Analysis of student`s mathematical writing skill with two stay two stray models toward writing in performance tasks strategy at SLETV materials

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Abstract. The aims of this research is to investigating the student`s mathematical writing skill on doing exercise after studying with two stay two stray models toward writing in performance tasks strategy at SLETV materials. This research is qualitative research. The technique of collecting data is test method to collect the data of student`s mathematical writing skill after studying with two stay two stray models toward writing in performance tasks strategy. The subject of this research are student`s of 2nd grade in SMP Negeri 24 Surakarta year 2017/2018. The sampling technique is based of student`s group with high achievement, medium achievement, and low achievement then from each group taken two students to analize the student`s mathematical writing skill. The analize of data use three activities, there are reduction data, present data, and getting the conclusion. The result of the research: students number 19 with high achievement have all the aspec of mathematical writing, there are written text, drawing, and mathematical expression. Students number 23 with high achievement have all the aspec of mathematical writing, there are written text, drawing, and mathematical expression although the drawing aspec still not perfect. Students number 3 with medium achievement have all the aspec of mathematical writing, there are written text, drawing, and mathematical expression but the written text aspec still not perfect. Students number 22 with medium achievement have all the aspec of mathematical writing, there are written text, drawing, and mathematical expression but the mathematical expression and written text aspec still not perfect. Students number 17 with low achievement have all the aspec of mathematical writing, there are mathematical expression, drawing and written text but the drawing and written text aspec still not perfect. Students number 21 with low achievement have all the aspec of mathematical writing, there are mathematical expression, drawing and written text but the drawing and written text aspec still not perfect.

1. Introduction
As a basic science, mathematics has undergone very rapid development in terms of its material and utility. Mathematics is studied from elementary to advanced education level. Mathematics learning is conducted so that students have the following abilities: 1) understand mathematics concepts; 2) use reasoning on patterns and attributes; 3) solve problems that include problems understanding and mathematical models – designing; 4) communicate ideas; and 5) respect the use of mathematics in daily life [6]. Based on the goals of mathematics learning, one of the most important goal is to communicate mathematics ideas. One difficult thing is to define how far a student’s understanding of a learning material is. One of the ways to determine it is by seeing how the student communicates his mathematics ideas. Writing in Mathematics can be used as a medium to convey those ideas [4]. Some
of mathematical writing skills are solving mathematical problems, writing the learning conclusions, making mathematics journals, making summary from the learning, etc [4].

Writing is an external representation that exists in the form of graphic symbols as lingual expression units. Writing is perceived as a process of thinking aloud on paper [4]. Writing skills need to be taught and developed, it is very important because communicating ideas in writing is such a difficult thing for many people. Therefore, mathematical writing skills need to be developed optimally as an aspect of mathematic communication for students in schools [4]. One indicator of mathematical writing is an indicator developed by Cai, Lane, and Jacobsin which includes, (1) written text where students are required to be able to write an explanation of the problematic answers mathematically, making sense, clear and arranged logically and systematically (2) drawing mathematically (Drawing) where students are required to be able to paint pictures, diagrams, and tables completely and correctly, and (3) mathematical expressions (Mathematical Expression) where students are expected to be able to model mathematical problems correctly, then do calculations or get solutions completely and correctly [2].

Based on the problem stated, it is important to develop mathematical writing in school learning. Teachers need to be able to define the proper learning models and strategies for learning in order to improve their writing skills. One of the learning strategies to improve their writing abilities is Writing in Performance Tasks. This learning strategy is designed by asking students to demonstrate and communicate students' mathematic understanding through a task. The mathematical writing tasks are divided into two: (a) stating problems using their own language, and (b) showing or demonstrating the solution of the tasks given [5].

In doing these mathematical writing task, the use of proper learning models to support the learning strategies are highly recommended, for example by utilising learning models that stimulate the students to be active so that they can understand their mathematical writing task well. The way teachers convey classroom learning is very influential in changing students' attitudes and habits in learning mathematics as it is in writing mathematics [1]. One of the models used is the Two Stay Two Stray model. This kind of model can make the students to be more active in the learning process, such as in the discussion, looking for answers, explaining and listening to materials explained by their friends. Cooperative learning means working together to accomplish shared goals [3]. In cooperative learning, each member is equally trying to achieve results that can be felt by all group members. One of the advantages of this type of cooperative model is that it can direct students to be more active in learning, both in discussion activities, question and answer, looking for answers, explaining and listening to the material explained by friends. This is because learning activities in this type of learning model are phases which require students to actively discuss with other group members and share the results of group discussions with other groups, so that students can improve their mathematical writing skills better. Therefore, the Two Stay Two Stray learning model is used with the strategy of Writing in Performance Tasks.

Based on the illustration above, the writer will analyze the mathematical writing skills of the eight grade students of Junior High School 24 Surakarta year 2017/2018 after learning by using Two Stay Two Stray model with Writing in Performance Task strategy.

2. Method

This research is conducted in Junior High School 24 Surakarta year 2017/2018. This research is a qualitative descriptive research. The data source of this research consist of written source from some of the class VIII B students that are selected as research subjects.

This research uses purposive sampling in which the research subject consists of the students of VIII B class of Junior High School 24 Surakarta year 2017/2018. The students are divided into three groups based on their learning achievement: high; average; and low learning achievement. Two students are taken from each group as research subjects. The data collection techniques used in this research are: 1) documentation, 2) observation, and 3) test method. Documentation technique is used to analyze the documents related to the focus of the research. This research uses
documentation about the achievement test results of students to divide them into three groups: high; average; and low learning achievement. The observation method in this research is used to monitor the learning process. It is also used as an initial description of the study and to support the data analysis results. Written test method in form of essays is used in this research. Essays are used to give the students freedom to write down their answers so that their mathematical writing skills can be analyzed. The data analysis used in this study includes 3 stages: data reduction, data presentation, and conclusion.

3. Results And discussion
Based on the research that has been conducted, the following results are obtained that the learning runs according to the syntax of learning model Two Stay Two Stray with Writing in Performance Task strategy. Students are actively involved in learning, such as at the presentation of material, discussion, and when presenting the results of mathematical writing in front of the class. Some students are eager to ask to their friends when there are differences of opinion regarding the answers of their group’s mathematical assignments. The following are the results of research and analysis of the discussion of mathematical writing skills tests on each research subject.

3.1 Students with high learning achievement
Student number 19
Based on the results of mathematics learning achievement, this student is included in the high learning achievement group. Then according to the analysis of his mathematical writing skills, this student meets all the aspects of mathematical writing (written text, drawing, and mathematical expression aspect). The student answers the problems well and systematically, he also gives written explanation in each of the steps and provides conclusion related the picture he draws on the answer sheet. It shows that he masters the written text aspect well. The drawing aspect appears with the presentation of graph images that are in complete accordance. The student can also present formulas or equations and do calculations correctly. It shows that he also masters the aspect of mathematical expression.

Student number 23
This student is included in the high learning achievement group. Based on the analysis of his mathematical writing skills, this student meets all the aspects, yet he does not meet the drawing aspect perfectly. The student answers the problems well and systematically, he also gives written explanation in each of the steps and provides conclusion related the picture he draws on the answer sheet. It shows that he masters the written text aspect well. The student does not draw the graph completely, it means that he does not master the drawing aspect perfectly. The student present formulas or equations and do calculations correctly. It shows that he also masters the aspect of mathematical expression.

3.2 Students with average learning achievement
Student number 3
Based on the results of mathematics learning achievement, this student is included in the average learning achievement group. According to the analysis of his mathematical writing skills, this student meets the aspect of drawing and mathematical expression, meanwhile he does not meet the written text aspect. The student does not solve the problem well and systematically, he does not provide written explanation in each of the steps, but he can give conclusion related the picture he draws on the answer sheet. The student is able to draw the graph completely and correctly, thus he masters the drawing aspect correctly. The student present formulas or equations and do calculations correctly. It shows that he also masters the aspect of mathematical expression well.
Student number 22
This student is included in the average learning achievement group. Based on the analysis of his mathematical writing skills, the student meets the drawing aspect, meanwhile he does not meet the mathematical expression and written text perfectly. The student writes down the problem solving steps well and systematically, he also provides written explanation in each of the steps but does not give conclusion related the picture he draws on the answer sheet. It shows that the student does not master the written text aspect perfectly. For the drawing aspect, the student can draw the graph completely and correctly, so the drawing aspect is perfectly met. The student presents formulas and equations correctly but he makes some mistakes in the calculation. It means that he does not master the mathematical expression perfectly

3.3 Students with low learning achievement
Student number 17
Based on the results of mathematics learning achievement, this student is included in the low learning achievement group. According to the analysis of his mathematical writing skills, this student meets the mathematical expression aspect, but he does not meet the drawing and written text aspect perfectly. The student writes down the problem solving steps unsystematically, although he provides written explanation in each of the steps. Furthermore, the student does not give conclusion related the picture he draws on the answer sheet. It means that the written text aspect is not perfectly met. For the drawing aspect, the student draws the graph with some mistakes, so he does not meet the aspect perfectly. For the mathematical expression aspect, the student present formulas and equations and do calculations correctly, which means that he masters the aspect well.

Student number 21
This student is included in the low learning achievement group. According to the analysis of his mathematical writing skills, this student meets the mathematical expression aspect perfectly, but not with the drawing and written text aspect. For the written text aspect, the student does not write the problem solving steps and gives no explanation, but he gives conclusion related to the graph he draws on the answer sheet. It shows that he does not master his written text aspect perfectly. For the drawing aspect, he draws the graph but makes some mistakes when defining the intersection point, so he does not meet the aspect perfectly. The student present formulas or equations and do calculations correctly, which means that he masters the written text aspect well.

Based on the description above it can be seen that the high learning achievement category fulfills all aspects of mathematical writing, there is only one aspect that has not been fulfilled perfectly, namely the drawing aspect of student number 23. Nevertheless, the drawing aspect has been seen though there are still a few errors. The average learning achievement category meets all the mathematical writing aspects, but there are two aspects that are not perfectly met, namely written text aspect of student number 3, and the mathematical expression and written text of student number 22. Even so, the mathematical expression aspect has been seen although there are some calculation mistakes and there are incompleteness in the written text aspect. The low learning achievement category fulfills the mathematical expression aspect well. The written text and drawing aspects have been seen in the students’ answers, although they are not fulfilled well.

Moreover, it can be seen that the students from all learning achievement categories fulfill all the aspects of mathematical writing after the Two Stay Two Stray model with Writing in Performance Tasks are utilized in the learning process, although the average and low learning achievement students cannot fulfill some of the aspects perfectly. It shows that by utilizing Two Stay Two Stray model with Writing in Performance Tasks strategy, all of the students can improve their mathematical writing skills. It can be related to the observation results when the learning process takes place. In the learning process, all students are actively involved in the presentation of material, discussion, and when presenting the results of mathematical writing assignments in front of the class. Furthermore, some
students are also eager to the presenting group when there are differences of opinion regarding the answers of their group’s mathematical assignments.

4. Conclusion

Based on the results of the research and the discussion above, the conclusions of this study is that after utilizing Two Stay Two Stray model with Writing in Performance Tasks strategy in the learning process, the students can fulfill the mathematical writing aspects although some of them do not fulfill the aspects perfectly. The mathematical writing skill of the students based on each learning achievement category are as follows: 1) For the high learning achievement category, student number 19 fulfills all the mathematical writing aspects, namely written text, drawing, and mathematical expression aspects. Student number 23 fulfills the written text, drawing, and mathematical expression aspects, even though his drawing aspect is not perfectly fulfilled. 2) For the average learning achievement category, student number 3 fulfills the mathematical writing aspects that consist of drawing and mathematical expression, but he does not fulfill the written text expression perfectly. Student number 22 fulfills the drawing, mathematical expression, and written text aspects even though he does not fulfill the mathematical expression and written text aspects perfectly. 3) For the low learning achievement category, student number 17 fulfills the mathematical expression, drawing, and written text aspect even though he does not fulfill the drawing and written text aspect perfectly. Student number 21 fulfills the mathematical expression, drawing, and written text perfectly although they are still imperfect. 4) By utilizing Two Stay Two Stray model with Writing in Performance Tasks strategy, the students can improve their mathematical writing skills. It can be related to the observation results when the learning process takes place. In the learning process, all students are actively involved in the presentation of material, discussion, and when presenting the results of mathematical writing assignments in front of the class. Furthermore, some students are also eager to the presenting group when there are differences of opinion regarding the answers of their group’s mathematical assignments.

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