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# IMPLEMENTATION OF A LEARNING MODEL WHICH IS HELPED BY COMICS BASED ON A REALISTIC MATHEMATICALAPPROACHMENT TO IMPROVE ELEMENTARY SCHOOL STUDENTS' PROBLEM SOLVING ABILITY

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## Abstract

*This research's purpose is to know the ability of problem solving in fifth grade students of SDN 010015 Sei Serindan, Sub-district Sei Kepayang Barat, Asahan regency with comics media teaching materials based on Realistic Mathematics Approachment Learning Year 2018/2019. The experimental design is based on the Pretest-Posttest control Group Design which involves two groups of students who are a group of experimenters who get learners assisted by comic media and a control group who get a tutorial with a conventional strategy. This research involved the two types of instruments, they are test and non-test. Instruments in the form of tests were used to extend the ability of mathematical problem solving and question solving. While the non-test instruments consisted of students' learning sheets, student learning activities and teacher opinion questionnaires. The results of the research showed that the ability to solve mathematical problems of students who got learning from comic media with the PMR approach was better than students who received ordinary learning. This can be seen tcount = 3,92 > t table = 1,9. Students with PMR approaching has a better increase in mathematical understanding than students who follows ordinary learning. This can be seen in tcount 6.30 >_ ttable = 1.99. Attitudes of students towards learning are positive. Student activities are more positive in learning and more able to solve given problems*

**Keyword**: *Comics media, Problem Solving Abilities, Attitudes*

## A. Introduction

School has been one of the places given by educational activities that function as a creator of human resources. One of the subjects taught in school are mathematics. Mathematics has a considerable degree of ability to provide concepts of various abilities to students for the needs of further study, structuring ability of thinking and ability to solve problems originating in everyday life. In addition to achieve everyday's roles and technology, mastery of concepts and mathematical principles are also a requirement for the success of learning towards mathematics at the next level.

Considering the important mathematic roles, so mathematics should be fun, so that it creates self-awareness and students' spirit in learning functions so that they are able to meet their needs and compete and work in response to the challenges faced by the community. The reality in the field so far is that the learning scheme is still material oriented. Teachers tend to emphasize the knowledge of procedural structuring, in other words reasoning students tend to memorize a pattern or mere algorithmic learning. With this situation, students passively receive knowledge with mathematics as finished goods transferred symbols by the teacher. They simply memorize the procedure and then apply to the appropriate questions.

Students' low learning results are caused by the low ability of students in mastering the subject matter, understanding mathematical concepts that are lacking by students. This is the case with the problem mentioned by Jenning and Dunne (2002: 23) said that, "most students have difficulty in applying mathematics to real life situations." In addition, the causes of mathematics are difficult for students because the teacher's learning in class does not associate with a strategic scheme which has been had by the students and they are given less chances to more understand the learning topics in real life.

Various efforts have been made to overcome the difficulties of students in understanding concepts and solving problems, among others, by paying attention to the causes of the difficulties of the students who come from the students themselves or who can only come from outside

the students themselves. But the results achieved by students in mathematics are still not able to achieve the expected goals. There is injustice in determining students' learning difficulties. Students often become victims and are considered as the source of learning difficulties. Maybe the difficulties come from outside of the students themselves, for example learning process related to the curriculum, how to present and refine the subject matter, and the learning atmosphere.

Mathematical learning has a natural function as a mean to develop the ability to think critically, logically, creatively and work together that students need in modern life. According to Sidi (2002: 56) this mathematics can be seen as a strategic basis science and functions for: 1) the ability to organize and improve the sharpness of students' reasoning so that they can clarify or resolve problems in the daily lives of students; 2) train the ability to communicate using numbers and symbols; 3) train students to always be truth-oriented by developing logical, critical, creative, objective, rational, careful, disciplined and able to work together effectively; and 4) train students to think regularly, systematically, based on lines, and structured in clear conceptions. The importance of solving abilities that mathematical problems possessed by students are expressed Branca (in Sumarmo, students 1994: 8-9) as follows: (1) The ability to solve is a real general goal ". Mathematics teaches, even as for the heart of mathematics, (2) The solution to problems includes methods, procedures and strategies which are the core and main processes in mathematic curriculum, and (3) mathematic solving is the basic ability in learning mathematic.

The problem solving ability is basically one of the learning outcomes that will be achieved in learning mathematics at any school level (Sumarmo, 1994: 2). Therefore mathematics learning must be focused on problem solving abilities, so that students' mathematical abilities are achieved optimally. So that mathematics learning not only transfers knowledge to students, but also helps students to shape themselves and their knowledge empowers students to be able to solve problems faced.

To overcome this, teachers are currently required to be able to make innovations in the learning process. A teacher must be able to

choose the right learning media. Observations show that teachers in Public Elementary School 010015 Sei Serindan were more likely to use textbooks and whiteboards to carry out the mathematics learning process at school. But from what was found in the school it was seen that mathematics lessons were less attractive to students. The lack of students' interest in learning mathematics can be seen from the students' low responsibility for the assignments given by the teacher. Many students do not do homework. Even if there are students who do homework, they only copy the work of their friends at school. In addition, the teacher still does not utilize problem solving as a target in mathematics learning, mathematical problem solving skills in students on aspects of solving mathematical problems are generally not satisfactory, students often do not understand the true meaning of a problem. The most difficulties or mistakes are found in the strategy to count, check process and the result of calculation (Sumanto, 1994).

In general, Elementary School students tend to be less interested in the activities of reading. They are more likely to be eager to learn if the reading material is not too rigid. As one alternative, it increases motivation and increases the activeness of students, so the math comic books can be used as textbooks for mathematics at school. Comic books tend to be more emphasizing the activities of visual abilities just students are expected to have a comic book, but it can determine the success of the process to form learning. And the comic compilation is oriented towards capable Student Centered Learning, aimed at encouraging students to be able to make more observations, ask questions, reason and communicates and presents what the student gets or knows after receiving the subject matter. One of the media is the Learning Approachto Realistic Mathematics. This approach uses realistic problems as a basis for rejecting learning, and through horizontal-vertical mathematical processes, students are expected to find and reconstruct the concepts of mathematics or less formal mathematical knowledge. Horizontal mathematical moves from the real world to the symbols world. In the horizontal mathematical students with the knowledge they have, can organize and solve the problem, real in everyday life. Horizontal mathematics include, among

other things, informal processes carried out by students in completing a problem, making a model, making a scheme and finding relationships, emotion, transforming real-world problems into mathematical problems. Whereas vertical alignment moves from the world of symbols. Vertical mathematics is a process of reorganizing a model by using mathematics itself or the "real world" is the source of mathematical strategy and as a place for applying back the concept of mathematics, Vertical mathematic includes process in stating a relationship with a formula, making various model, finding new concepts and doing generalization.

**B. Research Methods**

The experimental design used in this study is in the form of Pretest-Posttest Control Group Design that involves two groups of students.

| | | | |
|---|---|---|---|
| Experimental Group | R | O | X | O |
| Control Group | R | O | | O |

Information:
R = Random class selection.
O= pretest (initial test given before giving treatment) or posttest (final test used after giving treatment) given to both groups.
X = learning assisted by comic media

This research involved two types of instruments, namely tests and non-tests. Instruments in the form of tests are used to measure mathematical problem solving skills and problem solving. While the instruments in the form of non-tests consist of the scale of student opinions, observation sheets of student learning activities, and teacher opinion questionnaires. The following is a description of the two types of instruments developed.

Questionnaires are used to determine the responses or opinions of students towards the application of comic-based learning and questions that measure mathematical problem solving skills and problem solving. The questionnaire model developed in the study was a Likert attitude

scale which contained 4 choices of answers, namely SS (strongly agreed), S (agreed), TS (disagree), and STS (strongly disagree).

The next questionnaire is called the scale of student opinion, given to students in the experimental class after the post-test. Scale of these students' opinion consists of 25 statements developed from the grid and validates the contents of each item. The score scale of this opinion is determined by aposteriori that is based on the distribution of students' answers. Meanwhile, the descriptive analysis is based on a comparison between the students' opinion scale scores and their neutral scores and is complemented by the percentage of students' answers.

The observation sheet is used to capture information directly about student learning activities during the process of applying the comic media-based learning model. Observations were made for students both individually and in groups from the beginning to the end of learning in each meeting.

Students' activities observed directly by researchers occur when students read statements in the LKS (Students' work sheets) and look for information to determine the solution to the questions and student activities in making small notes.

The teacher's opinion questionnaire contains a number of open questions to find out the opinions and responses of mathematics teachers outside the researcher on the application of comic media-assisted learning models, test questions for mathematical problem solving skills and problem solving, and suggestions that can be input for researchers. Questionnaire of teacher's opinion is given after the last learning process.

Data obtained from test results both pretest and posttest and student opinion questionnaire were analyzed statistically. While the results of observing student learning activities and teacher opinion questionnaires were analyzed descriptively.

## C. Research Finding

### 1. Pretest Data

Mathematical test results data consisted of pretest and posttest learning obtained through multiple choice written tests of 10 items of

mathematical comprehension and 6 items of problem description with each maximum score is 20 and 24. The test was given to the students in grade two (experiments and control class), the data was analyzed.

Table1
The result of Normality pretes
in Experiment and Control Class

| Aspects | Experiment Class | | | | Control Class | | | |
|---|---|---|---|---|---|---|---|---|
| | dk | $¡^2_{count}$ | $¡^2_{table}$ | conclusion | dk | $¡^2_{count}$ | $¡^2_{table}$ | conclusion |
| Problem Solving | 4 | 2,5 | 8,49 | Normal | 4 | 6,26 | 8,49 | Normal |

Table2
The result of Variance Homogeneous
pretest in Experiment and Control Class

| Aspects | Varians | | F count | F table | conclusion |
|---|---|---|---|---|---|
| | Eksperi Ment class | control class | | | |
| Problem Solving | 1,24 | 1,23 | 1,43 | 1,69 | Homogeneous |

Table3
The test of differences
in Experiment and Control Class

| Aspect | Experiment Class | | | Control Class | | | $T_{count}$ | $t_{table}$ | conclusion |
|---|---|---|---|---|---|---|---|---|---|
| | $\overline{x}_e$ | $S_e$ | $S_e^2$ | $\overline{x}_k$ | $S_k$ | $S_k^2$ | | | |
| Problem Solving | 6,5 | 1,32 | 2,40 | 6,7 | 1,43 | 2,42 | 0,39 | 1,99 | No Difference |

**2. Post-test Data**

Table 4
Lowest Scores, Highest, Average and Deviation Scores Standard MathematicsUnderstanding Test

| Class | Ideal Score | $X_{min}$ | $X_{maks}$ | $X_{average}$ | $S$ |
|---|---|---|---|---|---|
| Control | 20 | 8 | 15 | 12,23 (66,5% ) | 1,55 |
| Eksperiment | 20 | 11 | 16 | 13,66 (75,5%) | 1,35 |

Table 4 shows that the average score of the test in the experimental class is not much different from the score in the control class. But if we see the achievement score of the experimental class of 75.5% of the ideal score greater than the control class with an achievement of 66.65% of the ideal score.

Based on the data obtained, an analysis of the average differences in groups of students who obtained ordinary learning (control class) and groups of students who received learning from the PMR approach (experimental class).

Before doing the test of average score of students in Control Class and Experiment class, we need to have normality test for the collected data. Based on the normality testing of data using the test of Chi Square test (x2) at a significance level of a = 0.05, it was concluded that the mathematical problem solving abilities of the control class and experimental class were normally distributed. The concise results of the data normality test using the Chi Square statistical test in the experimental class and the control class can be seen in Table 5.

Table5 Normality Test Results Problem Solving Tests Control and Experimental Classes

| Class | degree of freedom (dk) | ¡ $^2$ *count* | ¡ $^2$ *table* | Conclusion |
|---|---|---|---|---|
| Control | 4 | 6,54 | 9,5 | Normal |
| Eksperiment | 3 | 3,52 | 7,3 | Normal |

Because the data in both classes are normally distributed, then proceed with testing the homogeneity of variance on the control and experiment class with a significance level a= 0.05. The results of the approachment calculation of the tests in both classes indicate that the variance of the two classes has a variance that is not equal. In summary the results of using homogeneity test calculations between the control class and the experimental class are shown in. Table 6.

Table6 Variance Homogenities Result Mathematical Problem Solving Tests Experiments and Control Class

| Class | Variance ( $s^2$ ) | Dk | $F_{count}$ | $F_{table}$ | Information |
|---|---|---|---|---|---|
| Control | 1,55 | 39 | 1,72 | 1,69 | Not Homogeneous |
| Eksperiment | 1,15 | 39 | | | |

Table7 Average Difference Test Mathematical Problem Solving Test Experiment Class and Control Class

| Aspect | Eksperiment class | | | Control class | | | $T_{count}$ | $t_{table}$ | Conclusion |
|---|---|---|---|---|---|---|---|---|---|
| | $\overline{x}_e$ | $S_e$ | $S_e^2$ | $\overline{x}_k$ | $S_k$ | $S_k^2$ | | | |
| Mathematical Problem Solving | 13,8 | 1,3 | 1,69 | 14,3 | 1,7 | 2,89 | 3,92 | 1,9 | better |

From Table 7 above, it is seen that t.count = 3.92 > t.table 1.9 thus Ho is rejected or Ha is accepted, so it is concluded that the self-solving mathematical problem solving skills help with learning with the help of media with the Realistic Mathematics approachment is better than students who get ordinary learning problems.

**3.Students' Problem Solving Ability in Mathematics Improvement**

To see the improvement of students' problem solving skills in mathematics who follow learning with the calculation of the PMR approachment and students who demonstrate following ordinary learning is by calculating the gain of both classes with cash results using the normalized gain formula. The results of the normalized gain calculation class are presented in the table 8.

Table 8 Gain Normalized Mathematical Problem Solving Test Experiment Class and Control Class

| Aspect | Eksperiment Class | | Control Class | |
|---|---|---|---|---|
| | Normalized Avarage gain | category | normalized avarage gain | category |
| Problem solving | 0,600 | middle | 0,54 | middle |

From Table 8. It can be seen that normalized gain mathematical problem solving in students of experimental class is greater than the control class, but the gain of the two classes is in the moderate category. Next to see whether the normalized gain of the experimental class has a significant difference in the mean with the normalized gain of the control class, an analysis of the average difference is carried out. Before the difference test is carried out on average it is necessary to test the normality of the data. Based on the normality testing of the data using the Chi squared test (x2) at the level of a significance of 0.05 was concluded that the normalized gain of the average experimental class of data and the

control class was normally distributed. The normalized gain normality test in both classes can be seen in Table 9.

Table9 Normalized Gain Test Results Normalizing Mathematical Problem Solving Test Experiments and Control Class

| Class | Degree Of freedom (dk) | $¡^2_{count}$ | $¡^2_{table}$ | Conclusion |
|---|---|---|---|---|
| Control | 3 | 1,434 | 7,81 | Normal |
| Eksperiment | 3 | 3,543 | 7,81 | Normal |

After the normalized gain score is normally distributed, then it is continued by testing the homogeneity of variance homogenities toward the normalized gain of students' mathematical understanding between the experimental class and the control class with an experimental significance level of a= 0.05. The results of the calculation of the gain a normalized test of mathematical comprehension of the two classes show that the variance is not the same than it means that the two classes are not homogeneous. Normally. summarize the results of the calculation shown in Table 10.

Table 10 Homogeneity Test Results Gain Normalized Problem Solving Experimental and Control Class

| Class | Variance ( $s^2$ ) | Dk | $F_{count}$ | $F_{table}$ | Information |
|---|---|---|---|---|---|
| Control | 0,204 | 39 | 1,872 | 1,690 | not homogeneous |
| Eksperiment | 0,175 | 39 | | | |

Table 10 shows that the gain variance normalized in the experiment class and the control class was not the same (not homogeneous). Furthermore, the difference test is done on average normalized gain data on students' mathematical understanding between the experimental class and the control class by using uji-t (accent t test) at some significant level that a = 0.05. Results of calculation of average normalized data gain can bee seen in Table 11.

Tabel 11 Tests for Differences in Average Gain Normalized Mathematical Understanding Tests for Experiment and Control Class

| Aspect | Eksperiment Class | | | Control Class | | | $T_{count}$ | $t_{table}$ | Conclusion |
|---|---|---|---|---|---|---|---|---|---|
| | $\overline{x}_e$ | $S_e$ | $S_e^2$ | $\overline{x}_k$ | $S_k$ | $S_k^2$ | | | |
| Problem Solving | 0,7 | 0,09 | 0,008 | 0,59 | 0,21 | 0,044 | 6,30 | 1,99 | better |

Based on the test results in Table 11 above, it is concluded that t count = 6,30 >_ t table =1,99 so H0 is rejected and Ha is accepted so it can be concluded that the gain of experiment class is better than the control class or in students who take mathematics learning with the PMR approachment an increase in a better variance in mathematical understanding is not the same, than students who follow regular learning.

**4. Students' Opinion Scale**

From the distribution of answers given by students, it can be seen that students have a high interest in mathematics. From the students' answers it was seen that as many as 30 students (85%) from 35 students revealed that mathematics learning was fun, and only 5 students -I (15%) stated that they did not like mathematics. This shows that students have a high level of interest in taking mathematics lessons even though there are some students who do not like it.

A total of 32 students (91%) stated that their motivation for learning mathematics was very high, that is, often using mathematical models in terms of working on a problem, do your math assignments as well as possible, and not be afraid if told by the teacher to solve the questions on the board, there are 3 students (6%) who say that they don't do homework well.

Mostly, (33 students or 94%) stated strongly agree that the questions given were very liked by students and increased their understanding of mathematics, although there were still 2 students (6 %) students who think that the questions given are boring and confusing, even though

there are difficulties in answering the questions given, but the usefulness of the questions given in everyday life. From the questions given, the conclusion is it is rising like toward mathematic and useful in everyday's life.

Based on data, the average student activity was the most dominant discussion among fellow students / group (95%), furthermore is the readiness of students before the lesson begins, pay attention and listen to the teacher's explanation, write things that are relevant to the task learning / worksheets given, and together with the teacher conclude the material taught (93%), ask relevant questions (90%), read books and teach the material learning and conveying mathematical opinions / ideas (89%), and behaving non-positively at 0%.

## D. Conclusion

1. Mathematical problem solving abilities of students who get comic media-assisted learning with Realistic Mathematics approaches are better than students who get ordinary learning. This can be seen $t_{count}$ = 3,92 >_ $t_{table}$= 1,9.
2. Students who take part in learning with the PMR approach increase better on mathematical understanding than students who take regular learning. This can be seen obtained $t_{count}$= 6,30 ≥ $t_{table}$= 1,99.
3. The attitude of students towards mathematics, learning assisted by comic media or with the PMR approachment is positive. This learning also makes students more enthusiastic about learning
4. The activities of students who receive learning support by assisting the comic media with the PMR approachment are more active in learning, students are more courageous to ask to the teacher, and are more capable of solving problems that are given.

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