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Improving Students Problems Solving Capacity Through The Discovery Learning Model Assisted By Autograph Media

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Abstract
This research aims to find out: (1) whether there is a significant increase in students' mathematical problem-solving abilities through the discovery learning model assisted by autograph media; (2) whether there is an interaction between students' initial mathematical abilities and students' mathematical problem-solving abilities; and (3) how students respond to the discovery learning model assisted by autograph media. This research is quasi-experimental. The population of this study was class XI SMA N 02 Rantau Selatan, and two classes were selected as the sample. The experimental class received discovery learning assisted by autograph media, and the control class received conventional learning. The instruments used consist of: (1) a test of students' mathematical problem-solving abilities; (2) a questionnaire of students' responses to the Discovery Learning model assisted by Autograph media. The results of the research show that (1) there is a significant increase in students' mathematical problem-solving abilities; (2) there is an interaction between students' initial mathematical abilities and students' mathematical problem-solving abilities; and (3) there is a positive response to the Discovery Learning model assisted by Autograph media.

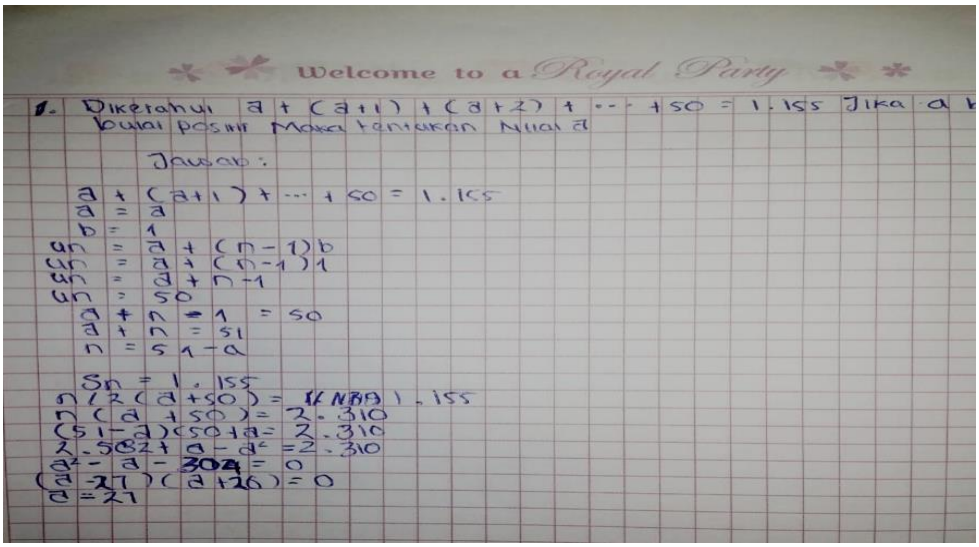
Keywords: discovery learning; autograph media; problem-solving ability.

Introduction

Education is a conscious effort made by humans to change their lives for the better through guidance, teaching or training activities. One of the educations that is closely related to everyday life is mathematics education. Mathematics is a science that is obtained by thinking, reasoning and calculating. Learning and mastering mathematics is a must for every individual. If we are familiar with mathematics, we will be better able to solve problems in everyday life (Musthofa et al., 2023).

Mathematics is also closely related to other sciences, therefore mathematics needs to be taught from an early age because it is useful for equipping children with the ability to think logically, analytically, systematically, critically and creatively as well as the ability to work together (Suningsih et al., 2023). With this provision, it is hoped that children will be able to live their future lives well which are full of competition, challenges and changes in the times (Nifrani et al., 2024). One of the goals in learning mathematics is to develop basic mathematical skills in order to maximize learning outcomes.

One way to maximize mathematical learning outcomes is to improve problem-solving skills. Mairing (2018: 3) stated that everyone should learn and have the ability to solve problems. In addition, the reason students must have problem-solving skills is because these abilities are included in the KD (Basic Competencies) that students from grades I to XII must have (Wildan et al., 2023). However, the reality in the field is not in accordance with what is expected. Based on the results of interviews with teachers at the place where the researcher conducted PPL, it was concluded that teachers had tried to apply learning models that could enliven the learning atmosphere so that it was not tense. However, this has not been fully achieved because there are some students who think that mathematics is very difficult so that many students' learning outcomes do not improve. In addition, researchers pay attention to the way students answer questions related to everyday life. There are still many students who do not understand the questions and make appropriate solutions. The following are examples of student answers:



Gambar 1. Jawaban Siswa Berdasarkan Pemikiran Sadar

Based on the answers above, it can be concluded that children have not been able to make steps to solve according to what is known in the problem which causes the

final result to be inaccurate. Another finding is that there are still many students who complete assignments by copying their friends' answers without discussing with their friends so that students are unable to explain what they are doing. Students are also not fully able to use mathematics in everyday life meaningfully. Therefore, researchers want to add one reference to improve students' mathematical problem-solving abilities through the Discovery Learning model assisted by Autograph media. The Discovery Learning model was carried out in the study because this model involves all students' abilities to the maximum to think critically, logically and analytically. In mathematics learning, especially the Discovery Learning model, it is still rarely used by teachers. Students tend to accept explanations from teachers without making new discoveries. Lestari (2020:8) states that the Discovery Learning model is a component of educational practice which includes teaching methods that promote active learning, are process-oriented, self-directed, self-searching, and reflective. Therefore, the results obtained will be remembered longer and are not easily forgotten by students. Through this learning model, students are also directed to solve the problems they face themselves. This habit will be applied in everyday life.

In the era of technological development today, we can use computers to facilitate the learning process, especially mathematics learning. One of the popular computer-based tools used is Autograph. Unfortunately, students have not used or even known the Autograph application. Computer-based learning innovations are very well integrated into learning mathematical concepts such as function graphs, geometric transformations, calculus and statistics. This learning media can improve scientific discourse that directs students to problem solving and investigative learning experiences. By utilizing Autograph media that is collaborated with the Discovery Learning model, it will help students more in learning mathematics. The use of Autograph can be used to support the process of observing, thinking critically, logically and analytically. So that by using collaboration between Discovery Learning and Autograph, students' mathematical problem-solving abilities can be improved.
Based on the description above, researchers are interested in conducting research entitled "Improving Students' Mathematical Problem-Solving Ability Through the Discovery Learning Model with Autograph Media".

Research Methods

This type of research is quantitative research with experimental research methods. The research design used is Quasi Experiment design. The research was conducted at SMA Negeri 02 Rantau Selatan. The population in this study were 286 students in grade XI and the sample in this study were XI IPA 1 & XI IPS 2 students at SMA N 02 Rantau Selatan. Data collection techniques were in the form of test techniques (by providing test instruments to determine students' problem-solving

abilities) and non-tests (by providing questionnaires). Data analysis techniques were carried out using normality tests, homogeneity tests, and two-way ANOVA. While data analysis for non-tests was carried out descriptively. RESULTS AND

Results and Discussions

The material taught in this study was Linear Programs. To determine the learning outcomes of the two groups, after being given different treatments between the experimental and control groups, both groups were given a post-test that had been tested first. The results of the validity and reliability of the mathematical problem-solving ability test instrument can be seen in the following table:

Table 1. Validity and Reliability Results of the Mathematical Problem Solving Ability Test Instrument

No	Validity Correlation Coefficient (r)	r_{tabel}	colerasion	Interprestasion	Reliability Reliability Coefficient	corelasion	Interprestasion
1	0,792	0,334	Valid	Baik	0,806	Reliabel	Baik
2	0,792		Valid	Baik		Reliabel	
3	0,528		Valid	Cukup baik		Reliabel	
4	0,602		Valid	Cukup baik		Reliabel	
5	0,792		Valid	Baik		Reliabel	

The table above shows that the mathematical problem solving ability test instrument can be used as a measuring tool to determine the level of students' mathematical solving ability.

The normality test using the Kolmogorov Smirnov test can be seen in the following table:

Tabel 2. Uji Normalitas *Pre-Test*

	Kolmogorov-Smirnov[a]		
	Statistic	Df	Sig.
Experimental Data	.128	35	.162
Control Data	.140	35	.080

Tabel 3. Uji Normalitas *Post-Test*

	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.

Experimental Data	.141	35	.077
Control Data	.140	35	.080

Because the significance value is greater than 0.05, the data for both classes are normally distributed. The homogeneity test used in this study is the Levene statistical test. The homogeneity test is to show that the sample data comes from a population that has the same variance. Data is said to be homogeneous if the significance value is > 0.05.

Tabel 4. Uji Homogenitas Pretest Test of Homogeneity of Variances

dataPreTest

Levene Statistic	df1	df2	Sig.
1.262	1	68	.265

Tabel 5. Uji Homogenitas Post Test Test of Homogeneity of Variances

dataPostTest

Levene Statistic	df1	df2	Sig.
1.690	1	68	.198

N-Gain is used to determine the increase in students' abilities between before and after treatment.

Tabel 6. N-Gain

Categories	Scor	Eksperimental			Control		
		N	average	SD	N	average	SD
Keseluruhan	KAM	35	13,88	7,60	35	10,51	1,82
Keseluruhan	N-Gain	35	0,44	0,20	35	0,21	0,13
KAM tinggi	N-Gain	5	3,85	0,77	1	0,13	0,1
KAM sedang	N-Gain	18	8,91	0,49	10	3,87	0,38
KAM rendah	N-Gain	3	2,74	0,22	24	2,39	0,18

The table shows that overall the average N-Gain of the experimental class is higher than the average N-Gain of the control class. This means that descriptively it can be concluded that the increase in mathematical problem-solving abilities of students who receive Discovery Learning assisted by Autograph media is better than the increase in mathematical problem-solving abilities of students conventionally.

The testing of the formulated hypothesis was analyzed using Two-Way Analysis of Variance with the help of the SPSS 22 program.

Tabel 7. Hasil Uji Two Way Anava Tests of Between-Subjects Effects

Dependent Variable: N_Gain

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6948.869[a]	4	1737.217	6.068	.000
Intercept	35614.759	1	35614.759	124.393	.000
Pembelajaran	29.810	1	29.810	.104	.748
KAM	3865.372	2	1932.686	6.750	.002
Pembelajaran * KAM	1389.204	1	1389.204	4.852	.031
Error	18610.117	65	286.309		
Total	59483.000	70			
Corrected Total	25558.986	69			

Based on the table above, it can be seen that for the interaction between learning and initial mathematical ability (KAM), a significant value of 0.031 was obtained. This means that 0.031 <0.05. It can be concluded that there is an interaction between learning and students' initial mathematical ability towards improving students' mathematical problem solving abilities.

Students' Mathematical Problem Solving Ability

Based on the results of data analysis, it was concluded that there was a significant increase in the mathematical problem solving abilities of students who received discovery learning model learning assisted by autograph media. When a problem is given, students will think about how to find something related to the problem at hand and solve it on the answer sheet. During the data collection process, students will indirectly connect the problem with the knowledge they have. The learning process emphasizes students to be active in order to find something related to the problem at hand. After students are faced with a problem, then students will carry out verification as a continuation of data processing. At the proof stage, students will carefully examine to prove whether or not the hypothesis is set with alternative findings. When the process of checking the hypothesis, students think consciously as a form of problem-solving activity so that the accuracy of proving the hypothesis remains consistent from the beginning to the end of the process. Autograph media also helps improve problem-solving skills. Autograph media is used to make it easier for students to understand the questions given.

Interaction of Students' Initial Mathematical Ability on Mathematical Problem-Solving Ability

Students' initial mathematical ability was obtained from the pre-test results which were then analyzed together with the N-Gain results. Based on the results of the analysis, it was concluded that there was an interaction of students' initial mathematical ability. This means that the discovery learning model has an effect on students' mathematical problem-solving abilities.

Student Response to the Discovery Learning Model Assisted by Autograph Media Student responses to the discovery learning model assisted by autograph media which were analyzed per item through a questionnaire were included in the good category. This shows that discovery learning assisted by autograph media received a positive response from students. The learning process through this model can increase student activity and interest in learning mathematics.

Conclusion and Sugestion

Based on the results of data analysis and research findings during Discovery Learning learning assisted by Autograph media by emphasizing students' mathematical abilities, the following conclusions were obtained: There is a significant increase in students' mathematical problem-solving abilities through the discovery learning model with autograph media. There is an interaction between students' initial mathematical abilities and mathematical problem-solving abilities. Students' responses to discovery learning assisted by autograph media provide positive responses. Discovery learning assisted by autograph media can improve students' ability to solve problems and increase students' interest in mathematics lessons. Conduct comparative studies between Discovery Learning and other learning models, such as Problem-Based Learning or Inquiry-Based Learning. Research can compare the impact on learning outcomes, motivation, and long-term retention.

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References

Musthofa, A. F. D., Nurcahyo, A., Setyono, I. D., Rejeki, S., Ishartono, N., & Suningsih, A. (2023). *Development of gamification for high school mathematics learning to encourage students' interest in learning*. 020072. https://doi.org/10.1063/5.0141608

Nifrani, N., Sutiarso, S., Firdaus, R., & Suningsih, A. (2024). *Development of FlipaClip-Based Learning Media to Improve Problem-Solving Skills*. *7*(1), 20–31.

Suningsih, A., Ketut Budayasa, I., & Ismail. (2023). Think Talk Write : Efforts to Improve Students' Critical Thinking In A Rural School Environment. *BIO Web of Conferences*, *79*, 05007. https://doi.org/10.1051/bioconf/20237905007

Wildan, W., Sutiarso, S., Firdaus, R., & Suningsih, A. (2023). Hubungan kemampuan penalaran matematis dan pemecahan masalah matematika materi matrik terhadap prestasi belajar. *Jurnal Pendidikan Informatika Dan Sains*, *12*(2), 320–330. https://doi.org/10.31571/saintek.v12i2.6678

Jana, P., & Fahmawati, A. A. N. (2020). *Model Discovery Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah*. AKSIOMA: Jurnal Program Studi Pendidikan Matematika, 9(1), 213–220. https://doi.org/10.24127/ajpm.v9i1.2157

Lestari. (2020). *Discovery Learning*. Yogyakarta:Deepublish.

Lestari & Yudhanegara. (2015). *Penelitian Pendidikan Matematika*. Bandung:Reflika Aditama.

Mairing. (2018). *Pemecahan Masalah Matematika*. Bandung:Alfabeta.