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Geogebra Learning Media for Students' Mathematical Problem Solving Ability

Wa Ode Shofiatul Munawwarah [1)*], Saleh [1)], Salim [1)]
[1]Department of Mathematics Education, Universitas Halu Oleo. Kendari, Indonesia.

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Abstract

The low mathematical problem-solving ability of students and technological advances became the beginning of this research, with the aim of finding out the influence of geogebra learning media for students' problem-solving ability. A quasi-experiment design was employed, specifically a Post-Test Only Control Group design. The population of this research is all 10th grade students, with classes X.1 and X.2 selected as the sample. Data were collected through observation sheets and tests of mathematical problem-solving skills. The collected data were analyzed both descriptively and inferentially. Descriptive analysis showed that the average mathematical problem-solving ability of students taught using GeoGebra media was 80.185, with 44.44% rated as very good, 37.04% as good, and 18.52% as adequate. In contrast, the average problem-solving ability of students taught without GeoGebra media was 72, with 28% rated as very good, 28% as good, 28% as adequate, and 16% as poor. Inferential analysis yielded a$t_{count} = 2.047 > 1.675 = t_{table}$. Based on these results, it can be concluded that there is a significant influence of the GeoGebra learning media for students' mathematical problem solving ability

Keywords: geogebra; mathematical problem solving ability; mathematics learning media.

INTRODUCTION

Mathematics is a mandatory subject taught in schools and plays a crucial role in everyday life. There are three main objectives of mathematics education: (1) The formal objective is to develop students' personalities through the enhancement of their thinking abilities; (2) The material objective is to improve students' skills in problem-solving and the application of mathematical logic; (3) The skill-related objective involves using mathematics to solve problems, whether they are mathematical problems, issues related to other fields of study, or contextual problems commonly encountered in daily life (Susanti, 2020).

Mathematics can enhance critical, logical, creative, systematic thinking, and the ability to work collaboratively. The mathematical abilities that students need to possess, according to the National Council of Teachers of Mathematics (NCTM), are divided into five categories: reasoning, connection, problem solving, representation, and communication. Each of them has their own role and is inseparable from the process of learning mathematics. (Setyadi et al., 2020). Problem-solving ability is a process or activity carried out to resolve issues that involves thought and effort, in determining which method will be used. In addition, problem-solving skills can be understood as the efforts made by an individual to find a solution to a problem. (Rujumi, Cahyono, & Busnawir, 2017). Mastery of mathematical problem-solving skills can enrich students' abilities to think critically, logically, systematically, and meticulously. This is considered a crucial foundation for students in developing a positive mindset when facing mathematical problems (Yunaeti, Arhasy, & Ratnaningsih, 2021).

* Author Correspondence. E-mail: shofiatulmunawwarah@gmail.com
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According to Polya, there are four procedures that form the basis of problem-solving: (1) Understanding the problem. In this procedure, students will comprehend the problem by identifying the known elements, whether they are numbers or relationships within a problem, as well as identifying the main point or what is being asked in the problem; (2) Making a plan. In this procedure, students must identify the operations needed to solve a problem; (3) Implementing the plan. In this procedure, the students who have created a plan in the previous procedure will begin to execute their plan. This includes calculations and the interpretation of information to arrive at an answer to a problem; (4) Double-checking. In this procedure, students review the answers they have found in the previous procedure. Students need to pay attention to the relationship between what is known and what is being asked, whether the solutions provided are reasonable and relevant to the questions posed, and ensure that the calculations made are accurate. (Yuwono, Supanggih, & Ferdiani, 2018). According to the perspective of the National Council of Teachers of Mathematics, two functions of problem-solving in mathematics learning include that problem-solving is a supportive skill for learning mathematics and provides knowledge and tools for students to formulate, approach, and solve problems. (Nurvela, Malalina, & Yenni, 2020).

The global assessment known as the Programme for International Student Assessment (PISA), conducted every three years, indicates that the mathematical problem-solving skills of Indonesian students aged around 15 are considered low. According to the 2022 results, Indonesia's ranking has improved compared to the PISA results of 2018. The assessment evaluates skills in mathematics, science, and reading. In the mathematics category, Indonesia's ranking in PISA 2022 improved by 5 positions compared to PISA 2018, placing 68th out of 79 countries, with an average score of 366. This score represents a decrease from Indonesia's average score of 379 in 2018. The score is still significantly below the international average of 500 set by PISA (Ministry of Education, Culture, Research, and Technology; 2023).

Consultations with mathematics teachers at SMA Negeri 10 Kendari reveal that students face challenges in various aspects of mathematical problem-solving. In addition to difficulties in understanding core material, students often struggle to accurately identify information in word problems. Moreover, students also have trouble determining the initial steps for solving problems, which sometimes prevents them from reaching a final solution. Students are also accustomed to not writing down the final conclusions of their problem-solving processes. These issues suggest that the assessment of students' mathematical problem-solving abilities at this school is still relatively inadequate.

To address the above findings, educators need to design more effective and innovative learning strategies to help students develop their mathematical problem-solving skills. The use of relevant learning media is crucial in this process. Such media serve as effective tools for making abstract concepts more concrete and easier for students to understand. Learning media act as intermediaries for conveying information, thereby facilitating comprehension of the content. The concept of training media includes two components: software and hardware. In educational media, software refers to the information or messages contained within the media, while hardware refers to the equipment or tools used to deliver data or messages (Pagarra, 2022).

There are three main objectives for using media: (1) To Inform. During the learning process, the use of learning media should effectively convey information related to the subject matter to students. The enhancement of information delivery is supported by the advancement of information technology, which is now available not only in print form but also in audiovisual and multimedia formats; (2) To Motivate. Media is expected to stimulate students' enthusiasm during the learning process. The smart and appropriate use of media can create an engaging environment, motivate students to learn, and minimize boredom, which often occurs during lessons. By motivating students and reducing their boredom, media can aid in the absorption of information about the learning material; (3) To Learn. By using learning media, it is hoped that engaging, enjoyable, and varied learning experiences can be created. Interactive learning media are designed to help students gain more information and participate in more activities. The use of interactive learning media can significantly improve student learning outcomes (Pagarra, 2022).

Various types of learning media have been developed. One such program is GeoGebra, an interactive software that offers effective visualization tools to facilitate students' understanding of abstract mathematical concepts (Syahbana, 2016). Using GeoGebra as an educational tool results in drawings that are produced more quickly and accurately compared to manual drawing with pencil, ruler, or compass. GeoGebra's features, such as the ability to manipulate mathematical objects, visually observe changes, and analyze mathematical relationships, can help learners gain a deeper understanding of complex mathematical concepts. Additionally, GeoGebra's offline accessibility and the abundance of blogs and social media resources that share how to use this educational tool greatly support its use in educational settings (Mulyadi et al., 2023).

According to Hohenwarter & Fuchs, the use of GeoGebra offers significant benefits as a mathematics learning tool with various activities: (1) GeoGebra as a Demonstration and Visualization Tool. Certain mathematical concepts can be demonstrated and visualized using GeoGebra. In conventional teaching contexts, teachers utilize GeoGebra to provide visual illustrations that enhance students' understanding of mathematical material; (2) GeoGebra as a Construction Aid. For example, when constructing inscribed or circumscribed circles of a triangle or drawing tangent lines, GeoGebra serves as a tool to visualize the construction of these mathematical concepts. This helps students understand and construct various geometric elements more easily; (3) GeoGebra Supports Discovery-Based Learning. GeoGebra is used as a tool to assist students in exploring and discovering mathematical concepts. For instance, in determining the characteristics of a parabola's graph and finding the coordinates of points on the parabola's graph, GeoGebra is expected to reinforce active understanding of the concepts through its use (Fitriani, Maifa, & Bete, 2019).

GeoGebra offers five main benefits: (1) GeoGebra can be used as a tool to support the learning process in mathematics. It is particularly useful for visualizing and demonstrating mathematical concepts, such as 2D and 3D graphs, which require high precision. Additionally, GeoGebra serves as a means for constructing specific mathematical concepts; (2) GeoGebra complements various existing mathematical software or applications on computers, especially for algebra and geometry learning; (3) GeoGebra can make online learning more interactive by allowing students to explore their studies more extensively with the help of GeoGebra media. The availability of GeoGebra on smartphones adds to its appeal; (4) GeoGebra helps students understand complex mathematical concepts by making these concepts more accessible and easier to grasp; (5) GeoGebra simplifies the creation of graphs from mathematical equations that are difficult to produce manually, providing practical and efficient tools for handling complex mathematical visualizations.

Research conducted by (Mukhtar et al., 2021) showed that there was a significant difference between the mathematical problem-solving ability of students who participated in learning with the help of Geogebra and students who participated in conventional learning. The use of the GeoGrabra application can attract attention and motivate students to carry out individual and group learning processes, can develop student independence, can train students, and educate students to be careful about what they do. However, there are still a lot of teachers and students who do not know the GeoGebra application, so they do not know the benefits of the GeoGebra application. In addition to making it simpler for instructors or students to research or illustrate the characteristics that apply to a geometric object, GeoGebra may provide pupils a clear visual experience in comprehending geometric principles (Miranda & Nurmitasari, 2022).

The results of (Ramadiana, et al., 2024) show that the low problem-solving ability in third-dimensional material caused by students' inability to understand and carry out problem-solving steps can be overcome by using GeoGebra based on theoretical conformity and empirical data. The use of geogebra that provides a direct response to the user, is seen as a stimulus. Any changes made by students will be responded to quickly by the computer. This is seen as able to help students in facing difficulties in solving problems (Setiawi, Suparta & Suharta, 2021).

Based on previous research, it is very important to conduct in-depth research on the use of geogebra media. So this study aims to determine the influence of the use geogebra learning media for students' mathematical problem-solving ability..

METHODS

This study is experiment. With the aim of understanding the influence of using GeoGebra learning media on students' mathematical problem-solving abilities. Quasi-experiment or semi-experiment is used in this study, where there are still other variables that cannot be controlled by the researcher, such as weather and others.

The population in this study consists of all tenth-grade students at SMA Negeri 10 Kendari, who have varying levels of abilities. Using purposive sampling, the study selected two classes as samples. These classes were chosen based on the similarity in average daily test scores and the homogeneity of variances. Classes X1 and X2 were selected as the sample for this study. The grouping of these classes into the experiment and control groups was done randomly using a simple random technique, specifically through a lottery method, where the first draw determined the experiment class. The lottery results indicated that class X1 became the experiment group, while class X2 served as the control group.

This study employs a posttest-only control group design. The experiment group in this study received an intervention in the form of GeoGebra learning media, while the control group served as a comparison group. In both sample classes, two types of instruments were provided: observation and tests. Observation is divided into teacher activity observation and student activity observation. In this research, observation serves as a means to evaluate the role of the teacher and the learning activities of students during the duration of the learning process. The purpose of the observation is to assess the realization of the planned activities that represent the actions of both the teacher and the students during the learning period using GeoGebra as a learning tool. The observation table was developed by the researcher with consideration of the learning methods used. The next instrument is the test; the posttest at the end of the learning process is conducted to achieve the main objective, which is to identify the significant influence of using GeoGebra learning media on improving students' mathematical problem-solving skills. The post-test questions that have been tested for validity and reliability are used as data collection instruments. The validity analysis employed is the panelist test, where each item on the instrument is assessed for its relevance to the main topics and subtopics being studied. After the instrument is declared valid, the next step is to calculate its reliability to demonstrate that the instrument can be trusted to collect study data.

In this study, data collection techniques were used, including observations of teachers and students who received and did not receive the GeoGebra media intervention, as well as tests of mathematical problem-solving ability. The test data consist of posttest results with questions representing various indicators. From these posttest data, the mathematical problem-solving abilities of the students were determined. The data analysis in this study was carried out in two stages. The first, descriptive statistics including percentage (%), mean ($\bar{x}$), median (Me), mode (Mo), standard deviation (s), variance (s^2), maximum value, and minimum value. Next, conduct an inferential analysis. Before hypothesis testing, as a prerequisite, normality was carried out using the Kolmogorov-Smirnov test and homogeneity test using the f-test. After the data is normally distributed and homogeneous, the t-test is used to analyze the influence of GeoGebra media for students' mathematical problem-solving ability.

RESULTS AND DISCUSSION

The results of the observations conducted at each meeting, based on the teacher's activities on the topic of linear inequalities with two variables in each class, are as follows: Class X.1 (Experimental), which was given an intervention in the form of GeoGebra media, and Class X.2 (Control), which did not receive the intervention. In both classes, there was an improvement in each meeting, and based on the percentages, it shows a very good rating. The graph of the increase in teacher activity can be seen in Figure 1 below.

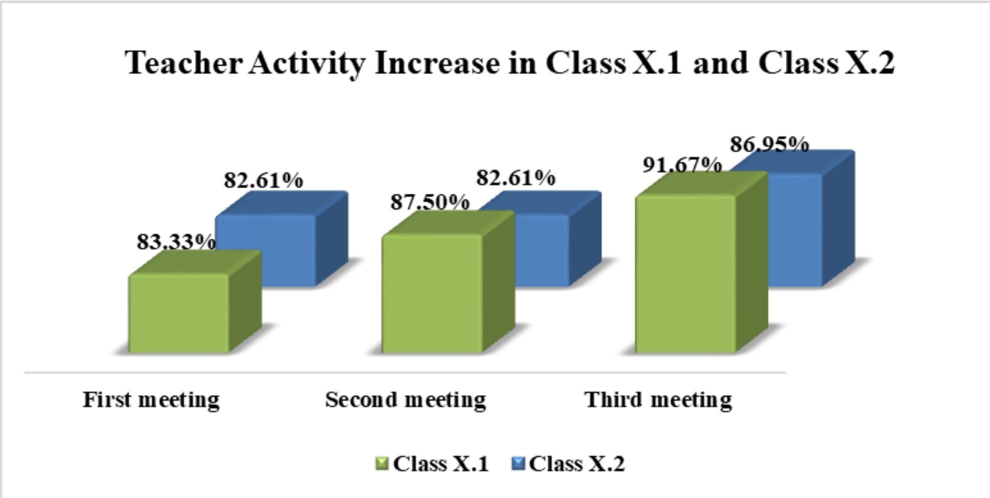

Figure 1. Graph of Teacher Activity Increase in Class X.1 and Class X.2

Based on the results of the diagnostic assessment, each class was divided into two groups: students with low ability and students with high ability. Subsequently, observations were conducted for each group. In class X.1, both the high-ability and low-ability groups showed continuous improvement. The graph illustrating the improvement in student activity in the experiment class can be seen in the Figure 2 below**.**

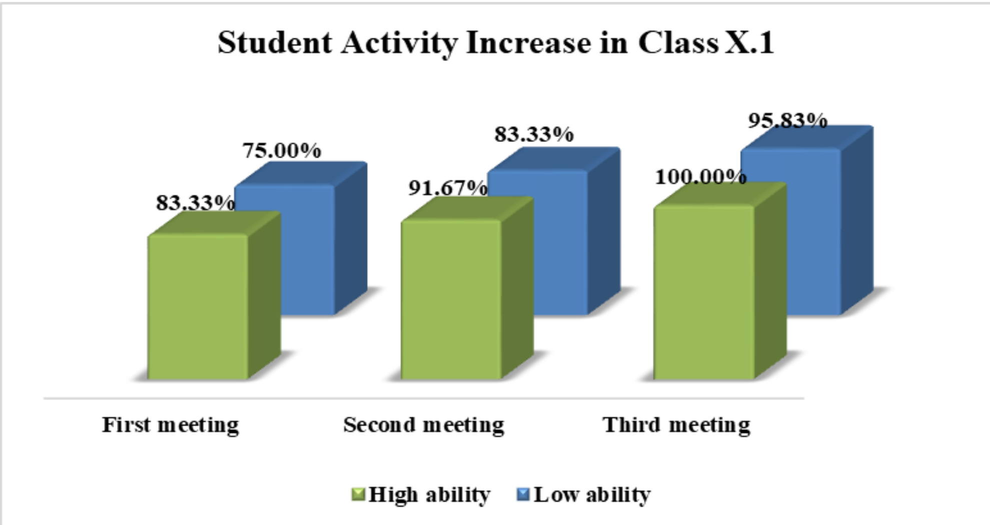

Figure 2. Graph of Student Activity Increase in Class X.1

Similarly, in class X.2, the percentage of student activity showed improvement, especially in the low-ability group, which demonstrated continuous progress in each meeting.

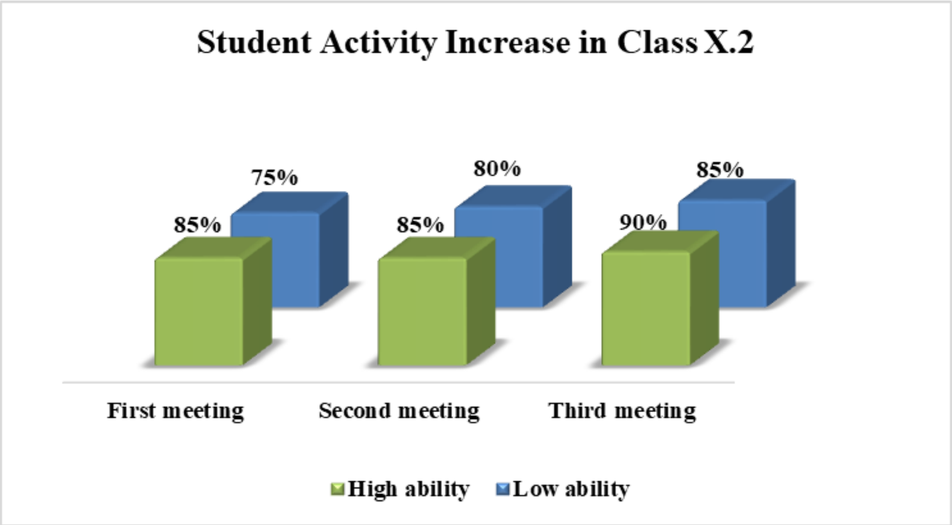

Figure 3. Graph of Student Activity Increase in Class X.2

The graph ilistrating the improvement in student activity in the control class can be seen in the following figure 3.

At the end of each meeting, a mathematical problem-solving ability test was administered to each class. The descriptive analysis of the posttest results on students' mathematical problem-solving abilities was manually processed. The results of the descriptive analysis can be found in Table 1.

Table 1. Results of Descriptive Analysis of Mathematical Problem-Solving Abilities in Class X.1 (Experiment) and Class X.2. (Control)

Descriptive Statistics	Experiment	Control
N	27	25
Mean	80,185	72
Median	80	70
Mode	90	50
Variance	147,079	272,917
Standard deviation	12,127	16,52
Min	60	50
Max	100	100

The percentage distribution of post-test scores in class X.1, which was taught using GeoGebra learning media, and in class X.2, which was taught without using GeoGebra learning media, can be seen in the following Figure 4.

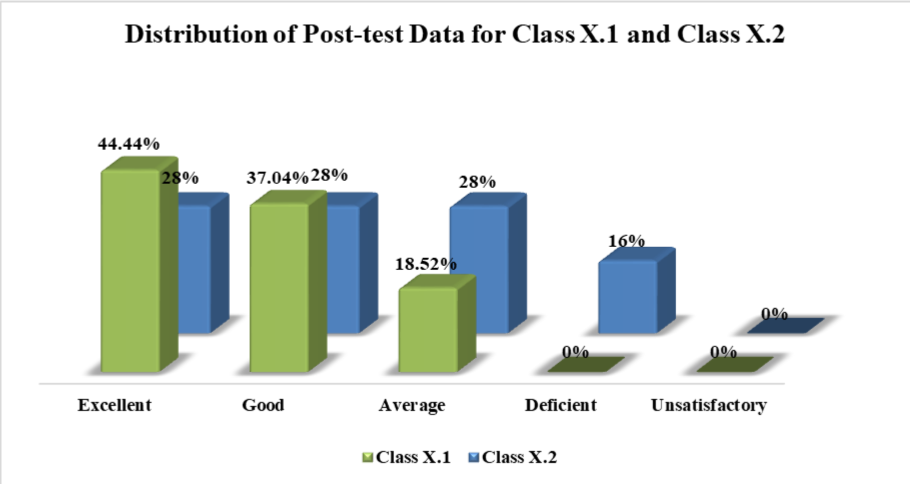

Figure 4. Distribution of Post-test Data for Class X.1 and Class X.2.

As seen in Figure 4, the percentage distribution of post-test data for problem-solving abilities shows a general difference between the experiment class, which used GeoGebra media, and the control class, which did not. Specifically, the percentage of students with very good and good abilities is higher in the experiment class compared to the control class. Conversely, the percentage of students with sufficient and poor abilities is lower in the experiment class than in the control class. Based on the descriptive analysis, students who used GeoGebra media for problem-solving have higher mathematical problem-solving abilities compared to those who did not use GeoGebra media.

After conducting a descriptive analysis, then an inferential analysis was carried out. Through this analysis, we can find out whether the hypothesis being tested is accepted or rejected. Inferential analysis consists of several stages of analysis, namely normality test and homogeneity test. Both are required to complete the hypothesis testing analysis. In the normality test using the Kolmogorov-Smirnov test, the researcher tested the assumption of normality on student score data. The results of this test can be found in Table 2.

Table 2. Results of the Normality Test Data

Class	D_{max}	D_{table}	Description
Experiment	0,098	0,254	Normal
Control	0,108	0,264	Normal

Based on the normality test of the post-test data, for the experiment class, $D_{max} = 0{,}098 < 0{,}254 = D_{table}$,, indicating that the data from the post-test shows that the abilities of students in Class X.1, who used GeoGebra as a learning medium for the topic of systems of linear equations with two variables, are normally distributed. Similarly, for the control class, $D_{max} = 0{,}108 < 0{,}264 = D_{table}$, suggesting that the data from the post-test indicates that the abilities of students in Class X.2, who did not use GeoGebra as a learning medium for the same topic, are also normally distributed. After the data is confirmed to be normally distributed, then through the F test, the researcher tests the assumption of variance homogeneity in the data. The results of this test can be found in Table 3.

Table 3. Results of the Homogeneity Test Data

$F_{calculated}$	F_{table}	Description
1,856	1,95	Homogeneous

Based on the homogeneity test analysis, $F_{calculated} = 1.856 < 1.95 = F_{table}$, indicating that the post-test data for both the experiment and control classes have homogeneous variances.

The results of the normality test and homogeneity test showed that the data of each class was normal and homogeneous. Furthermore, a hypothesis test was carried out to determine the influence of the use of GeoGebra learning media on students' mathematical problem-solving skills. Data analysis used an independent sample test to test the mean difference between the two groups. The results of the statistical test can be found in Table 4.

Table 4. Results of the Hypothesis Test

$t_{\text{calculated}}$	t_{table}	**Description**
2,047	1,675	There is an influence.

Based on the hypothesis test analysis, $t_{calculated} = 2.047 > 1.675 = t_{table}$, indicating a significant influence of the GeoGebra learning media on the mathematical problem-solving abilities of tenth-grade students at SMA Negeri 10 Kendari.

The learning activities conducted during the research process consisted of three sessions, for both Class X.1, which received the GeoGebra intervention, and Class X.2, which did not. A problem-based learning model and content differentiation method were applied throughout the process. Students in Classes X.1 and X.2 were divided into two groups based on their skill levels: a high-ability group and a low-ability group. The high-ability group was given problems with higher difficulty levels, while the low-ability group was given problems with lower difficulty levels.

In this study, the use of GeoGebra was focused on the visualization capabilities of the tool, specifically for graphing linear inequalities with two variables. However, students were encouraged not to become overly reliant on the media, so they would still understand how to manually draw graphs. Therefore, in Class X.1, where GeoGebra was used as a learning medium, its use was carefully managed to ensure that students could still determine the solution regions through calculation. During the first and second sessions, GeoGebra was used to understand the shape of graphs representing the solution regions of linear inequalities with two variables and systems of linear inequalities with two variables. GeoGebra was also used to help students draw the graphs of equations derived from changing the inequality signs and to verify the accuracy of the graphs drawn for linear inequalities with two variables and systems of linear inequalities with two variables. In the third session, GeoGebra was used to help students understand the concept of corner points in the solution regions. Additionally, GeoGebra was used to determine the solution regions and to recheck the accuracy of the corner points of the solution regions obtained by the students.

In class X.1 (experiment), the activities of students in the first meeting of the high-ability group still faced issues with the use of GeoGebra as a learning medium. The introduction of GeoGebra as a learning tool for the topic of linear inequalities in two variables took a considerable amount of time, resulting in the failure to realize the presentation of discussion outcomes. In this first meeting, the percentage of activity among high-ability students was 83.33%, which is lower compared to the activity percentage of low-ability students at 75%. In the first meeting, the low-ability group not only faced challenges in the process of familiarizing themselves with the learning media but also with the material being studied. This resulted in the failure to realize the presentation of the discussion results. In the second meeting, the high-ability and low-ability groups experienced improvements of 91.67% and 83.33%, respectively. In the second meeting, the high-ability group was already able to operate the GeoGebra learning media but still required some assistance from the teacher. This allowed the high-ability group to realize their group presentation activities, while the low-ability group still needed time to adjust and therefore was not yet able to carry out their group presentation activities. In the third meeting, the high-ability group was able to achieve a percentage of 100%, while the low-ability group also showed improvement with a percentage of 95.83%. During this third meeting, the high-ability group was able to solve the problems presented in the LKPD using the GeoGebra learning media without asking for help from the teacher, whereas the low-ability group still required assistance from the teacher regarding the issues in the LKPD but was able to operate the GeoGebra learning media.

In class X.2 (control), the activity of students in the first meeting of the high-ability group reached a percentage of 85%, where students were still adjusting between the prerequisite material they had learned and the material on linear inequalities in two variables. This caused delays in the problem-solving process found in the student worksheets. Meanwhile, in the low-ability group, the percentage was 75%, where students had largely forgotten the previous lessons that served as prerequisite material for linear inequalities in two variables, which hindered them in solving the problems presented in the student worksheets. In the second meeting, the high-ability group maintained a performance level of 85%. However, in this meeting, the high-ability group was able to deliver their presentation, but time constraints hindered the closing activities from being carried out effectively. In contrast, the percentage of the low-ability group increased to 80% in the second meeting. In this meeting, students with low abilities were still unable to perform group presentations but began to be able to respond to presentations from high-ability groups. In the third meeting, the percentage of high-ability and low-ability groups increased consecutively to 90% and 85%. In the high-ability group, students were able to solve the problems presented in the LKPD without asking for help from the teacher, although it took them more time, so they were unable to present the results of their discussion. Meanwhile, the low-ability group still required guidance from the teacher regarding the problem-solving process.

In Class X.1 (experiment), the activity of the high-ability group showed a steady increase in percentage, achieving an excellent rating. The low-ability group also demonstrated significant improvement, with their rating increasing from good in the first session to very good in the third session. The continuously increasing activity percentages align with the function of the learning media, which aids in the learning process, makes learning activities more engaging, and provides an enjoyable learning experience, thereby fostering high student motivation (Hanipa, 2019).

As observed in student learning activities and the analysis of mathematical problem-solving abilities, the use of GeoGebra in the experiment class showed significant results compared to the control class, which did not use it. The percentage of problem-solving abilities in the experiment class rated as very good was higher than in the control class, with respective percentages of 44.44% and 28%, representing a difference of 16.44%. For the good category, the problem-solving ability percentages were 37.04% for the experiment class and 28% for the control class, with a smaller difference of 9.04%. In the sufficient category, the percentages were 18.52% for the experiment class and 28% for the control class. In the experiment class, the sufficient category was the lowest achieved by students, while the control class still had an additional category, namely poor, with a percentage of 16%. This analysis indicates that the mathematical problem-solving abilities in the experiment class were superior to those in the control class. This aligns with the research by (Sari et al., 2023) which found that mathematical problem-solving abilities in linear programming can be enhanced by using a problem-based learning paradigm with the assistance of GeoGebra. Teachers can create an engaging and interactive learning environment by using GeoGebra as a teaching tool in mathematics education. Additionally, GeoGebra encourages students to identify problems, apply mathematical concepts they have learned to solve these problems, and visualize issues, making students more interested in studying mathematics.

Through hypothesis testing, the influace of GeoGebra learning media on students' mathematical problem-solving abilities is examined. As a prerequisite, normality and homogeneity tests were performed on the sample data. The researcher used the Kolmogorov-Smirnov test to assess normality, where D_{max} for the experiment class was smaller than D_{table}, or $0.098 < 0.254$, and similarly for the control class, where D_{max} was smaller than D_{table}, or $0.108 < 0.264$. This indicates that the data from both classes are normally distributed. For the homogeneity test, the researcher used the F-test, with a significance level of ≤ 0.05. The test results yielded $F_{calculated} = 1.856 < 1.95 = F_{table}$, indicating homogeneity of the data between the experiment and control classes. Since the data met the hypothesis testing requirements, an independent samples t-test was conducted to determine the validity of the hypothesis. The t-test results showed $t_{calculated} = 2.047$ and $t_{table} = 1.675$. Therefore, $t_{calculated} = 2.047 > 1.675 = t_{table}$, leading to the rejection of H_0. Rejecting H_0 indicates that there is a significant difference in the average mathematical problem-solving abilities between students who used GeoGebra and those who did not. This suggests that the mathematical problem-solving abilities of tenth-grade students at SMA Negeri 10 Kendari have significantly improved due to the use of GeoGebra learning media.

The findings of this study are consistent with the research by (Nurfadilah & Suhendar, 2018), which explains that students' problem-solving abilities, particularly involving lines and angles, are positively influenced by the use of GeoGebra. Which in the process GeoGebra Media is useful as a medium to visualize mathematical concepts so that initial concepts can be formed in students, which is the initial concept that can help students in designing and implementing problem-solving strategies.

This result is also in line with the study conducted by (Sari et al., 2023), which indicates that improvements in students' problem-solving abilities in linear programming can be achieved through the development of a problem-based learning model with the assistance of GeoGebra. In a problem-focused learning model that uses GeoGebra as a tool, students can be invited to identify practical everyday problems and implement the mathematical concepts they have learned to solve problems involving calculations. Students can also visualize these problems and solutions by using GeoGebra so that the concepts taught can be more easily understood by students and the mathematical problem-solving process is carried out systematically. By involving students in interactive activities with Geogebra, students will be more interested in learning mathematics in terms of mathematical problem solving.

The above study demonstrates that there is a statistically significant difference between the mathematical problem-solving abilities of students using GeoGebra (Class X.1) and those not using GeoGebra (Class X.2) for the topic of systems of linear inequalities with two variables. This statement is supported by the results of student learning activities and problem-solving ability tests, where Class X.1 showed better results compared to Class X.2. Therefore, the use of GeoGebra as a learning medium can be an effective alternative for teachers to enhance the effectiveness of teaching and strengthen the mathematical problem-solving abilities of tenth-grade students at SMA Negeri 10 Kendari.

CONCLUSION

Based on the results of the study, student activity in Class X.1 (experiment) and Class X.2 (control), consistently increased with each session. But, the ability of students in Class X.1, who used GeoGebra as a learning medium, to solve mathematical problems had an average score of 80.185, and students in Class X.2, who did not use GeoGebra, had an average score of 72. This showing that students who learn mathematics with GeoGebra were better at solving mathematical problems than students who learn without this media. There is a significant influence of the use geogebra learning media for students' mathematical problem-solving ability. This can be seen from the statistical calculation of the hypothesis test where $t_{calculated} > t_{table}$, that is, $2.047 > 1.675$.

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