**Comparison of Mathematical Communication Skills of Students Between Learning Model Problem Based Learning with Realistc Mathematics Education and Open-Ended Approach.**

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***Abstract***This research is based on the low ability of students & apos mathematical communication whichhas an impact on the low ability to solve the mathematical problems that demand the students&apos; mathematical communication ability. This study aims to determine the comparison of students&apos; mathematical communication skills between Learning Problem Based Learning Model&nbsp; with Realistic Mathematics Education and open-ended approach. The benefit of this research in general is to provide an overview of PBL learning model with RME and open-ended approach to students & apos mathematical communication ability. The research method used in this research is a quasi experimental method consisting of two classes, namely experimental class 1 which received PBL learning model with RME approach and experiment class 2 which got PBL learning model with Open-Ended approach. The research was conducted in SMP Negeri 1 Cikajang with the research sample is class VII A as experimental class 1 and VII B as experiment class 2. The material used as research material is about system of equation and linear inequality one variable (SPLSV). The instrument of this research is a test with the form of description given at the time of pretest and posttest and given the students attitude scale test. From the results obtained pretest Ho accepted so it can be concluded that there is no significant difference in students&apos; mathematical communication between experimental class 1 and experiment class 2. From the result posttest obtained Ha accepted, so it can be concluded mathematical communication skills between students who get the model of learning Problem Based Learning Using the Realistic Mathematic Education approach is better than the Open-Ended approach. While the scale of student attitudes processed with Likert scale and it can be concluded that students interpret both the PBL learning model with the approach of RME and open-ended.

Keywords: Student Mathematical Communication Skill, Problem Based Learning Model, Realistic Mathematics Education Approach, Open-Ended Approach.

1. **Introduction**

Mathematics is one component of a series of subjects that have an important role in education (Sundayana, 2015). In learning mathematics, there are several mathematical abilities that must be possessed by students. One of them is the mathematical communication skill which is one of the abilities demanded in the curriculum in Indonesia. According to Baroody (Husna et al, 2013) this ability is very important and needed by students both in mathematics lessons, other subjects, or for their provision in future life.

One of the reasons students do not like mathematics is the possibility that the learning model provided by the teacher is not suitable or not suitable for the students. In order for students to be motivated, enjoy mathematics lessons and have a positive attitude towards mathematics, efforts are needed to create learning that is pleasing to students in learning, as expressed by Russefendi (1991) that teachers who master the material must be able to manage learning strategies, apply methods / techniques teaching right. One learning model that is expected to improve mathematical communication skills and student activeness is by using the Problem Based Learning learning model, learning begins by presenting real problems to students to stimulate students to think. This can increase students' enthusiasm and interest in the material they are learning because it is linked to real life. Furthermore, the teacher organizes students to learn.

In addition to the PBL model, learning is also inserted with a scientific or scientific approach which is defined as our starting point or point of view towards the learning process which is still very general, in which it accommodates, inspires, strengthens and underlies the learning method, seen from the approach, there are two kinds of learning. The first type of approach is student-centered and the second is teacher-centered (Sudrajat, 2008), for this reason the authors prefer to use a student-centered approach, which aims to make students directly active in learning, namely the Realistic Mathematics Education and Open-Ended approaches.

Wijaya (2012) explains that RME is an approach to learning mathematics in the Netherlands. The word "realistic" is often misinterpreted as "real-world", namely the real world, a further explanation that realistic mathematics learning departs from the child's life, which can be easily understood by children, real, and reachable by their imagination, and can be imagined so that easy for him to find possible solutions by using mathematical abilities that he already has.

Wijaya (2012) explains that Open-Ended is an approach that aims to develop creative activities and the ability to think mathematically simultaneously. From the other side, students are also not only expected to be able to find a solution, but are asked to present steps to achieve that solution. Open-ended also provides opportunities for students to gain knowledge or experience to find, recognize, and solve problems in several ways. But basically students are more lazy when we are faced with some challenging / high-level problems especially with concepts that must take a long time so that students are able to understand the meaning of these mathematical problems, also when students do not have interest or do not have the belief that the problem is learning is difficult to solve, so they will feel reluctant to try it, but maybe when students start to understand mathematical concepts without being limited by a concept and introduced to various ways of solving it might be students like it more because students are free to choose which way of solving the student thinks is easy understood as in the Open-Ended approach, therefore the authors are interested in conducting research with the title "Comparison of Mathematical Communication Abilities Between Students Who Get a Problem Based Learning Model with Realistic Mathematics Education and Open-Ended Approaches".

**2. Eksperimental Method**

The research method that I use in this research is a quasi-experimental or quasi-experimental method. Where the subject is not chosen randomly or randomly. In this case the writer gives treatment to two classes with the same model but different approaches, the Experiment I class uses the PBL learning model using the RME approach while the Experiment II class uses the PBL learning model using the Open-Ended approach.

The two classes are first given a pre-test, which aims to determine the initial ability of each class, after carrying out the learning process several times with different learning models, then the two classes are given a final test (post-test).

**3. Result and Conclusion**

From the results of research that has been carried out, it is obtained the results of the pre-test and post-test from the class that received the Problem Based Learning learning model with the Realistic Mathematics Education and Open-Ended approaches, also obtained questionnaire data. To further describe the data analysis:

**Table 1.** Experimental data 1

|  |  |  |  |
| --- | --- | --- | --- |
| **Class** | **PBL with the RME approach** | | |
| Test | *Pretest* | *Posttest* | Gain Normalized |
| Student | 37 | 37 | 37 |
| Mean | 3,811 | 9,189 | 0,445 |
| Standard Deviation | 2,448 | 4,332 | 0,330 |

**Table 2.** Experimental data 1

|  |  |  |  |
| --- | --- | --- | --- |
| **Class** | **PBL with the Open - Ended approach** | | |
| Test | *Pretest* | *Posttest* | Gain Normalized |
| Student | 39 | 39 | 39 |
| Mean | 2,615 | 6,000 | 0,225 |
| Standard Deviation | 1,711 | 3,340 | 0,266 |

The value of the two tables can be seen that the average value of the initial test and the final test shows that the mean value of the Experiment class 1 is compared to the Experiment class 2.The standard deviation value of the pre-test and final test shows that the standard deviation value of Experiment 1 class is higher than that of Experiment 2 class. This shows that the initial ability of Experiment 2 class is more spread out and based on the quality of improvement of the two classes analyzed with the Normalized Gain test, it is found that the quality of the improvement from the Experiment 1 class with an average of 0.445 and a standard deviation of 0.330 has a moderate interpretation, and for the class Experiment 2 which has an average of 0.266 and a standard deviation of 0.266 has a low interpretation, this is clearly seen that the quality of the improvement in Experiment 1 class students is better than Experiment 2 class.

**Table 3.** Final Test Data Normality Test Results

|  |  |  |  |
| --- | --- | --- | --- |
| **Initial test** | **L** | | **Interpretasi** |
| **Ltabel** | **Lmaks** |
| Eksperimen 1 | 0,148 | 0,106 | Normal Distribution |
| Eksperimen 2 | 0,144 | 1,161 | Not normally distributed |

In the table above, it can be seen that the Experiment 1 class has a value of Ltabel = L0.05 (36) ^ 0.5 = 0.148 and Lmax = 0.106, then Lmax <Ltabel, so the final test data for Experiment 1 class is normally distributed and Experiment 2 class has the value of Ltabel = L0.05 (38) ^ 0.5 = 0.144 and Lmax = 0.161, then Lmax> Ltabel, so that the final test data for Experiment 2 class is not normally distributed.

As in the data obtained, the two samples are not normally distributed, so the next step is to perform a non-parametric statistical test, namely the Mann Whitney test as follows:

Obtained the value of ztable = 1.645 because the value of zhitung = 3.166 is in the acceptance area Ha, namely: zhitung t ztabel it can be concluded that: Mathematical communication skills between students who get the PBL learning model using the RME approach are better than the Open-Ended approach.

Judging from the normality test for Experiment 1 and 2 classes, there is indeed no significant difference from the two because both of them have not been given the subject matter, but when viewed from the average value of the pretest results and the standard deviation it can be seen that the Experiment 1 class is better than the Experiment 2 class. And after getting a lesson from the posttest results, then from the quality of the improvement, from the student observation sheet and seen from the attitude scale it is very clear that the Experiment 1 class is better than the Experiment 2 class. PBL using the RME and Open-Ended approaches. But even though the results of the pretest, posttest, quality of improvement, and the attitudes of the Experiment 1 class students were more dominant than the Experiment 2 class, basically from the two classes there had been an increase in the quality of learning.

**4. Conclusion**

Based on the problem formulation, research results, and discussion as stated in the previous chapter, the following conclusions were obtained:

1. Mathematical communication skills between students who get the Problem Based Learning learning model using the Realistic Mathematic Education approach is better than the Open-Ended approach.

2. The quality of the improvement of students' mathematical communication skills for PBL class using the RME approach with moderate interpretation.

3. The quality of the improvement of students' mathematical communication skills for PBL class using the open-ended approach with low interpretation.

4. Interpretation of PBL class students' attitudes using the RME approach with good interpretations.

5. Interpretation of PBL class students' attitudes using the Open-Ended approach has a good interpretation.

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