

The Influence of RME-Based Teaching Media Assisted by Pixton Application on Students' Mathematics Problem Solving Ability

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Abstrak

Kemampuan pemecahan matematika siswa di Indonesia tergolong rendah, guru perlu menerapkan media pembelajaran yang dapat melatih kemampuan pemecahan masalah matematika siswa, yang salah satu media tersebut adalah media ajar berbasis RME (Realistic Mathematics Education) berbantuan aplikasi pixton. Tujuan penelitian ini adalah untuk mengetahui pengaruh media ajar berbasis RME berbantuan aplikasi pixton terhadap kemampuan pemecahan masalah matematika siswa. Penelitian ini merupakan penelitian kuantitatif dengan metode quasi eksperimen menggunakan desain The Pretest-Posttest Non-Equivalent Control Group, yang dilakukan di salah satu SMP Negeri Kota Palembang. Sampel yang digunakan yaitu siswa kelas VIII.6 sebanyak 33 orang dan siswa kelas VIII.2 sebanyak 31 orang, dengan menggunakan instrumen tes. Teknik analisis data menggunakan uji-t dengan bantuan SPSS. Hasil analisis data diperoleh kesimpulan terdapat pengaruh media ajar berbasis RME berbantuan aplikasi pixton terhadap kemampuan pemecahan masalah matematika siswa.

Kata Kunci: Kemampuan pemecahan masalah matematis; Media ajar berbasis RME; Pixton.

Abstract

Students' mathematical solving abilities in Indonesia are relatively low, teachers need to apply instructional media that can train students' mathematical problem-solving abilities, one of which is RME (Realistic Mathematics Education)-based teaching media assisted by the pixton application. The purpose of this study was to determine the effect of RME-based teaching media assisted by the Pixton application on students' mathematical problem solving abilities. This research is a quantitative study with a quasi-experimental method using The Pretest-Posttest Non-Equivalent Control Group design, which was conducted at one of Palembang City Public Middle Schools. The samples used were 33 students in class VIII.6 and 31 students in class VIII.2, using a test instrument. Data analysis technique using t-test with the help of SPSS. The results of the data analysis concluded that there was an influence of RME-based teaching media assisted by the pixton application on students' mathematical problem solving abilities.

Keywords: Mathematical problem solving ability; RME-based teaching media; Pixton.

I. INTRODUCTION

One of the curriculum goals in learning process is problem solving (Aklimawati & Mahmuzah, 2018). Students who have problem solving skills are able to control problem-solving indicators such as understanding the problems, planning, executing the plans, and reviewing the plans (Purnamasari & Setiawan, 2019). Thus, it can be said that problem solving skills are such important skills that the students need to acquire based on the indicators of problem solving.

According to NCTM (National Council of Teachers of Mathematics), one of the topics of mathematics is algebra, a branch of knowledge used in solving the problems (Maghfiroh et al., 2021). This study uses SPLDV lesson, in which the students should have enough knowledge about algebra material (Nurhayati et al., 2021). In other words, SPLDV is able to measure students' problem-solving skills in mathematics.

However, the data from PISA (Programme for International Student Assessment) and TIMSS (Trend in International Mathematics and Science Study), Indonesian students still have low problem-solving skills in mathematics. In 2018, PISA obtained the Indonesian students' average score of mathematics was 379 from the OECD score, 489, (OECD, 2018). Similarly, from the result of TIMSS in 2015, Indonesia got the average score of 397 from the international score of 500 (Hadi & Novaliyosi, 2019). One of the

measured mathematics contents in PISA is change and relationship about algebra material (Fakhriyana et al., 2018). Algebra is a prerequisite material in studying SPLDV (Sianipar, 2020), therefore, the students' ability in SPLDV is also low. One of the main causes of this low score is that the students are not used to answer the problem-solving questions (Gabriella & Imami, 2021).

From this issue, it is expected that teachers are able to have students adapted to work on contextual problem-solving questions (Selan & Yunianta, 2020). Besides, one of the determinant factor of learning process is the use of interesting teaching media (Harefa & La'ia, 2021). Hence, interesting and contextual-problem teaching media is required.

Comic as learning media is an interesting media and can help students understand the material given (Witanta et al., 2019; Putro & Setyadi, 2022). The learning media used in this study is comic learning media made with pixton application because this app has everything required in making a comic (Hidayah, 2019).

Apart from media of instruction, it is also required appropriate learning approach as learning support process (Syach, 2022). SPLDV material relates to students' daily experience or contextual (Diana et al., 2021). Therefore, a good and proper learning approach that correlates to contextual problem is necessary. Realistic Mathematics Education (RME) is

an approach that enables students to understand the concept and express their ideas related to the contextual problems (Wansurni et al., 2022). It also has several features such as contextual problems, models, student contribution, interactive activities, and relatable topics (Muzaini, 2018).

There have been a number of previous researches that investigate mathematical problem-solving abilities and RME as in (Matondang, K. Matondang, 2022; Afriansyah, 2022). The finding of this study shows that the use of RME effectively improves students' mathematical problem-solving skills. It can be said that RME is able to increase students' abilities in solving the problems. In addition to, another study done by (Panggabean et al., 2022) reveal that in learning process, comic learning media about SPLDV material is effective to use. However, the researcher has yet found the combination of mathematical problem-solving ability, RME, and comic learning media. Therefore, the researcher considers this study is worth to be investigated because RME can influence the abilities of mathematics problem solving. This approach relates to the students' daily lives and the topic of this study is in line with the previous studies by Matondang & Matondang and Panggabean, et. all.

Based on the previous explanation, this research is expected to produce learning media that can help students improve their problem-solving skills with creative

and interesting media to achieve learning goals. The purpose of this study is to find out the influence of RME-based teaching media assisted by Pixton application on mathematical problem-solving ability.

II. METHOD

This study used a quantitative approach with a quasi-experimental method. The design of the study was pretest-posttest non-equivalent control group design that involves two different groups. In this design, there are two groups; the experimental group and the control group (Sugiyono, 2019).

Referring to the purpose of the study, the learning media used in the study was valid and feasible to use. The population of this study were students in grade level of VIII, SMPN Palembang City, academic year of 2022/2023. The 8th grade consisted of 11 classes. Each class had more or less 30 students. The samples were grouped into experimental and control class. The experimental class was taken from VIII.6 class, consisting of 33 students. The control class was selected from VIII.2, consisting of 31 students. RME-based teaching media assisted by Pixton application was applied in experimental class. On the other hand, the control class was treated conventionally. This study was conducted in October 2022 with 3 meetings for each class.

The data collection technique used was a written test. Both questions in pretest and posttest had been tested for validity

and reliability and they were valid and reliable. The questions both for pretest and posttest consisted of two questions. The pretest was carried out to find out students' initial abilities, while a posttest was conducted to see the learning outcomes after the treatment was given for each class. The indicators for mathematical problem solving, according to Polya are (1) understanding the problem; (2) setting plans; (3) implementing the plan; and (4) reviewing (Christina & Adirakasiwi, 2021).

After the students worked on the pretest and posttest questions, the researchers scored the questions according to the scoring guidelines. When the score was obtained, the normality and homogeneity test could be carried out to determine the statistical hypothesis test used.

1) Normality Test

The normality test used *kolmogorov-smirnov* test with significance level of 5% ($\alpha = 0,05$) (Usmadi, 2020).

- Hypothesis Formulation:
 - H_0 : Population is normally distributed
 - H_1 : Populasi is not normally distributed
- Based on significance level:
 - Significance level $< 0,05$, then H_0 is rejected.
 - Significance level $\geq 0,05$, then H_0 is accepted.

(Riyanto & Hatmawan, 2020)

2) Homogeneity Test

Levene test was used to test for homogeneity. The formulation of hypothesis is as follow: (Usmadi, 2020):

- Hypothesis formulation in Levene test:
 - H_0 : The data is distributed homogeneously
 - H_1 : The data is not distributed homogeneously
- To interpret the result of Levene test, IBM SPSS *Statistics 22 for windows* was used. The formulation of hypothesis is seen as in the following:
 - If significance $< 0,05$, then H_0 is rejected.
 - If significance $\geq 0,05$, then H_0 was accepted.

(Kuswiarti et al., 2019)

If the data is not homogeneously, T-test (independent sample t-test) is conducted to test for hypothesis by taking decision based on output *equal variances not assumed* (Sumardjoko & Akhmadi, 2020). The homogenous data is the data which is not absolutely required in t-test (Hasyim et al., 2021).

3) Hypothesis Test

The hypothesizes in this study are:

- H_0 : There is no influence of RME-based teaching media assisted by Pixton application on students' mathematical problem-solving ability.
- H_1 : There is influence of RME-based teaching media assisted by Pixton application on students' mathematical problem-solving ability.

In this study, researchers used t-test to test for hypothesizes, with the significance level of 5% ($\alpha = 0,05$). *Independent Sample T-Test* was calculated by IBM SPSS *Statistics 22 for windows*. Based on significance level:

- Jika Sig. > 0,05, then H_0 is accepted.
 - Jika Sig. \leq 0,05, then H_0 is rejected.
- (Ghozali, 2018)

III. RESULT AND DISCUSSION

A. Result

Pretest was conducted to each class before the first meeting. At the first meeting, the general material of SPLDV and graphical method to solve SPLDV was given to both experimental and control class. In experimental class, the students were formed into several groups and they used learning media; RME-based teaching media assisted by Pixton application. In control class, the students were taught conventionally using lecturing method. In the second meeting, each class learned material for solving SPLDV using the substitution and elimination methods. Finally, in the third meeting, each class was given SPLDV completion material using a combined method (substitution and elimination) as well as the application of SPLDV based on real life. In this study, most of the eighth-grade junior high school students liked to read stories in the form of pictures. When researchers used comic teaching media, it was easier for students to understand the material and attract students' attention to read it. After

the third day of research was completed, posttest questions were given to see the effect of each class.

The following is the description of students' mathematical problem-solving ability before and after the treatment is given.

- a) The results of pretest and posttest of students' mathematical problem solving in experimental class.

Table 1.
Pretest Result in Experimental Class

Descriptive Statistics (Before being given the treatment)					
	N	Minimum	Maximum	Mean	Std. Deviation
Result	33	10	95	44.55	16.074

Table 2.
Posttest Result in Experimental Class

Descriptive Statistics (After being given the treatment)					
	N	Minimum	Maximum	Mean	Std. Deviation
Result	33	65	100	87.42	8.397

As seen from Table 1 and Table 2, it was found that the average pretest result was 44.55 and the posttest result was 87.42. From the results of the analysis in the table above, the students' ability to solve problems for the experimental class increased after being given treatment. This is in line with research conducted by Jamil, et al. that giving pretest and posttest can improve student learning outcomes (Jamil et al., 2021).

b) The results of pretest and posttest of students' mathematical problem solving in control class

Table 3.
Pretest Result in Control Class

Descriptive Statistics (Before being given the treatment)					
	N	Minimum	Maximum	Mean	Std. Deviation
Result	31	5	65	43.06	15.421

Table 4.
Posttest Result in Control Class

Descriptive Statistics (After being given the treatment)					
	N	Minimum	Maximum	Mean	Std. Deviation
Result	29	5	75	43.45	22.043

Based on Table 3 and Table 4, it was found that the average pretest result was 43.06 and the posttest result was 43.45. From the results of the analysis in the table above, that the students' ability to solve problems for the control class increased slightly after being given treatment. This is in line with the research conducted by Novianti & Salim that giving pretest and posttest questions can have an impact on learning readiness; therefore, the scores would increase (Novianti & Salim, 2018).

The next step is to find out whether the pretest and posttest data for the experimental class and control class are normally distributed or not. The Kolmogorov-Smirnov test was used to test the normality. The analysis of normality

test both for experimental and control class for pretest data is displayed in the table below.

Table 5.
Normality Test of Pretest Data in Experimental and Control Class

Tests of Normality				
Class		Kolmogorov-Smirnov ^a		
		Statistic	Df	Sig.
Learning Outcome	Pretest Exp	.148	33	.066
	Pretest Cont	.154	31	.058

From the Table 5, the results of the pretest in experimental class obtained a Sig. value of $0.066 > 0.05$, and the control class obtained a Sig. value of $0.058 > 0.05$, indicating that the data is normally distributed. Because the data is normally distributed, a homogeneity test is then carried out to see whether the data used is homogeneous or not.

Table 6.
Test of Homogeneity of Pretest in Experimental and Control Class

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Learning Outcome	Based on Mean	.169	1	62	.682

From the Table 6, the pretest in experimental and control class obtained the value of $0.682 > 0.05$, indicating that the data was homogenous.

After the data of pretest was normally distributed and homogenous, the next step is to test for normality for posttest data. The result analysis of normality test

both in experimental and control class for posttest data can be seen as follows.

Table 7.

Test of Normality of Posttest Data in Experimental and Control Class

Tests of Normality				
Class		Kolmogorov-Smirnov ^a		
		Statistic	df	Sig.
Learning Outcome	Posttest Exp	.150	33	.058
	Posttest Cont	.146	29	.115

As seen from Table 7, the significance value obtained from the posttest data was $0.058 > 0.05$ and $0.115 > 0.05$, both for experimental and control class respectively, meaning that the data is normally distributed.

Then, homogeneity test is carried out to see the homogeneity data of posttest.

Table 8.

Test of Homogeneity of Posttest in Experimental and Control Class

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.

Table 9.

T-test Result Analysis

Independent Samples Test						
Levene's Test for Equality of Variances			t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)
Learning Outcome	Equal variances assumed	28.888	.000	10.626	60	.000
	Equal variances not assumed			10.118	35.096	.000

Learning Outcome	Based on Mean	28.888	1	60	.000
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Based on Table 8, the posttest results of experimental class and control class obtained the value of $0.000 > 0.05$, showing that the data is not homogeneous. However, T-test (independent sample t-test) is still possible to carry out, because the homogeneity test is not an absolute requirement (Hasyim et al., 2021). To test hypothesis, a t-test (independent sample t-test) is used.

T-test, namely the independent sample t-test, was used as a hypothesis testing tool. Because the purpose of the study was to find out the influence of RME-based teaching media assisted by the Pixton application on students' mathematical problem-solving abilities, this hypothesis test only used the posttest scores. Following are the results of the analysis of hypothesis testing using IBM SPSS Statistics 22 for windows.

Based on Table 9, the results of the analysis of hypothesis testing using the t-test obtained the value of Sig. (2-tailed) in the equal variances not assumed output table of $0.000 < 0.05$, meaning that H_0 was rejected and H_1 was accepted. It can be concluded that there is an influence of RME-based teaching media assisted by the Pixton application on students' mathematical problem solving abilities.

B. Discussion

The learning process using RME-based teaching media assisted by the Pixton application begins with remembering. The students are trying to recall material related to the material to be delivered, namely SPLDV (System of Linear Equations of Two Variables). Students are given directions to remember material of seventh-grade, namely PLSV (One Variable Linear Equation System) and relate this material to SPLDV material. This is the key to students' ability to solve problems, namely remembering and associating previous knowledge (Gozali et al., 2022). It also includes in the RME principle; topic relatedness. Setting the connection and integration between mathematical topics needs to be considered to support a meaningful learning process. (Muzaini, 2018).

In experimental class, RME-based teaching media assisted by the Pixton application was used. The students were given time to read and understand the material. If there were any questions, students feel free to ask. Then, students

were asked in groups to solve contextual problems using mathematical models and gave their opinions to solve the problems given. This is based on the characteristics of RME, namely the use of contextual problems, the use of models, student contributions, and interactive activities.

From the results of the study, there were differences in the values obtained by the experimental class and the control class. Seen from the average score of students' mathematical problem solving abilities, RME-based teaching media assisted by the Pixton application had higher score and was more influential than conventional learning method. This finding is in line with research conducted by Lestari & Saadati (2021) which states that the conventional learning process cannot be said to have a significant effect on students' abilities to solve problem solving problems. This is because students in the control class are not used to finding solutions to problem-solving questions on their own, so the students have difficulty in solving existing problems in the posttest questions. Contrarily, the students in the experimental class are getting used to finding and solving problem-solving questions on their own, because when given treatment, experimental class students discussed and exchanged information with each other. Therefore, the experimental class students could solve posttest questions (Sari, 2018). However, it is not yet known statistically whether there is a significant influence of

the use of RME-based teaching media assisted by the Pixton application on students' mathematical problem solving abilities, if only seen from the average results. Therefore, a statistical test was carried out with the t-test. Based on the results of the t-test analysis (independent sample t-test), it was found that learning using RME-based teaching media assisted by the pixton application was more influential than conventional learning.

IV. CONCLUSION

The application of RME-based teaching media assisted by the Pixton application is effectively used during the learning process to train students' mathematical problem-solving skills. In addition to, RME-based media assisted by the Pixton application is recommended so that teachers can use other fun teaching media to achieve the learning objectives that have been set.

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