Mathematics learning activities of the acceleration class program of SMA Negeri 2 Purwokerto

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Abstract. Acceleration class program in Indonesia provides opportunities for gifted students to obtain educational services based upon their special abilities. SMA Negeri 2 Purwokerto is one of senior high school in Indonesia that implemented this program. This qualitative research was held to find out mathematics learning activities of acceleration class program, especially in exponents and logarithms learning of X Akselerasi, the tenth grade of this school's acceleration class program in academic year 2014/ 2015. Research results indicated that mathematics learning activities in X Akselerasi which implemented a scientific-approached curriculum named Kurikulum 2013 showed these five forms of scientific learning activity, i.e. observing, questioning, experimenting, associating, and communicating. We also could conclude from results that accelerated learning principles were shown by: (1) students' involvement in improving the learning, (2) learning activities were done by creating knowledge actively, (3) the collaboration among students in the learning, and activity-centered learning.

1. Introduction

There are several high schools in Indonesia that held acceleration class program and one of them is SMA Negeri 2 Purwokerto that is located in Banyumas, Central Java, Indonesia. Acceleration class program is an educational program in Indonesia that provides opportunities for gifted students to obtain educational services based upon their special abilities with accelerated learning. Scientific-approached curriculum named Kurikulum 2013 was implemented in mathematics learning held in SMA Negeri 2 Purwokerto. Mathematics learning with scientific approach also held in X Akselerasi, the tenth grade of the acceleration class program of SMA Negeri 2 Purwokerto in academic year 2014/2015, where this research was conducted. The aim of this research was to find out teacher's and students' mathematics learning activities of the acceleration class program. Subjects of this research were the mathematics teacher and 17 students of X Akselerasi.

The acceleration class program is one of educational service for students that have excellent intelligence potentials and gifts. Acceleration is educational service given based upon intelligence potential and excellent gift students have by giving opportunity to them to do regular program in a shorter time period than regular program students. This is a suitable program for accelerated learner type students [1]. The most out of using accelerated learning operate out of these following accelerated learning foundation principles [3]:
1.1. Learning involves the whole minds
1.2. Learning is creation, not consumption
1.3. Collaboration aids learning
1.4. Learning takes place on many levels simultaneously

1.5. Learning comes from doing the work itself (with feedback)
1.6. Positive emotions greatly improve learning
1.7. The image brain absorbs information instantly and automatically

The curriculum that was implemented in SMA Negeri 2 Purwokerto was scientific-approached curriculum named Kurikulum 2013. Scientific-approached learning activities forms are shown in Table 1 [2].

Table 1. Scientific-approached learning activities forms

Activities	Learning activities
Observing	Watching, observing, reading, listening (with or without device)
Questioning	Asking a question from the factual one to hypothetical one, started with the teacher guidance up to independently asking and be a habit
Experimenting	Determining needed data from asked question, determining data sources (object, document, book, experiment), gathering data
Associating	Analyzing data by making categories and determining data/ categories relations. Concluding from data analysis results, started from unstructured, unistructure, multistructure, up to complicated structure.
Communicating	Delivering conceptualization results in verbal, written, diagram, chart, image form or other medias.

Whereas, the teacher's activities in the learning process, i.e. [2]:
1.1. Providing learning sources
1.2. Encouraging students to interact with learning sources
1.3. Asking questions so that students could think their interaction results
1.4. Monitoring perceptions and thinking processes of students and giving scaffoldings
1.5. Encouraging students to discuss and share their thinking results
1.6. Confirming students' comprehensions
1.7. Encouraging students to reflect on their study experiences

2. Research method

Subjects of this research were the mathematics teacher and students of X Akselerasi. Objects of this research were mathematics learning activities of X Akselerasi in exponents and logarithms materials. This qualitative research was held in August 2014 with observation method and questionnaire method. Observations were done three times in exponents and logarithms learning of X Akselerasi. Questionnaires were distributed to the mathematics teacher and students. The other instrument that was used in this research beside the researcher herself as the primary instrument is the video recording of the mathematics learning process.

Data analysis was done in three steps, i.e. data reduction, data categorization, and conclusion drawing. Data reduction consisted of data transcription and data topic determining to choose, simplify, abstract, and transform rough data. In data categorization, data categories were determined based upon similarities of data topics that were determined in data reduction. Conclusion drawing in this research was done based upon the aim of this research and research results in the form of mathematics learning activities that were done in the classroom.

3. Mathematics learning activities of the acceleration class program

From data categories that were determined in categorization, we could get mathematics learning activities of the tenth grade acceleration class program X Akselerasi. Learning activities that were done in the mathematics learning of the acceleration class program i.e.:

3.1. Learning preparation in the class
3.2. The teacher and students did opening activities of the learning
3.3. The teacher communicated learning materials, learning activities, and activities instructions and guides
3.4. The teacher and students did apperception activities
3.5. Learning material discussion
3.6. The teacher and students did questioning and answering activities
3.7. Students solved problems the teacher gave
3.8. Students did discussions
3.9. The teacher walked around in the classroom to supervise and ask about difficulties that were experienced by students
3.10. Students communicated their opinions
3.11. The teacher delivered feedback to students' answers and opinions
3.12. The teacher motivated and rewarded students
3.13. The teacher and students closed the learning

4. Accelerated learning foundation principles in acceleration class' learning activities

From data categories that were determined in categorization, we could get mathematics learning activities that were done in the tenth grade acceleration class program X Akselerasi. Learning activities of the acceleration class program were described in this section.

4.1. *Learning involves the whole minds*

Students were involved in the learning through learning activities that were done in the allocated time. Students were involved actively in solving problems in students' activities sheets, students' handbooks, or problems given by the teacher. Students were also involved actively in learning materials and problem solving discussions, presenting arguments and ideas, and delivering feedbacks or corrections. Students could be involved in the learning with their whole mind thus the mathematics learning of X Akselerasi could be improved and enhanced.

4.2. *Learning is creation, not consumption*

Students integrated new knowledge into their existing structure of self in the learning process. Learning activities in X Akselerasi were done so that students' knowledge could be created actively and not only by gathering information passively. Students integrated new information gathered from learning materials actively into their own existing information by answering questions the teacher delivered actively. Students also actively wrote down proving procedures of a property or procedures to get a formula and procedures of problem solving on the whiteboard. Students also did some discussions actively to integrate new concepts in the learning material while solving problems. From these activities, it could be showed that students did learning activities not only by gathering information passively but also by creating knowledge actively.

4.3. *Collaboration aids learning*

Learning activities of X Akselerasi students also showed collaborations among students that could help to improve learning processes and outcomes. Collaborations among students were showed in discussion activities where they could help each other to solve problems and understand concepts in the learning material. Collaborations among students were also presented when students delivered their ideas and arguments by writing them down on the whiteboard. Other students helped these students in correcting problem solving, proving, or formulating procedures, reminding of concepts that could be used in these procedures, or giving other forms of feedback thus students could obtain correct procedures.

4.4. *Learning takes place on many levels simultaneously*

Students learned the learning material simultaneously on many levels at a one moment or occasion. Students of X Akselerasi learned many concepts in the learning material at a time by watching,

listening, reading, and observing learning sources they could use in the learning process. Students also learned how to solve problems at a time by watching, listening, reading, observing and did problem solving by themselves at once.

4.5. *Learning comes from doing the work itself*
Students did learning activities by doing themselves some works that were related to the learning material. Students learned learning materials by doing formulations to obtain a formula and proving properties of exponents and logarithms themselves. Students learned how to solve problems that were related to the learning material by doing the problem solving themselves, either through individual works or discussions with the teacher and other students.

4.6. *Positive emotions greatly improve learning*
Students' feelings determine the quality and quantity of their learning. In the learning of X Akselerasi, the teacher could make the class had a joyful, relaxed, and engaging environment and situation so that students could have positive emotions during the learning process. Students themselves also could bring out those positive emotions in the learning thus they were relaxed, engaged, and enjoying the whole learning process they did.

4.7. *The image brain absorbs information instantly and automatically*
In delivering and presenting learning materials, the teacher used concrete images to explain concepts and real world problems that were related to the learning material. Students could learn concepts and understand problems with those concrete images drawn by the teacher faster and remember them easier than by using verbal abstractions and explanations. For a case in point, the teacher drew images or sketches to demonstrate and explain bacterial growth in exponents learning material. Students also had opportunities to sketch themselves exponential bacterial growth processes so that they could measure the growth by using concepts in exponents.

5. Scientific-approached learning activities of acceleration class' learning activities
Mathematics learning activities of the acceleration class X Akselerasi also performed these following scientific approached learning activities, i.e. observing, questioning, experimenting, associating, and communicating that are described in this section.

5.1. *Observing*
Learning activities in this observing category were done by the teacher and students in learning material discussions and problem solving activities. The teacher explained learning materials by showing the materials with projector or writing them in the whiteboard. Through these activities of the teacher, students could do these following observing activities, i.e. watching, observing, reading, and listening. Students also did these observing activities towards to either written or verbal arguments of other students. Students did watching, observing, and reading activities from learning sources they had or from students' activities sheets the teacher gave. Listening activities were done by students when the teacher delivered the learning material verbally. Students also listened to arguments that were delivered by other students verbally. So, it can be concluded based upon the learning observation results that these observing activities had been shown in the mathematics learning of X Akselerasi.

5.2. *Questioning*
Students had opportunities to ask about topics on the learning material discussion or steps on problem solving, either to the teacher or students that presented their arguments. Students also asked questions to the teacher and other students while they were solving problems on the students' activities sheets. Students also asked questions before or while they were writing their arguments or works on the whiteboard. So, it can be concluded that activities that were included in the asking activity were done in the mathematics learning of X Akselerasi.

5.3. *Experimenting*

One of experimenting activity that was done by students in the learning of X Akselerasi was gathering information about concepts and problem solving procedures from various learning sources that were used in the learning. Concepts in learning materials such as definitions, properties, or formulas could be obtained from students' activities sheets, students' handbooks, the teacher's explanations, or other learning sources. From these learning sources, students also could get information about problem solving procedures that were related to learning materials. These concepts and information also could be obtained from real world problems or learning materials of other subjects that were related to the learning material.

5.4. *Associating*

Data such as concepts or problem solving procedures that were obtained from learning sources were associated trough learning activity of X Akselerasi. As a case in point, by using concepts that had been learnt before to obtain concepts that were learnt or discussed in the learning process. Besides found out and used relations between mathematics materials, the teacher and students also discussed relations between learning material with other subjects' materials or with real world problems. Associating activities were also done in using of concepts and knowledge that was learnt before in solving a problem. Knowledge that was gained from a problem solving procedure also could be used in solving other problem solving procedures that were related or could be done by similar procedures.

5.5. *Communicating*

Students had opportunities to deliver their arguments either in verbal or written forms. Students communicated their thoughts verbally trough discussions about learning materials or problem solving activities. Students also presented their ideas in written form by writing problem solving procedures in the whiteboard. Other students also could deliver their arguments either in verbal or written forms as a feedback of presented materials or problem solving procedures. Based upon these activities, it could be concluded that communicating activities were acted out by students in the mathematics learning of X Akselerasi.

6. Conclusion

Research data that were gathered by observation and questionnaire method were analyzed so that we obtained mathematics learning activities of the acceleration class program as results of this research based upon data categories. Mathematics learning activities that were done in X Akselerasi, the tenth grade acceleration class program of SMA Negeri 2 Purwokerto, satisfied accelerated learning foundation principles by Meier (2000) that were operated out by the most out of accelerated learning using. Students' learning activities that were used scientific-approached curriculum named Kurikulum 2013 also showed five forms of scientific learning activities. Scientific-approached learning activities of the teacher also performed the mathematics teacher of X Akselerasi.

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