Implementation of Inquiry Strategy on Exponent, Roots and Logarithm

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Abstract. The aim of this research is to enhancing students’ learning outcomes on exponent, roots, and logarithm through the implementation of Inquiry strategy. This research is a descriptive qualitative research with classroom action research approach which was done in three cycles. Each cycle consists of 4 steps, those are: planning, acting, observing and reflecting. This research had been conducted with 30 students (17 female and 13 male) studying in the 10th grade. Data was collected from students through documentation, observation, and test. The data was analyzed using descriptive qualitative and quantitative methods. The findings revealed that Inquiry strategy affected students’ learning outcomes on exponent, roots, and logarithm.

1. Introduction
This research is based on the number of students in class X SMAN (senior high school) 1 Gumay Talang who get scored low on learning exponent, roots, and logarithm. One of the causes of low student score is strategy used in learning process. Learning strategies used in schools today are teacher centered and teachers considered to be the only source of learning. Teacher centered learning can curb the creativity of learners, because the teacher only speaks, explains on the board, students listen to teacher explanation and memorize a concept without giving meaning to mathematics. The fact is contrary to expectation. Mathematics in school was expected to improve students’ mathematical capabilities such as problem solving, reasoning, and communication [1].

Because of the learning condition, researchers are interested in finding a solution to the problem. Researchers try different strategy in learning exponent, roots, and logarithm that is inquiry strategy. The selection strategy is due to inquiry strategy gives students autonomy in the learning process [2]. Inquiry is a learning where students are directly involved in open-ended, student centered, and hands-on activities. Therefore implementing inquiry strategy can encourage students to be active in learning process, provide them to discover a new concept and solve mathematics problems with teacher guidance. This opinion is in line with opinion Kahn and O’Rourke. Kahn and O’Rourke stated that in inquiry based learning teacher as a facilitator, establishes the task and facilitates the process while students conduct their inquiry, use their prior knowledge, and responsible for analyzing and presenting their ideas [3].This research is a classroom action research aimed to enhancing students’ learning outcomes on exponent, roots, and logarithm through the implementation of Inquiry strategy.

Colburn defines inquiry with a variety of different approaches namely, structured inquiry, guided inquiry, and open inquiry [4]. This research use guided inquiry. Guided inquiry has 5 steps, formulate problems to be exposed to students with the sufficient data; students draw up, add new data, process, organize, and analyze data; students construct conjecture; students review their conjecture created and teacher check students’ conjecture; teacher gives practice as a matter additional to check understanding students [5].

Exponent, roots, and logarithm material in this research include exponent of integer and rational, roots of rational and irrational number, and relation between exponent and logarithm. A number of related researches include the guided inquiry approach of active learning: not just hand-on learning, but minds-on learning. Activities in any discipline that capitalize on guided inquiry alike make
academic material more meaningful, for guided inquiry inspire intellectual curiosity rather than defensiveness [6]. The learning by guided inquiry approach can improve the ability of critical thinking and mathematical communications [7]. Students are viewed from the learning and categories of students’ mathematical abilities. This guided inquiry learning can be applied to medium and high-ability students, in low-ability students can be applied by increasing the guidance of the teacher [8]. The guided inquiry learning approach is a learning centered on The learning approach requires students to be able to identify problems, develop hypotheses, collect data, verify data and make conclusions. This guided inquiry learning approach is oriented towards scientific techniques and can build students problem solving abilities based on the students’ cognitive ability Guided inquiry methods are better than students who have received conventional learning [9].

2. Experimental Method

Selected sample of this research was 30 students (17 female and 13 male) who enrolled in the X.1 class, SMAN 1 Gumay Talang. This research was done in the first semester of the academic year of 2015-2016 from August to October. This research applied a classroom action research to examine the research questions. Classroom action research refers to an activity for observing events in the classroom to improve practice in learning so that the results of learning to be better [10].

This research used several ways to collect the data. Data had been collected from students through documentation, observation, and test. Documentation was used to obtain data the number of students in X.1 class and students’ learning outcomes before inquiry strategy was applied. Observation was used to obtain data students’ learning activity. Test was used to obtain data students’ learning outcomes when inquiry strategy was applied in learning.

Collected data in this research was analysed by using quantitative and qualitative technique. Before analysed, data students’ learning activity had been processed to obtain the arithmetic average. Data students’ learning activity was made based on the arithmetic average of the scores, namely:

| Category          | Arithmetic Average of The Scores |
|-------------------|----------------------------------|
| Excellent         | 75% - 100%                       |
| Good              | 55% - 74%                        |
| Pretty Good       | 25% - 54%                        |
| Not Good          | 0% - 24%                         |

Data students’ learning outcomes obtained from test (daily test) was analysed using 1-100 scale. Student is declared complete if he gets ≥75 in the daily test. Conversely, a student is declare incomplete if he gets <75 in the daily test. This research was conducted in three cycles, each cycle consists of planning, acting, observing and reflecting. The cycle would be stopped if students’ learning outcomes had improved.

3. Result and Discussion

This research was conducted in three cycles, each cycle consists of planning, acting, observing and reflecting. Researchers acted as a teacher in class X.1 and taught exponent, roots, and logarithm. In step planning, researchers prepared lesson plan, syllabus, observation sheet, student worksheet, and student’s test. Research in every cycle was done twice, in each meeting was 1 x 40 minutes. The first analysed data was student’s test result in solving exponent, roots, and logarithm without Inquiry strategy. After that, student’s test result in solving exponent, roots, and logarithm with Inquiry strategy was analysed.

| Score  | Frequency | Percentage |
|--------|-----------|------------|
| 75-100 | 11        | 36.7 %     |
| 55-74  | 7         | 23.3 %     |
| 25-54  | 12        | 40 %       |
Table 3. Student’s learning outcome in cycle 1

| Score  | Frequency | Percentage |
|--------|-----------|------------|
| 75-100 | 14        | 46.7%      |
| 55-74  | 9         | 30%        |
| 25-54  | 7         | 23.3%      |
| 0-24   | -         | -          |
| Total Score | 30 | 100%       |

Based on observation in cycle 1, researchers obtained that learning had not reached criteria (≥70% students got score above 75). Table 3 shown that only 14 of 30 students (46.7%) got score above 75. Based on the student’s test result in cycle 1, learning had not reached criteria caused by many reasons, students were not active in learning process because they were unfamiliar with Inquiry strategy; students were not confident with their own answer in test; and researchers did not pay attention to students difficulties. Because of those reasons, researchers made some improvements in cycle 2. In cycle 2 researchers give motivation to students to be more active in learning process; guide students who have difficulty in learning process; implement Inquiry strategy, and give reward.

Table 4. Student’s learning outcome in cycle 2

| Score  | Frequency | Percentage |
|--------|-----------|------------|
| 75-100 | 20        | 66.7%      |
| 55-74  | 9         | 30%        |
| 25-54  | 1         | 3.3%       |
| 0-24   | -         | -          |
| Total Score | 30 | 100%       |

Based on observation in cycle 2, researchers obtained that learning had reached criteria (≥70% students got score above 75). Table 4 shown that only 20 of 30 students (66.7%) got score above 75. Based on the student’s test result in cycle 2, learning had reached criteria because students were more orderly during learning process; students were used to learning conditions (using inquiry strategy); researchers had paid attention to students difficulties.

Table 5. Student’s learning outcome in cycle 3

| Score  | Frequency | Percentage |
|--------|-----------|------------|
| 75-100 | 26        | 86.7%      |
| 55-74  | 4         | 13.3%      |
| 25-54  | -         | -          |
| 0-24   | -         | -          |
| Total Score | 30 | 100%       |

Based on observation in cycle 3, researchers obtained that learning had reached criteria (≥70% students got score above 75). Table 5 shown that only 26 of 30 students (86.7%) got score above 75. Based on the student’s test result in cycle 2, learning had reached criteria because students were used to learning conditions (using inquiry strategy).
From figure 1, it can be seen that cycle 1, cycle 2, and cycle 3 have significant difference. It means that Inquiry strategy can enhance students’ learning outcome on exponent, roots, and logarithm and it can be implemented in mathematics teaching and learning.

4. Conclusion
Using Inquiry strategy on exponent, roots, and logarithm can enhance students’ learning outcomes. In the first cycle, the arithmetic average of class is 72.8, 14 of 30 students (46.7 %) got score ≥75. In the second cycle, the arithmetic average of class is 78.4, 20 of 30 students (66.7 %) got score ≥75. In the third cycle, the arithmetic average of class is 83.9, 26 of 30 students (86.7 %) got score ≥75. From the first, second, and third cycles obtained that Inquiry strategy affected students’ learning outcomes on exponent, roots, and logarithm.

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