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An Analysis of Problem Solving Ability in Social Studies Subject Using Problem Based Learning Model

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Abstract

Research has been carried out which to compare the problem-solving abilities taught through Problem Based Learning assisted by Geogebra Software with direct learning assisted by Geogebra Software. This research is a quasi-experimental research. The population in this study were all class VIII students at junior high school, SMP Negeri 11 Surabaya. The instrument used in the research was a problem solving ability test in the form of a description with 10 questions. The regression equation in the Experiment class is $YE = 45.21 + 0.86XE$ and the regression equation for the control class is $YK = 33.26 + 0.31XK$. Inferential analysis of the data was carried out using Analysis of Covariance (Anacova). The research results obtained were that students' problem solving abilities through the problem-based learning model assisted by GeoGebra software were higher than students who used the direct learning model assisted by GeoGebra software.

Keywords: Problem Based Learning, Geogebra Software, Problem Solving Ability

1. INTRODUCTION

Social Sciences as part of the school curriculum, plays a very important role in efforts to increase graduates who are able to act on the basis of social thinking, namely logically, rationally, critically, systematically in solving problems of daily life or in studying other sciences, by Therefore, efforts to improve the quality of education and learning in Social Sciences in particular are a top priority for educational researchers.

The ability to think socially is one of the factors that must be used as research material, one of which is the ability to solve social problems. According to Dahar (2020):, problem solving is a human activity that combines previously acquired concepts and rules, and is not a generic skill. This understanding means that when someone is able to solve a problem, then that person has a new ability. Meanwhile, Montague (2016); Prasetya et all. (2024), said that social problem solving is a complex cognitive activity accompanied by a number of processes and strategies. Social problem solving is a complex cognitive activity, as a process for overcoming a problem encountered and to solve it requires a number of strategies. Training students in problem solving in learning Social Sciences is not just expecting students to be able to solve the questions or problems given, but it is hoped that the habit of carrying out the problem solving process will enable them to live a life full of complex problems (Fadillah, 2020).

The importance of problem solving was stated by the National Council of Teachers of Mathematics (NCTM, 2022) stating that problem solving is an integral part of learning Social

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Sciences, so it should not be separated from learning Social Sciences. Furthermore, according to Ruseffendi (2016) problem solving skills are very important in Social Sciences, not only for those who will later study or study Social Sciences, but also for those who will apply them in other fields of study and in everyday life. .

Determining a model and approach to learning Social Sciences is the initial key in the teacher's efforts to increase students' Social Sciences abilities. Learning models or approaches that are varied and provide many learning options enable the development of students' potential. In this way, students are given the opportunity to develop according to their capacity, learning style and learning experience. Wahyudin, (2008) said that one important aspect of planning relies on the teacher's ability to anticipate needs and materials or models that can help students to achieve learning goals. It is also supported by Sagala (2021) that teachers must have methods in learning as strategies that can make it easier for students to master the knowledge provided.

There are many innovative models that are suitable and recommended in the 2013 curriculum to accommodate the scientific approach which is the core process standard of the 2013 curriculum. One of these models is the Problem Based Learning model or known as Problem Based Instruction (PBI), a model commonly used by teachers or researchers to determine problem solving abilities. states that problem-based learning is an interesting alternative learning model in traditional classroom learning. Arends (2008:41) states that the Problem Based Learning model is a learning model where students work on authentic problems with the aim of building their own knowledge, developing inquiry and high-level thinking skills, developing independence and self-confidence.

The problem-based learning model is a learning model that uses real world problems. These problems are used as a context for students to learn critical thinking and problem solving skills, as well as to gain essential knowledge and concepts from the subject matter (Kharida & Rusilowati, 2022). Lidinillah (2024) explains that Problem Based Learning is a learning approach that uses real world problems as a context for students to learn about critical thinking and problem solving skills, as well as to gain essential knowledge and concepts from lecture or lesson materials. Duch (2001) states that the basic principles that support the concept of Problem Based Learning predate formal education itself, namely that learning begins by posing problems, questions, or puzzles that make students want to solve them. Meanwhile, Roh (2023) states that Problem Based Learning is learning in the classroom that organizes or manages Social Sciences learning around problem solving and gives students the opportunity to think critically, propose their own creative ideas, and communicate with their friends socially.

Several studies have been carried out applying the Problem Based Learning Model as an effort to improve students' social problem solving abilities. Sumartini (2016) highlights that the increase in social problem-solving abilities of students who received problem-based learning was better than students who received conventional learning. In line with this, Noriza (2015) said that the problem-based learning model is effective for problem-solving abilities and social disposition in geometry material. Furthermore, Masri (2018) concluded in his research that the social problem solving abilities of students who received the PBM learning method were higher than students who received conventional learning. So the PBM learning method needs to be applied in the learning process. Yuhani (2018) concluded from his research that the

social KPM of students who used the PBM approach in their learning was better than the group of students who received regular learning in their learning. Meanwhile, Imam (2018) concluds that the social problem solving abilities of students who use problem-based learning are better than those who use regular learning.

However, in the process of implementing the Problem Based Learning Model, there are still obstacles such as: there are still students who have difficulty understanding the problem, students still have difficulty carrying out investigations individually or in groups for abstract concepts, and students have difficulty determining the solution to the problem given. Reflecting on these problems, one of the actions taken by teachers which they feel can overcome the problems of the Problem Based Learning Model is to use learning media designed with the help of computers.

There are many and varied computer programs that can be used, one of which is Geogebra. GeoGebra was developed by Markus Hohenwarter in 2001. According to Hohenwarter and Fuchs (2004), GeoGebra is a computer program (software) for teaching social sciences, especially calculus, geometry and algebra. GeoGebra is dynamic Social Sciences software (DMS) that can help teachers in learning Social Sciences in high schools or universities. GeoGebra is open source software under the GNU (General Public License) and can be obtained for free at www.GeoGebra.org. Majerek (2014) concluded that all students everywhere can be encouraged to study Social Sciences with GeoGebra.

Utilization of learning media using GeoGebra software provides immediate feedback to students. The media provided is seen as a stimulus. Any changes that occur when students use this media will immediately be given back by the computer. With the direct feedback provided by the computer when using GeoGebra-assisted media, students will also respond so that a learning process occurs that is in line with the independent curriculum.

2. METHOD

This research is a quasi-experimental research (quasi-experiment). The stages in this research are preliminary study, development and validation of learning tools, selection of research subjects, application of learning models, data analysis, findings, conclusions and suggestions

The population in this study were all class VIII students at SMP Negeri 11 Surabaya. The sampling process refers to the size of the population. The results of the observations revealed that: (1) class VIII consists of 7 (seven) parallel classes; (2) the distribution of students in each class is even, including students with high, medium and low abilities, as well as male and female students. The research sample was chosen randomly and assigned to class VIII-A students as the experimental class who were given the Problem Based Learning model assisted by Geogebra Software, class VIII-B students as the control class who were given the Direct Learning model assisted by Geogebra Software and class VII-C students as the test class try devices and instruments.

The data that will be analyzed in this research are the pretest results as accompanying variables and the posttest results as the dependent variable. Inferential analysis of data was carried out using Analysis of Covariance (Anacova). testing the effect of treatment will be more accurate if analyzed using Anacova rather than using anova (Hanafiah & Sukamto, 1991). Analysis of covariance (Anacova) is a combination of comparative and correlational tests, so that the

prerequisite test analysis for Anacova also uses prerequisite regression tests and Anova (Widihiarso, 2011). Ananova testing is carried out in the same way as anava, namely by calculating F, but the previous calculation changes due to the presence of covariables. The formula used is:

$$F^{*} = \frac{\frac{B-A}{(k-1)}}{\frac{A}{(n_B + n_K - 2k)}} \quad (1)$$

$$A = \sum_{j=1}^{k}\left\{\sum_{i=1}^{nj}(Y_{ij}-Y)^2 - \frac{\left[\sum_{i=1}^{nj}(Y_{ij}-Y)(X_{ij}-X)\right]^2}{\sum_{i=1}^{nj}(X_{ij}-X)^2}\right\} = SST_{x(adj)} \quad (2)$$

$$B = SST_y - \frac{(SPT)^2}{SST_x} \quad (3)$$

Information:
SPT: Total number of products
SST_x : The total sum of X's squares
SSTy : The total sum of Y's squares
K : Many groups
N : the number of students in groups with problem-based learning and direct learning groups

Figure 1. Anacova Testing

3. RESULT AND DISCUSSION

RESULT

The data analyzed in this research are the results of tests on students' problem-solving abilities and social disposition towards Social Sciences. The initial and final ability tests of the experimental class were attended by 30 students and the control class was attended by 31 students. This information is in the form of initial and final ability test results data.

Inferential Statistical Analysis (Anacova) Problem Solving Ability Inferential analysis of the test results of students' Social Problem Solving ability is aimed at testing the hypothesis, namely that students' Social Problem Solving ability in applying the Geogebra software-assisted problem-based learning model is higher than direct learning in class VIII of SMP Negeri 11 Surabaya . Statistically, it is still necessary to test the significance of differences using the Anacova statistical test. Before using the Anacova statistical test, the data normality test, homogeneity test, determining the linear regression model, independence test, linearity test, similarity test of two regression models, and parallelism test of two regression models must first be used.

Before the data is analyzed, the normality of the data is first tested as a requirement for quantitative analysis. This test was carried out to see whether the data from the Social Problem Solving ability test results were normally distributed in the control class and experimental class. The normality test results of the Social Problem Solving ability test in both classes were analyzed using the Liliefors test and the One Sample Kolmogorov-Smirnov Test with the help of the SPSS 16.00 program. The test results using the Liliefors test on students' Social Problem

Solving Ability data in the control class (Direct Model) obtained a value of LCount = 0.1520 and LTable = 0.2503. It turns out that LCount < LTable which means that the data obtained from the results of the Social Problem Solving Ability test of students in the control class (Direct Model) is normally distributed. Furthermore, the results of calculating data on students' Social Problem Solving Ability in the experimental class (Problem Based Learning Model) obtained a value of LCount = 0.1435 and LTable = 0.2503. It turns out that LCount < LTable which means that the data obtained from the results of the Social Problem Solving Ability test of students in the experimental class (Problem Based Learning Model) is normally distributed. Furthermore, the normality test results of the Social Problem Solving ability test in both classes were analyzed using the One Sample Kolmogorov-Smirnov Test with the help of the SPSS 16.00 program.

The data homogeneity test, namely testing the variance between the experimental class and the control class, is intended to determine whether the variance of the two classes is the same or different. Testing this hypothesis uses a variance test of two independent variables. It has been previously calculated that the samples in both classes in the initial and final ability tests are normally distributed. The initial ability test variance in the experimental class SE 2 = 185.42 and the initial ability test variance in the control class SK 2 = 132.45. So we get: F *count* = 185.42/132.45= 1.39 and $Ftable$ = 1.42 with v1 (numerator) = (30-1), v2 (denominator) = (31-1) and significance level α = 5%. Because F *count* < $Ftable$ then H 0 is accepted, meaning that the initial Social Problem Solving ability test data is homogeneous. For the final ability test variance in the experimental class SE 2 = 142.45 and the final ability test variance in the control class SK 2 = 87.01. So we get: F *count* = 142.45/87.01 = 1.64 and $Ftable$ = 1.82 with v1 (numerator) = (30-1), v2 (denominator) = (31-1) and significance level α = 5%. Because F *count* < $Ftable$ then H 0 is accepted, meaning that the final Social Problem Solving ability test data is homogeneous.

Based on the calculation of the students' Social Problem-Solving ability test results, the regression equation for the experimental class was YE = 45.21 + 0.86 XE and the regression equation for the control class was YK = 33.26 + 0.31. Based on data from the Social Problem-Solving ability test results of experimental class students, the regression equation YE = 45.21 + 0.86 XE was obtained. To test the significance of the coefficients of the regression equation, a hypothesis is formulated as follows: H 0: θ1 = 0 and H a: θ2 ≠0

Testing the hypothesis used analysis of variance using F statistics with the specified formula and criteria analyzed with the help of the SPSS 16.0 program. Based on the results of data calculations on Social Problem-Solving Ability in the Experimental class, F *= 114.24 was obtained and based on Table F, for α= 5% it was obtained: F (1− α,1:n−2) = F(0.95,1.30) = 4.17. The calculation results show that the F value* ≥F(0.95,1.31) which means H 0 is rejected and Ha is accepted. This means that there is a positive (significant) influence on the results of the Initial Ability test (X) on students' post-test results (Y) for the Experiment class. The following Table presents the results of the independence test analysis in the experimental class:

Table 1 Analysis of Independence Test in the Experimental Class

Source of variation	SS	df	M.S	F*
Regression	3078.231	1	3078.231	114.24
Error	783.2176	29	25,453	
Total	3654.678	30		

Source: Primary Data Processed 2024

The regression model obtained for the Social Problem-Solving abilities of experimental class students is YE = YE = 45.21 + 0.86 , then the suitability of the linear regression model with the hypothesis will be tested: H 0: The regression model is linear H a: The regression model

is not linear To test the above hypothesis, variance analysis was carried out using F-statistics with the specified formula and criteria. Analytical calculations were carried out with the help of the SPSS 16.0 program. The results of the linearity test analysis in the experimental class are presented in the following Table:

Table 2 Analysis of Linearity Tests in Experimental Classes

Source of variation	SS	df	M.S	F*
Regression	3078.231	1	3078.231	0,676
Error	783.2176	29	25.453	
Lack of fit	112.6542	5	19.2130	
Pure Error	658.1234	23	28.2311	
Total	3654.678	30		

Sumber: Data Primer Diolah 2024

Based on Table 2 above for Social Problem-Solving ability, the calculated F value = 0.676 and in accordance with Table F for α = 5%, the calculated F value (1- α,c-2, nc) = F (0.95,6.24) is obtained.) = 2.31. Means Fh < F (0.95,11,17). Which means that H0 is accepted or the experimental class regression model is linear

Based on the data from the control class Social Problem-Solving ability test results, the regression equation YK = 33.26 + 0.31 XK was obtained. To test the significance of the regression coefficient, the following hypothesis is formulated: H 0 : θ3 = 0 and H a : 4θ ≠0. Testing the hypothesis used analysis of variance using F statistics with the specified formula and criteria analyzed with the help of the SPSS 16.0 program. The results of the independence test analysis in the control class are presented in the following Table:

Table 3 Analysis of Independence Test in Control Class

Source of variation	SS	df	M.S	F*
Regression	1387.250	1	1387.250	25,202
Error	1465.832	30	53,891	
Total	2870.110	31		

Source: Primary Data Processed 2024

From the calculation results in Table 3 for Social Problem Solving, it is obtained that F *= 25.20 and based on Table F, for α= 5% it is obtained: F (1− α,1: n−2) = F (0.95,1.30) = 4.17. The calculation results show that the F value* ≥F (0.95,1.30) which means that H 0 is rejected and Ha is accepted. So, the regression coefficient is meaningful, meaning that there is a linear relationship between students' initial abilities and their final abilities. The regression model obtained for the Social Problem-Solving ability of control class students is YK = 33.26 + 0.31 , then the suitability of the linear regression model will be tested with the hypothesis: H 0 : The regression model is linear H a : The regression model is not linear.

To test the above hypothesis, variance analysis was carried out using F-statistics with the specified formula and criteria. Analytical calculations were carried out with the help of the SPSS 16.0 program. The results of the linearity test analysis in the control class are presented in the following Table 4:

Table 4 Analysis of Linearity Tests in the Control Class

Source of variation	SS	df	M.S	F*
Regression	1387.250	1	1387.250	0.23
Error	1465.832	30	53,891	
Lack of fit	100.12	5	20.54	
Pure Error	1348.56	25	60.41	
Total	2870.110	31		

Source: Primary Data Processed 2024

Based on table 4 above for Social Problem-Solving ability, the calculated F value = 0.23 and according to the F table for α = 5%, the value F(1- α,c-2,nc) = F(0.95.5) is obtained. .25)= 2.60. The calculation results show that the Fh value < F (0.95, 5.25). Thus *H* 0 is accepted so that the control class regression model is linear. In other words, the relationship between the results of the initial ability test and the final ability test of control class students is expressed by a linear regression model or the proposed regression model is suitable.

To test the similarity of the two regression models for the control class and the experimental class, analysis of variance was used using the F statistic. To test the similarity of the two regression models, it was formulated as follows: H 0 : θ1 = θ3 (both regression models are the same) Ha : θ1≠ θ3 (the two regression models are not the same) To test the hypothesis, the values in Table 5 are required. The results of the linear similarity test of the two regression models are presented in the following Table 5:

Table 5. Covariance Analysis for Similarity of Two Regression Models

a	b	SSR (R)	SSTO(R)	SSE (R)	SSE (F)	F*	F(0.95,1.58)	H0
39.67	0.65	4382.11	9121.55	4328.12	2760.19	65.44	4.00	Reject

Source: Primary Data Processed 2024

From the calculation results in Table 5, the value for Soci.al Problem Solving ability is F ∗= 65.44 and based on Table F, for α= 5% it is obtained that F (1− α,1:n−2) = F (0.95,1.58) = 4 .00. The calculation results show that the F value∗ ≥F (0.95,1.58) which means that H0 is rejected and Ha is accepted. This means that the two linear regression models are not the same or significantly different

If in testing the similarity of the two regression models above H 0 is rejected (the regression models are not the same), then proceed with testing the parallelism of the two regression models. To test the parallelism of the linear regression model for the experimental class and control class, covariance analysis was used using F statistics with the specified formula and criteria. The results of the parallelism test analysis of two regression models are presented in the following Table 6.

Table 6. Covariance Analysis for Regression Model Alignment

Source of variation	SSTx	SSTy	SPT	SSTx (adj)
PBM model	5237.887	3787.347	4055.923	782,320
Direct Model	3789.611	2987.210	2287.901	14350.931
Total	9028.345	7675.564	6543.460	2456.890
A	B	F*	F(0.05,1.62)	H0
2379.250	2344,001	1,356	3,996	accepted

Source: Primary Data Processed 2024

From the calculation results in Table 6 Social Problem-Solving Ability, the value F *= 1.356 is obtained and based on Table F, for α= 5%, F (1− α,1:n−2) = F(0.95,1.62) = 3.996 is obtained. The calculation results show that the value of F *< F (0.05, 1.62) means H 0 is accepted with a significance level of 5%. This means that the two linear regression models for the control class and the experimental class are parallel. Because the two regression models are not the same (do not coincide) and are parallel, students' Social Problem Solving abilities in applying the problem-based learning model assisted by Geogebra software are higher than direct learning.

After the linearity and parallelism test results of the regression model are fulfilled, to test whether students' Social Problem-Solving abilities in applying the problem-based learning

model assisted by Geogebra software are higher than direct learning, it can be analyzed using Anacova as a modification of variance analysis. For this reason, an analytical hypothesis was formulated by estimating the distance between the two linear regression lines of the control and experimental groups from each final test score of the control class and the final test score of the experimental class. The hypothesis is as follows: H 0 : θ 1 = θ 3 H a : θ 1 > θ 3. To test this hypothesis several values are required which are summarized in the following Table 7:

Table 7. Analysis of Covariance for Complete Design

Source of variation	**X**	**Y**	**XY**	**Df**
treatments	17.56	2535.90	201.45	1
Error	9231.23	6754.70	6453.67	62
Total	9132.50	9218.68	6775.01	63

	Adjusted SS	Adjusted Df	Adjusted MS	F*
treatments	2078.33	1	2083.44	52,897
Error	2535.02	61	38.88	
Total	4912.33	63		

Source: Primary Data Processed 2024

From the calculation results for Social Problem Solving ability in Table 7, the value F is obtained $*$ = 52.19 and based on Table F, for significance α = 5% we get F (1− α .1; n −2) = F (0.95.1;63) = 3.99. It can be seen that the value of $F*$ > F (0.95,1;63) so that H0: r1 = r2 = 0 is rejected. This means that students' Social Problem Solving abilities in applying the problem-based learning learning model assisted by Geogebra software are higher than direct learning

The regression model that has been obtained for the Social Problem Solving ability of the experimental class is YE = 45.21 + 0.86 XE and the regression equation for the control class is YK = 33.26 + 0.31 . Furthermore, because the two regressions for both classes are homogeneous and the constant of the linear regression line equation for the social problem solving ability of the experimental class, namely 45.21, is greater than the constant of the linear regression line equation for the control class, namely 33.26, then geometrically the regression line for the experimental class is above the regression line. control class. This indicates that there is a significant difference, and in the hypothesis above there is a difference in the height of the two regression lines which is influenced by the regression constant. The height of the regression line describes student learning outcomes, namely when This means that it can be concluded that students' Social Problem Solving abilities in applying the problem-based learning model assisted by Geogebra software are higher than direct learning.

The findings of this study reveal that the implementation of the Problem-Based Learning (PBL) model, assisted by GeoGebra software, significantly enhances students' social problem-solving abilities compared to the direct learning model with the same software. This result underscores the efficacy of PBL in fostering critical thinking and problem-solving skills, which are essential for students in addressing real-world issues. The use of authentic problems in the PBL model encourages students to engage actively in the learning process, promoting not only cognitive development but also the ability to apply knowledge in practical situations. This aligns with the findings of previous studies, such as those by Masri (2018) and Yuhani (2018), which confirmed that PBL enhances problem-solving abilities, especially in comparison to traditional learning approaches.

One of the key strengths of the PBL model is its focus on student-centered learning. In this study, students were encouraged to take responsibility for their own learning by actively seeking solutions to complex social problems. This approach is in line with the principles of constructivism, which emphasize the importance of students constructing their own knowledge through interaction with the environment and peers (Hendry et al., 1999). By

working on real-world problems, students not only improve their problem-solving skills but also develop the ability to think critically and make decisions based on evidence (Shanta, 2022). These skills are invaluable in the context of social studies, where students are often tasked with analyzing and addressing societal challenges (Zevin, 2015).

GeoGebra, as a dynamic software tool, played a crucial role in enhancing the learning experience in this study. By providing instant feedback, GeoGebra allowed students to see the results of their problem-solving attempts immediately, enabling them to make adjustments and refine their approaches. The interactive nature of GeoGebra, combined with the PBL model, facilitated a deeper understanding of social problems and the strategies needed to solve them. This feature aligns with Majerek's (2014) assertion that GeoGebra can significantly improve students' engagement and understanding of complex concepts, particularly in subjects like social studies that require both critical thinking and conceptual clarity.

However, despite the positive outcomes, the study also identified challenges in implementing the PBL model. Some students struggled with the initial stages of problem-solving, particularly in understanding the problems posed and in conducting investigations independently or in groups. These challenges highlight the need for teachers to provide adequate support and guidance throughout the learning process. Teachers must not only introduce the problems effectively but also ensure that students have the tools and strategies necessary to navigate the complexities of problem-solving tasks. The role of the teacher, therefore, extends beyond merely facilitating the learning process; it involves actively scaffolding students' understanding and helping them overcome obstacles in their learning journey.

In addition to teacher support, the success of the PBL model in this study also depends on students' familiarity with the technological tools used, such as GeoGebra. While GeoGebra offers numerous benefits, its effectiveness is contingent on students' ability to use it proficiently. The study found that students who were more comfortable with GeoGebra had an easier time navigating the problem-solving tasks, which suggests that technological literacy plays a crucial role in the success of PBL. Thus, it is essential for both students and teachers to receive adequate training in using educational technology to ensure that its full potential is realized in the learning process.

The statistical analysis conducted in this study, particularly the use of Analysis of Covariance (ANACOVA), further supports the effectiveness of the PBL model. The results revealed that the experimental class, which received PBL with GeoGebra, showed a significant improvement in problem-solving ability, with a higher regression coefficient compared to the control class that received direct learning. The statistical significance of the findings reinforces the notion that PBL, when integrated with the appropriate technological tools, provides a more effective learning experience for students. This aligns with the research of Ruseffendi (2016) and Prasetya et al. (2024), who emphasized the importance of problem-solving skills in education and highlighted the positive impact of innovative teaching models like PBL.

Moreover, the findings suggest that PBL not only improves students' problem-solving abilities but also contributes to the development of their social and collaborative skills. According to Nelson (2013), the model encourages students to work together in groups, share ideas, and communicate effectively to find solutions to the problems presented. This social dimension of learning is particularly important in the context of social studies, where students must understand and engage with societal issues from multiple perspectives (Barton & Avery, 2016). By working in teams, students are able to build their interpersonal skills, which are essential for success both in academic settings and in real-world situations (Foster & Yaoyuneyong, 2016).

Based on the positive outcomes observed in this study, it is recommended that educators incorporate PBL more frequently into their teaching practices, particularly in subjects that involve complex problem-solving tasks, such as social studies. However, for PBL to be fully effective, it is essential that teachers are adequately trained to implement this model. Teachers should be equipped not only with the skills to facilitate problem-solving activities but also with the knowledge to effectively integrate technology like GeoGebra into the learning process. Furthermore, ongoing professional development for teachers, as well as continuous technological support for students, will ensure that the benefits of PBL can be maximized in the classroom.

4. CONCLUSION

The research aimed to compare the problem-solving abilities of students taught using the Problem-Based Learning (PBL) model assisted by Geogebra software with those taught through direct learning assisted by the same software. The results indicated that the experimental class (PBL) demonstrated significantly higher problem-solving abilities than the control class (direct learning). The use of PBL, coupled with Geogebra software, proved to be a more effective approach in enhancing students' social problem-solving skills in Social Studies. This is evidenced by the higher regression coefficients and statistical analysis, particularly the ANACOVA results, which showed that the experimental class had a positive and significant effect on students' post-test scores. Furthermore, tests for normality, homogeneity, linearity, and parallelism of regression models confirmed the robustness of the data and the suitability of the analysis. This study underscores the importance of integrating innovative learning models, such as PBL, to foster critical thinking and problem-solving abilities in students, particularly in the context of Social Sciences education. Given the success of the PBL model, it is recommended that educators consider incorporating this approach into their teaching strategies to enhance learning outcomes..

REFERENCES

Arends, R. (1994). *Learning to teach*. New York: McGraw Hill.

Barton, K. C., & Avery, P. G. (2016). Research on social studies education: Diverse students, settings, and methods. *Handbook of research on teaching*, 5(1), 985-1038.

Dahar, R. W. (2022). Teori-Teori Belajar. Jakarta: Erlangga.

Duch, B. J., Groh, S. E., & Allen, D. E. (2001*). The Power of Problem Based Learning* (1st ed.). Virginia: Stylus Publishing.

Fadillah, S. (2020). Kemampuan Pemecahan Masalah Matematis dalam Pembelajaran Ilmu Pengetahuan Sosial. *Prosiding Seminar Nasional Penelitian, Pendidikan Dan Penerapan MIPA, Fakultas MIPA, Universitas Negeri Yogyakarta*, 1(4), 338–553.

Foster, J., & Yaoyuneyong, G. (2016). Teaching innovation: equipping students to overcome real-world challenges. *Higher Education Pedagogies*, 1(1), 42-56.

Hanafiah, & Sukamto. (1991). *Rancangan Percobaan Teori dan Aplikasi Edisi Revisi*. PT. Raja Jakarta: Grafindo Persada.

Hendry, G. D., Frommer, M., & Walker, R. A. (1999). Constructivism and problem-based learning. *Journal of further and higher education*, 23(3), 369-371.

Hohenwarter, M., & Fuchs, K. (2004). Combination of dynamic geometry , algebra and calculus in the software system GeoGebra. *In Computer Algebra Systems and Dynamic Geometry Systems in Mathematics Teaching, Proceedings of Sprout-Slecting Conference (Sarvari, Cs. Hrsg.)* (pp. 128-133). Bornus Nyomda.

Imam, I., Ayubi, A., & Bernard, M. (2018). Pengaruh Pembelajaran Berbasis Masalah Terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMA. *JPMI:Jurnal Pembelajaran Ilmu Pengetahuan Sosial Inovatif*, 1(3), 355–360. https://doi.org/10.22460/jpmi.v1i3.355-360

Kharida, L. A., & Rusilowati, A. (2022). Penerapan Model Pembelajaran Berbasis Masalah Untuk Peningkatan Hasil Belajar Siswa Pada Pokok Bahasan Elastisitas Bahan. *Jurnal Pendidikan Fisika Indonesia*, 5(2), 83–89. https://doi.org/10.15294/jpfi.v5i2.1015

Lidinillah, D. A. M. Problem Based Learning dan Discovery Learning: Komparasinya terhadap Keterampilan Berpikir Kritis pada Materi Sistem Pernapasan. (2024). *PENDIPA Journal of Science Education*, 8(1), 88–96. https://doi.org/10.33369/pendipa.8.1.88-96

Majerek, D. (2014). Application of geogebra for teaching mathematics. *Advances in Science and Technology Research Journal (ASTRJ)*. 8(24), 51–54. https://doi.org/10.12913/22998624/567

Masri, M. F., Suyono, S., & Deniyanti, P. (2018). Pengaruh Metode Pembelajaran Berbasis Masalah Terhadap Self-Efficacy Dan Kemampuan Pemecahan Masalah Matematis Ditinjau Dari Kemampuan Awal Ilmu Pengetahuan Sosial Siswa SMA. *Jurnal Penelitian Dan Pembelajaran Ilmu Pengetahuan Sosial*, 11(1). https://doi.org/10.30870/jppm.v11i1.2990

Montague, M. (2016). Mathematical Problem-Solving Characteristics of Middle School Students With Learning Disabilities. *The Journal of Special Education*. 27 (2), 1–13. https://doi.org/10.1177/002246699302700

National Council of Teacher of Mathematics (NCTM). (2022). Principles and Standarts for mathematics. *Journal of Equine Veterinary Science*, 18(11), 719. https://doi.org/10.1016/s0737-0806(98)80482-6

Nelson, L. M. (2013). *Collaborative problem solving. In Instructional-design theories and models* (pp. 241-267). Routledge.

Noriza, M. D. (2015). Kemampuan Pemecahan Masalah Dan Disposisi Matematis Siswa Kelas X Pada Pembelajaran Berbasis Masalah. *Unnes Journal of Mathematics Education Research*, 4(2), 66– 75.

Roh, K. ha. (2023). Problem-Based Learning in Mathematics. *ERIC Clearinghouse for Science Mathematics and Environmental Education*, 1–7.

Ruseffendi, E. T. (2016). *Pengantar kepada Membantu Guru Mengembangkan Kompetensinya dalam Pengajaran Ilmu Pengetahuan Sosial Untuk Meningkatkan CBSA (edisi revisi).* Bandung: Tarsito.

Prasetya, S. P., Fadirubun, F. F., Sitohang, L. L., & Hidayati, A. (2024). Effects of Learning Strategies and Learning Styles on Learning Performance in The Social Sciences Subject of Disaster Mitigation. *Anatolian Journal of Education*, 9(1), 215–230. https://doi.org/10.29333/aje.2024.9115a

Sagala, S. (2021). *Konsep dan Makna Pembelajaran*. Bandung: Alfabeta.

Shanta, S. (2022). Assessment of real-world problem-solving and critical thinking skills in a technology education classroom. *In Applications of Research in Technology Education: Helping Teachers Develop Research-Informed Practice* (pp. 149-163). Singapore: Springer Nature Singapore.

Sumartini, T. S. (2016). Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa melalui Pembelajaran Berbasis Masalah. Mosharafa: *Jurnal Pendidikan Matematika*, 5(2), 148–158. https://doi.org/10.31980/mosharafa.v5i2.391

Wahyudin. (2008). *Pembelajaran dan Model-Model Pembelajaran*. Bandung: UPI.

Widihiarso, wahyu. (2011). Aplikasi Analisis Kovarian dalam Penelitian Eksperimen Aplikasi Anacova dalam Eksperimen. 1–5. https://elnicovengeance.wordpress.com/wp-content/uploads/2011/06/analisis.pdf

Yuhani, A., Zanthy, L. S., & Hendriana, H. (2018). Pengaruh Pembelajaran Berbasis Masalah Terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMP. *JPMI (Jurnal Pembelajaran Ilmu Pengetahuan Sosial Inovatif)*, 1(3), 445. https://doi.org/10.22460/jpmi.v1i3.p445-452

Zevin, J. (2015). *Social studies for the twenty-first century: Methods and materials for teaching in middle and secondary schools*. Routledge.