of three functions use their knowledge when they are solving composition of two functions.

3.3. Collecting Information

Collecting information in this stage aims to solve or resolve the questions asked by the students to the information obtained or of the problems obtained. In the first meeting, average number of students who undertook collecting information activity was 7.14%. In the second meeting, average number of students who undertook collecting information activity was 6.90%. And the third meeting, average number of students who undertook collecting information activity was 14.29%.

This criterion was very low because students are too lazy to read the book. It caused the students always receiving formula (lesson) from the teacher or with guidance given by teacher. In addition, Kurikulum 2013 textbooks had not been distributed to this school. Thus, collecting information

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activity by the students in this class was read textbooks other sources, namely LKS because the students just had it. Actually library in this school also provide textbooks for subjects, but it must be returned after the study is finished due to the limited amount owned. However, if they borrow first semester mathematics textbooks for class XI, they will not find the material composition of function. It is because this materials contained in the second semester on the previous curriculum. Thus, if the students want to borrow a book they have to understand the material differences in Kurikulum 2013 and the previous curriculum.

There is only one indicator of the collecting information activity, so the results of this activity only depend on that indicator. Besides that, students may not be in communication with a resource person to collect information, because the teacher did not present a resource person in the learning process. This is because the material is not allowed to present a resource person. Conducted a trial was not possible in this study with the composition of function material, because it is difficult to conduct experiments related to the material.

3.4. Associating

Associating activity is processing the information was collected from the results of the observing activity and collecting information activity. This activity aims to find solutions from a variety of sources, to find information relation to one another with the information or find a pattern of this relation. This activity is also termed as the reasoning activity is the process of thinking logically and systematically to obtain a conclusion in the form of knowledge.

In the first meeting, average number of students who undertook associating activity was 80%. In the second meeting, average number of students who undertook associating activity was 76.55%. And the third meeting, average number of students who undertook associating activity was 61.43%.

In this activity aime to find a conclusion carried out together in a group. Processed information was done by the students with each other frequently questions and answers and exchanged opinions on the group. Reasoning activity in this research that students conduct systematic process of thinking and to solve problems in student activity sheet provided.

3.5. Communicating

In the first meeting, average number of students who undertook communicating activity was 48.26%. In the second meeting, average number of students who undertook communicating activity was 53.45%. And the third meeting, average number of students who undertook communicating activity was 58.93%. In this research, teacher always provide opportunities for students to communicate what they have done or learned.

In second meeting, communicating activity the results of the work group did not happen. This is because the discussion of homework takes a long time due to students are still waiting for each other friends in writing the results of students work on the board. However, students have communicated the results of their homework at the second meeting. At the third meeting, students have not been able to infer properties of composition of function because time of learning process was running out. Then, the teacher helped students to express some properties of composition of functions are communicative, associative, and the identity of the composition of function.

4. Conclusions

The results of this research showed that the students were quite active in the scientific approach which was use in the mathematics learning to the material of composition of functions. Overall students learning activities which includes the step of observing, questioning, associating, and communicating has been done by most students, except at the stage of collecting information. Where overall average

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number of students who undertook observing activity was 95.88% being in the "very high" criteria, questioning activity was done by 54.64% of students being in the "sufficient" criteria, collecting information activity was done by 9.44% of students being in the "very low" criteria, associating activity was done by 72.66% of students being in the "high" criteria, and communicating activity was done by 53.55% of students being in the "sufficient" criteria.

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