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Comparison of Students' Mathematical Problem Solving Ability Between Macromedia Flash Media and PowerPoint Media in the Two Stay Two Stray Cooperative Learning Model

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Abstract
This study aims to determine the student's mathematical problem solving taught using Macromedia flash and PowerPoint media by applying the Two Stay Two Stray cooperative learning model. This study uses a quantitative approach to the type of quasi-experimental research and non equivalent control group research designs. The study population was students of class VIII Junior high school 3 Tanete Riaja consisting of 2 classes, namely classes VIII A and VIII B. Sampling in this study was by saturated sampling technique by selecting the entire population as a research sample. Data collection uses a mathematical problem-solving test. Data analysis techniques used descriptive statistical analysis and inferential statistical analysis. Based on the research results obtained by the ability to mathematical problem solving of class VIII students of Junior high school 3 Tanete Riaja by using the cooperative learning model type Two Stay Two Strays Macromedia flash media is very high as much as 51.8%, the ability of students to mathematical problem-solving in class VIII Junior high school 3 Tanete Riaja by using the Two Stay Two Stray cooperative learning model PowerPoint media is in the very high category of 48.1%. The application of the Two Stay Two Stray cooperative learning model with Macromedia flash media is more effective in improving the mathematical problem-solving abilities of VIII grade students at Junior high school 3 Tanete Riaja compared to the application of the Two Stay Two Stray cooperative learning model with PowerPoint media.

Keywords: *Macromedia Flash; PowerPoint; Two Stay Two Stray Cooperative Learning Model; Mathematical Problem Solving.*

INTRODUCTION

Education plays an important role in human life. Education is important because it can be a benchmark for the development of a nation. The better the quality of education, the more able the nation is to compete with other nations in various fields (Suraji et al., 2018). Therefore, improvements in efforts to improve the quality of education need to be carried out, one of which is by implementing quality learning. The quality of learning is determined by various factors, including using learning models and methods by considering the objectives, materials, and characteristics of students in the classroom. Improving the quality of learning needs to be carried out, including in mathematics learning. Mathematics learning as part of the learning process in schools has a significant role in increasing student competence. Mathematics is a general science that underlies the development of modern technology, has an important position in various scientific disciplines, and improves human thinking power (Rusmana & Isnaningrum, 2012).

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The goal to be achieved in mathematics lessons, according to the National Council of Teachers of Mathematics (NCTM) (2000: 7), is that students must have five mathematical abilities, one of which is: learning to solve problems (mathematical problem solving). Mulyono (2012) states that problem-solving usually involves some combination of concepts and skills in a new situation or a different situation. Then problem-solving is the application of concepts and skills. The function of problem-solving in mathematics learning, according to the National Council of Teachers of Mathematics (NCTM) (2000: 335), is an important tool for learning mathematics and as a provision for students' knowledge and tools to formulate and solve problems according to what has been learned in school. Meanwhile, Wena (2011) stated that problem-solving ability is seen as a process to find a combination of a number of rules that can be applied to overcome a new situation. So problem-solving is part of the objectives of learning mathematics which is very important because in the learning process and its completion, students can gain experience using the knowledge and skills they already have to be applied in problem-solving that is not routine.

The process of solving such problems is carried out by students when they are faced with problems they find themselves or problems that are deliberately given in the learning process. This method aims to provide students with basic and technical skills to solve problems rather than just being confused with a certain amount of data or information that must be memorized. In other words, the teacher provides students with provisions on the ability to solve problems using scientific rules about techniques and steps for critical and rational thinking. This is emphasized by Suyanto (2012) that the provision of abilities about the basic rules and problem-solving techniques will be very useful for students to be applied in the problem-solving process in everyday life. According to O'Connell (2007: 17), guiding students to solve problems requires the following steps: (1) understanding the problem; (2) planning the resolution of the problem; (3) trying the plan; (4) checking the answers, and (5) reflecting on what has been done. Furthermore, according to Herman Hudojo (2001; 177-186), the systematic instructions for solving problems are as follows: (1) understanding the problem, (2) problem-solving planning, (3) carrying out problem-solving planning, and (4) looking back at problem-solving.

Based on an interview with one of the mathematics teachers at SMPN 12 Barru, information was obtained that the mathematical problem-solving ability of grade VIII students of SMPN 12 Barru is still low; most students think that mathematics is a difficult subject, some students have difficulty in understanding the mathematical formulas submitted by the teacher in front of the class and it is difficult to apply them in solving problems. Some students have difficulty stating everyday events in the language of mathematics. There are still students who do unsystematic questions. Some students just count the numbers on the given questions without understanding the meaning of the questions and the meaning of each step of solving the problem. Based on data on the learning outcomes of class VIII students in semester II of the 2020/2021 school year in mathematics subjects, there are 56% of students whose scores are below the minimum completion criteria set by the school, namely 80.

The learning process certainly influences students' low mathematical problem-solving ability in the classroom. The teacher-centered learning process with the lecture method causes students not to be actively involved in the classroom. As a result, the knowledge gained by students is stored only in short-term memory, not lasting long because students do not construct their own knowledge. Some students are also reluctant and embarrassed to ask the teacher if given the opportunity, which impacts students' low math problem-solving ability.

The selection of learning models and methods is one solution to creating a quality learning process. One learning model that gives students space to be actively involved in learning is the cooperative learning model. The cooperative learning model is a learning model that involves students in certain groups. One type of cooperative learning model is the Two Stay Two Stray. Two Stay Two Stray type cooperative learning gives each group the opportunity to share knowledge and experiences with other groups. In the learning process of Two Stay Two Stray, two group members stayed, and two members

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visited other groups (K. E. Lestari & Yudhanegara, 2015). With Two Stay Two Stray learning, students get the opportunity to express their mathematical ideas both orally and in writing through discussions with their respective group friends as well as with other groups. Lubis (2018) stated that students' learning outcomes using the Two Stay Two Stray learning model were higher than those of students taught using conventional learning. In addition to the use of learning models, teachers also need to use appropriate learning media.

Macromedia flash is a presentation-making media that can deliver messages or learning materials that are packaged in the form of readings, photos, animations, and videos designed with the expertise to make two-dimensional animations; on the other hand, PowerPoint media is a presentation-making media that can deliver messages or learning materials packaged in the form of readings, photos, animations, and videos combined in one whole. Both media are presentation media that can display learning materials not only in writing but in the form of pictures, animations, and videos that can attract attention and foster student motivation in paying attention to learning materials so that they can help students understand the concepts of the material presented by the teacher (Sanaky, 2013: 147-148).

Based on research conducted by Nasrullah (2012) regarding the use of Macromedia flash, it can be concluded that by using Macromedia flash, students learn better and respond positively. In her research, Gina Ratna Juwita (2017) also concluded that the use of Microsoft PowerPoint significantly influenced students' interest and learning outcomes in mathematics (Juwita, 2017).

Another study was conducted by Mimi Handayani, Mukhni, and Mirna (2014), which concluded that the Two Stay Two Stray type cooperative learning model was better than conventional learning on the final math test results of grade VIII students of SMP Negeri 13 Padang (Handayani et al., 2014). Based on these descriptions, the researcher wanted to compare the mathematical problem-solving ability of grade VIII students of SMPN 12 Barru who were taught using a Cooperative Learning Model type Two Stay Two Stray with Macromedia flash media and PowerPoint media.

METHOD

This research is experimental research with a quasi-experimental type of research. Quasi-experimental research is the development of a true experimental design that is difficult to do (Sugiyono, 2015). The research design used is a non-equivalent control group design. In this design, two experimental groups were given treatment. Both experimental groups were given pretests, treatments, and post-tests. In experimental group 1, treatment was given in the form of the use of Macromedia flash media, and experimental group 2 was given treatment in the form of using PowerPoint media, with each using a Cooperative Learning Model type Two Stay Two Stray. The study design is shown in table 1**.**

Table 1. Research Design

Group	*Pretest*	*Treatment*	*Posttest*
Experiment 1	O_1	X_1	O_2
Experiment 2	O_3	X_2	O_4

Information:
X1 = Treatment in experimental group 1 with TS-TS model of Macromedia flash media
X2 = Treatment in experimental group 2 with TS-TS model of PowerPoint media
O1 = Experimental group value 1 before being taught with the TS-TS model of Macromedia flash media.
O2 = Experimental group value 1 after being taught with the Macromedia flash media TS-TS model.
O3 = Experimental group value of 2 before being taught with the PowerPoint media TS-TS model
O4 = Experimental group value 2 after being taught with the TS-TS model of PowerPoint media.

The population in this study was all class VIII students of SMPN 12 Barru, Barru district, which consisted of two classes, namely class VIII A and class VIII B. Sampling technique used in this study was a saturated sampling technique by selecting all members of the population as a research sample. Class VIII A consists of 27 students as experimental group 1, and class VIII B with a total of 27 students as experimental group 2. Data collection in this study used a mathematical problem-solving ability test in the form of a description test. Data analysis techniques use descriptive statistical analysis and inferential statistical analysis.

RESULT AND DISCUSSION

Result

Description of Mathematical Problem Solving Ability of Class VIII A Students of SMPN 12 Barru Using a Two Stay Two Stray Learning Model with Macromedia Flash Media

The results of the mathematical problem-solving ability test for class VIII, A students of SMPN 12 Barru before and after being taught with the Two, Stay Two Stray learning model of Macromedia flash media can be seen in table 2.

Table 2. Descriptive Statistical Values of Pretest and Posttest Results of Experimental Group 1

Statistics	Grade Class VIII A	
	Pretest	***Posttest***
Sample count	27	27
Lowest value	10	50
Highest rated	67	90
Average value	43,48	71,85
Standard deviation	15,090	11,892
Variance Value	227,721	141,439

Based on table 2, it is known that there is an increase in student scores. The average value of the pretest was 43,48. After treatment, the average post-test value was 71,85. This means that there is an increase in student scores after being treated with the application of the Two Stay Two Stray learning model on Macromedia flash media. After obtaining these data, the level of mathematical problem-solving ability of class VIII A students of SMPN 12 Barru is categorized in table 3.

Table 3. Categories Of Students' Mathematical Problem-Solving Ability Levels Experimental Class 1

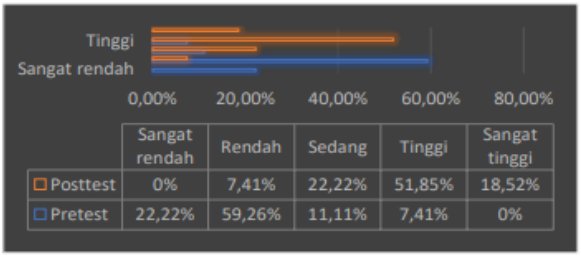

Table 3 shows that students' pretest scores are generally in a low category. However, after treatment by applying the Two Stay Two Stray type cooperative learning model with Macromedia flash media, the posttest scores of students were mostly in the high category with a percentage of 51.8%, and none of the students scored in the very low category.

Description of Mathematical Problem Solving Ability for Class VIII B Students of SMPN 12 Barru Using the Two Stay Two Stray Learning Model with Powerpoint Media

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The results of the mathematical problem-solving ability test for grade VIII B students of SMPN 12 Barru before and after being taught with the Two Stay Two Stray learning model of PowerPoint media can be seen in table 4.

Table 4. Descriptive Statistical Values of Pretest and Posttest Results of Experimental Group 2

Statistics	Grade Class VIII A	
	Pretest	***Posttest***
Sample count	27	27
Lowest value	5	45
Highest rated	70	90
Average value	32,25	68,96
Standard deviation	18,875	13,625
Variance Value	359,276	185,652

Based on table 4, it is known that there is an increase in student scores. The average value of the pretest was 32.25. After treatment, the average post-test score was 68.96. This means that there is an increase in student scores after being treated by applying the Two Stay Two Stray learning model for PowerPoint media. After obtaining these data, the level of mathematical problem-solving ability of class VIII B students of SMPN 12 Barru is categorized in table 5.

Table 5. Categories of Students' Mathematical Problem-Solving Ability Levels Experimental Class 2

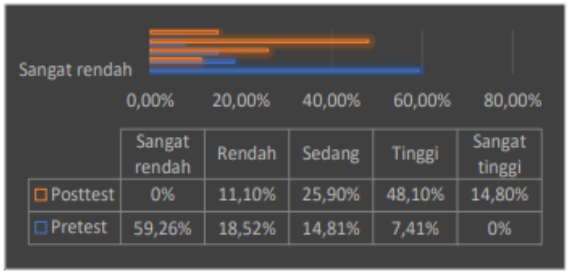

Table 5 shows that, in general, students' pretest scores are in the very low category. However, after treatment with the Two Stay Two Stray learning model with PowerPoint media, the posttest scores of students were mostly in the high category with a percentage of 48.1%, and none of the students scored in the very low category.

Differences in Mathematical Problem Solving Ability of Grade VIII Students of SMPN 12 Barru Using Macromedia Flash Media with Powerpoint Media in the Two Stay Two Stray Learning Model

- *Normality Test*

The difference test is carried out on the data of the value of the increase (gain). The normalized gain formula calculates the magnitude of the increase. Next, the gain normality test results are shown in Table 6.

Table 6. Gain Analysis Normality Test Experimental Group 1 and Experimental Group 2

Gain Analysis	Sig Value	
	Experiment 1	**Experiment 2**
	0.200	0.180

The significance value in the results of the gain analysis normality test of experiment group 1 is 0.200 greater than α (0.200 > 0.05), so it can be concluded that the gain analysis data in experiment group 1

are normally distributed. In experimental group 2, a significance value of 0.180 was obtained greater than α (0.180 > 0.05), so it can be concluded that the gain analysis in experimental group 2 was normally distributed.

- *Homogeneity Test*

Table 7. Data Homogeneity Test of Experimental Group 1 and Experimental Group 2

Homogeneity	Sig Value
	0.988

Based on table 7, the significance value of 0.988 is greater than the α (0.988 > 0.05), so it can be concluded that the data from experimental group 1 and experimental group 2 are homogeneous.

- *Hypothesis Test*

Hypothesis test using an independent sample t-test. The statistical hypothesis testing is as follows:

$H_0 : \mu_A = \mu_B$

$H_1 : \mu_A \neq \mu_B$

Information:

H_0 = There is no difference in the mathematical problem-solving ability of grade VIII students of SMPN 12 Barru using Macromedia flash media with PowerPoint media, a cooperative learning model type Two Stay Two Stray
H_1 = There are differences in the mathematical problem-solving ability of grade VIII students of SMPN 12 Barru using Macromedia flash media with PowerPoint media, a cooperative learning model type Two Stay Two Stray.

From the results of the t-test of two free samples, a p-value (2-tailed) = 0.059 was obtained. Since (p-value)/2=0.029<0.05, it is concluded that H1 is accepted. This means that there is a difference in the average level of mathematical problem solving of grade VIII students of SMPN 12 Barru between classes taught using the Two Stay Two Stray learning model Macromedia flash media and classes taught using the Two Stay Two Stray media PowerPoint learning model.

Comparison of The Effectiveness of Mathematical Problem Solving Ability of Grade VIII Students of SMPN 12 Barru Who Were Taught Using Macromedia Flash Media and Powerpoint Media in a Cooperative Learning Model Type Two Stay Two Stray

To find out effective learning media, a relative efficiency formula is used. Table 8 presents the variance values of data gain in experimental group 1 and experimental group 2.

Table 8. The variance of the Gain Value of Experiment 1 and Experiment 2

Varians	*Posttest*	
	Experiment 1	**Experiment 2**
	209.011	292.909

Based on Table 8, it is obtained:

$$R(\theta_2, \theta_1) = \frac{E(\theta_1 - \theta)^2}{E(\theta_2 - \theta)^2} = \frac{209,011}{292,909} = 0.713$$

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Since R = 0.713 < 1, relatively θ_1 is more efficient than θ_2. This means that the value variance of class VIII A students who are taught with the Two Stay Two type cooperative learning model Stray Macromedia flash media is more effective than the value variance of class VIII B students who are taught using the Two Stay Two type cooperative learning model Stray PowerPoint media.

Discussion

The mathematical problem-solving ability of students who were taught using the Two Stay Two Stray type cooperative learning model with Macromedia flash media has increased. Researchers use Macromedia flash media that make students pay more attention and listen to the material presented by the teacher. The use of Macromedia flash media is the first time in their classroom learning process, so students are interested and enthusiastic about following the learning process. In addition to using media, researchers also apply a Cooperative learning model type Two Stay Two Stray, which can actively involve students in the learning process. Students are actively involved in discussion activities with their groupmates and friends from other groups. This is in line with the results of research by Umam (2016) that students who are taught using Macromedia flash get higher learning outcomes.

The mathematical problem-solving ability of students who were taught using the Two Stay Two Stray type of cooperative learning model with PowerPoint media has increased. Researchers use PowerPoint media that makes students more focused on listening to the material presented by the teacher. In addition to using PowerPoint media, researchers also applied a Cooperative learning model type Two Stay Two Stray, which makes students active in the learning process. This is in accordance with the results of Juwita's research (2017) that using Microsoft PowerPoint can increase student interest and learning outcomes.

Based on the results of hypothesis testing using the t-test, the significance value of 0.059/2 = 0.029 < 0.05, it can be concluded that there is a difference in the average mathematical problem-solving ability of grade VIII students of SMPN 12 Barru who were taught using the Two Stay Two type cooperative learning model Stray Macromedia flash media and those taught using the Two Stay Two Stray type cooperative learning model with PowerPoint media. Using the relative efficiency formula, a value of R < 1 (0.713 < 1) was obtained, so it was concluded that the application of the Two Stay Two type cooperative learning model Stray Macromedia flash media was more effective in improving the mathematical problem-solving ability of grade VIII students of SMPN 12 Barru compared to using the Two Stay Two type cooperative learning model Stray media PowerPoint. This is in accordance with the results of research by Edi & Tatik (2017) that the use of flash-based multimedia is more effective than learning using PowerPoint media.

CONCLUSION

Based on the results of the analysis and discussion that have been previously stated, the conclusions obtained after conducting this study are:

1. The mathematical problem-solving ability of students taught using Macromedia flash media in applying the Two Stay Two Stray type cooperative learning model is in the high category with a percentage of 51.8%.
2. The mathematical problem-solving ability of students who are taught using PowerPoint media in the application of the Two Stay Two Stray type cooperative learning model is in the high category with a percentage of 48.1%.
3. There are differences in mathematical problem-solving ability taught using Macromedia flash media with PowerPoint in the Type Two Stay Two Stray (TS-TS) cooperative learning model in grade VIII students of SMPN 12 Barru.
4. Macromedia flashes media in the Type Two Stay Two Stray (TS-TS) cooperative learning model is more effective in understanding mathematical concepts than PowerPoint media in grade VIII students of SMPN 12 Barru.

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REFERENCES

Abdurrahman, Mulyono. (2012). *Anak Berkesulitan Belajar*. Jakarta: Rineka Cipta.

Edi, I., & Tatik, S. (2017). Implikasi Multimedia Interaktif Berbasis Flash terhadap Motivasi dan Prestasi Belajar Matematika. Beta: Jurnal Tadris Matematika, 10(1), 33-50.

Handayani, M., Mukhni, & Mirna. (2014). Pengaruh Model Pembelajaran Kooperatif Tipe Two Stay Two Stray terhadap Pemahaman Konsep Matematis Siswa. *Jurnal Pendidikan Matematika,* 3(1), 56–60.

Herman Hudojo. (2001). *Pengembangan Kurikulum dan Pembelajaran Matematika.* Malang: JICA Universitas Negeri Malang.

Juwita, G. R. (2017). *Pengaruh Penggunaan Microsoft Powerpoint terhadap Minat dan Hasil Belajar Matematika Peserta Didik pada Materi Segitiga dan Segiempat (Studi Eksperimen terhadap Peserta Didik Kelas VII SMP Negeri 1 Rancah Kabupaten Ciamis Tahun Pelajaran 2011/2012)*. IAIN Syekh Nurjati Cirebon.

Umam, K., & Yudi, Y (2016). Pengaruh Menggunakan Software Macromedia Flash 8 Terhadap Hasil Belajar Matematika Siswa Kelas VIII. *Kalamatika: Jurnal Pendidikan Matematika,* 1(1), 84-92.

Lestari, K. E., & Yudhanegara, M. R. (2015). *Penelitian Pendidikan Matematika*. Bandung: Reflika Aditama.

Lubis, M. A. (2018). Pengaruh Model Pembelajaran Kooperatif Tipe Two Stay Two Stray (TSTS) dan Artikulasi Terhadap Hasil Belajar Siswa Pada Materi Ekosistem Di SMA Negeri 1 Sibabangun Kabupaten Tapanuli Tengah. *Jurnal Biolokus*, 1(2), 117–122. https://doi.org/10.30821/biolokus.v1i2.352

NCTM. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

O'Connell, Susan. (2007). *Introduction to problem solving*. Portsmouth: Heinemann.

Rusmana, I. M., & Isnaningrum, I. (2012). Efektivitas Penggunaan Media ICT dalam Peningkatan Pemahaman Konsep Matematika. *Formatif*, 2(3), 198–205. https://doi.org/10.30998/formatif.v2i3.102

Sanaky, Hujair AH. *Media Pembelajaran Interaktif-Inovatif*. Cet. I; Yogyakarta: Kaukaba Dipantara, 2013.

Sugiyono. (2015). *Metode Penelitian Kombinasi.* Bandung: Alfabeta.

Suraji, Maimunah, & Saragih, S. (2018). Analisis Kemampuan Pemahaman Konsep Matematis dan Kemampuan Pemecahan Masalah Matematis Siswa SMP pada Materi Sistem Persamaan Linear Dua Variabel (SPLDV). *Suska Journal of Mathematics Education*, 4(1), 9–16. https://doi.org/10.24014/sjme.v3i2.3897

Suyanto. (2012). *Calon Guru dan Guru Profesional.* Yogyakarta: Multi Pressindo.

Wena, Made. (2011). *Strategi Pembelajaran Inovatif Kontemporer Suatu Tinjauan Konseptual Operasional.* Jakarta: Bumi Aksara.