Effectiveness of Mathematics Learning Tools Based on Guided Inquiry Model to Mathematical Communication Capabilities of Class VIII Students

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Abstract. This study discussed on the effectiveness of the use of mathematical learning tools based on guided inquiry models to improve mathematical communication skills (CS) for students of grade VIII SMP. The type of development research used is the Plomp model. The study was conducted on 30 students in one class to use learning tools, then given a final test to see how many students completed the test. The results showed that 86.6% had completely exceeded the minimum completeness criteria that had been set at 70. It could be concluded that the learning tools developed in the form of RPP and SW were effective in improving students' mathematical communication abilities so that they were suitable for use. Start your abstract here…

1. Introduction
Mathematics is seen as a means of thinking, communicating and solving problems. "Mathematics is as a field of science which is a means of thinking, communicating, tools for solving various practical problems, whose elements are logic and intuition, analysis and construction, generality and individuality" [1] Studying mathematics is not focused on studying mathematics as a rigid science but it is far more important to master mathematical skills. Mastering mathematical skills is the promotion of abilities and skills formed through learning mathematics such as the ability to think logically, creatively, critically and intuitively. This skill will be useful for students in understanding the world around and solving the problems they face.

The purpose of learning mathematics is one of them so that students are able to communicate ideas and be able to clarify problems using symbols, sentences and tables in mathematics [2]. CS is a basic mathematical ability needed by junior high school students in order to explore, and solve problems in learning mathematics [3]. Furthermore according to NTCM in 2000 learning to communicate problems helps foster interaction and expression of ideas in the classroom because learners learn in an active atmosphere [4]. From the description it is seen that mathematical communication skills are very necessary for students to have. But in reality, the mathematical goal to be achieved is still not realized.

Analysis of low mathematical ability was also found from the results of research conducted in grade 7 of Lincorn Junior High School which showed students felt much more comfortable communicating with peers to ask questions and students found it difficult to communicate verbally in class [5]. Then the results of preliminary observations made in class VIII Padang city junior high school also found the test results obtained that there is still a small percentage of students achieving a maximum score of 4. The percentage of CS 40 Padang SMPN obtained 30, 7% in fulfilling 3 indicators while SMPN 26 Padang...
obtained 55%. And when viewed from the average percentage of the two schools as a whole was obtained by 42.5%. This shows that CS represented by the three indicators is not optimal. Another factor of low CS is that in some schools students use SW prepared by MGMP in West Sumatra where the preparation is based on the agreement of all mathematics educators in accordance with the characteristics of students in general, this is what causes the SW to be in accordance with the wishes of students and there are also those who don't, so learning is less effective.

In an effort to improve CS students required SW and learning models that can be used as guidelines for activities such as trying to solve their own problems, find solutions and form learning experiences that can help guide students to construct knowledge that has been learned. Guided inquiry learning model can improve CS. This model is more suitable for junior high school students, because the problem is determined by educators to be resolved and still get guidance [6]. With the supervision of educators the learning process becomes structured and can help direct students to construct the knowledge that has been learned. Guided inquiry based learning tool is an activity to find solutions independently in solving problems by emphasizing the principle of critical and analytical thinking [7]. The guided inquiry based learning tool prioritizes active and effective involvement of students to orient, formulate problems, formulate hypotheses, collect data, test hypotheses and formulate conclusions so that learning activities run interestingly, fun, and at the same time challenge students to think. Learning tools that use guided inquiry seeks to foster scientific thinking in students so that whatever is done can be done individually or in groups.

Eka's research results (2017) revealed that modules with inquiry models effectively used in the learning process seen from the N-Gain experimental class were greater than the control class [8]. In addition, Praptiwi's study (2012) found that the application of the guided inquiry model was effective in increasing the mastery of the concept of junior high school students. Based on the results of the study the purpose of this study was to see whether the learning tools developed using the guide inquiry model were effective in enhancing CS students of class VIII.

2. Experimental Method
This research is a type of development research. Research development is a research method used to produce certain products and test the effectiveness of these products [9]. The development model used is the Plomp model which consists of three phases, namely preliminary research, development or prototyping stage and assessment phase [10]. The subjects of the study were students of class VIII at SMPN 26 Padang with 30 students. The data in this study were obtained through essay tests, in which questions were aimed at measuring student CS. Data analysis the effectiveness test was carried out using a statistical analysis of the average percentage of completeness obtained by students of more than 70%. The effectiveness of a product can be seen from the results of the number of students’ who complete above the KKM in the mathematical communication skills test is in the good category that is ≥ 70% [11].

3. Result and Discussion
The learning tool developed is the Lesson Plan (LP) and the Student Worksheet (LW), the steps implemented in based on the guided inquiry model. The learning tools that was designed was validated beforehand and tested at the field test stage as many as 6 meetings. The process used uses the stages in the Plomp development model, namely preliminary research, development or prototyping stage and assessment phase, through these stages it can be seen that the learning tools that include LP and SW that are developed have met the criteria of validity, practicality and effectiveness. In this case, what will be discussed is about the effectiveness of the products used on CS.

Measuring effectiveness in learning can be done by calculating how many students have reached the CS indicator in the final test given. Achievement of the learning objectives can be seen from the final test. Related to effectiveness in development research, Akker (1999: 10) states: "Effectiveness refers to the extent that the experiences and outcomes with the attention are consistent with the intended aims."
That is, effectiveness refers to the level that the experience and results of the intervention are consistent with the intended purpose. Effectiveness is used to find out whether the designed mathematics learning device can improve student CS.

Field tests were conducted in class VIII.1 with 30 students taking part in six groups with each group having 4 to 6 members and being heterogeneous. The material chosen in this study is material about the construction of flat side spaces. In the learning process, each group that has been determined will each get a student worksheet that is designed to contain all the steps of the guided inquiry learning model that is orientation, formulating the problem, proposing a hypothesis, collecting data to prove the hypothesis and making conclusions. The activity was carried out through group discussions. Activities undertaken namely students are given the opportunity to work together, express opinions, listen to the opinions of friends and make conclusions at the end of each lesson. At the end of the lesson, you are asked to do the exercises individually. Increased CS of students can be seen from the value obtained from the SW workmanship at the time of the trial and the final test results. The development of students' mathematical communication value at each meeting can be seen in Figure 1 below.

![Figure 1. Development of CS Value of Students in Field Test](image)

Based on Figure 1, it can be seen that the average value obtained by students at each meeting increases. It's just that in the third meeting the average decreased, but this did not become a big problem because the acquisition of the value was still relatively high. If the value at the third meeting compared to the value of the first meeting has also been seen to increase. The results of working on the questions in SW have seen a reduced level of errors made by students even though in the process is still assisted by educators. Each meeting, students are trained to work on multilevel questions for their ability level. Furthermore, the final test trial data is obtained by testing 3 essay items for the material to build a flat sided space. Following are the results of CS students of class VIII 1 can be seen in Table 1.

| Table 1. Percentage of Test Result |
|-----------------------------------|
| **Completeness**                  |
| Sum                               |
| Complete (≥ 70)                   |
| Not complete (< 70)               |
| Students                          | 26 | 4 | 30 |
| Percentage                        | 86.6 | 13.3 | 100 |

The percentage of students’ completeness can be seen in table 1 where students who completed 86.6% or ≥ 70% of 30 students who took the test and amounted to 13.3% of 30 students who did not complete the CS test. From the results of tests of mathematical CS obtained an average value of 30 students is 79.5. It means that the average score of mathematics communication ability test for Grade
VIII.1 students is categorized as effective. The results of this study can be concluded that in class VIII, the learning tools developed have met the effectiveness criteria in terms of the ability of CS that is the percentage of completeness of 86.6% that has reached the specified minimum completeness criteria of 70. This shows by using learning tools Based on the guided inquiry model, students have a good understanding of the material that has been studied. With a completeness percentage of more than 70%, it shows that the products developed in general are considered to be effective so that they are suitable for use.

The selection of an appropriate learning model can affect the achievement of student learning outcomes, guided inquiry learning model makes students able to actively participate in the learning presented; this can be seen from the steps of learning that requires students to do the learning process themselves so that they can find solutions to problems given by the teacher. This model provides a vehicle for interaction between students, as well as students with the teacher, thus students are also trained to use Indonesian that is good and right, as in general teachers have difficulty in creating an atmosphere of interaction in the classroom, with this model can help the process run learning well.

Overall, inquiry learning can arouse students' learning interest. This is consistent with the opinion of Weil & Joyce (2000) which states that this inquiry learning model develops inquiry models that include process skills which include observing, collecting and organizing data, identifying and controlling variables, testing and formulating hypotheses, explaining and inference skills. The applied inquiry learning can foster aspects of student knowledge, this is in accordance with statements made by Bilgin (2009) who say that learning activities using guided inquiry help students to develop a sense of individual responsibility, cognitive methods, report generation, problem solving, and understanding ability. In line with the results of Tiara's (2016) research, there were more than 70% of students completing learning so that the devices developed were in the "effective" category to improve problem solving abilities. This shows that the guided inquiry based mathematics learning device succeeded in helping students to understand the concept of the material on the flat side space so that this learning device was considered effective in mathematics learning. So it can be concluded that the instructional model based on guided inquiry model is effective to be used in increasing CS learners.

4. Conclusion

The results showed that mathematics learning tools consisting of LP and SW met the effective category for increasing CS students in class VIII, seen from the average completeness of the test results given as much as 86.6% which exceeded the minimum completeness criteria (≥ 70). So it can be concluded that the mathematics learning tool based on the guided inquiry model has been effective to improve mathematical communication skills of grade VIII students.

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