Software GeoGebra: As an Assistance to the Guided Inquiry Model in Improving Students' Numeracy Skills

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A B S T R A K

Kemampuan berhitung siswa masih rendah karena matematika disajikan secara abstrak. Selain itu, guru kurang menarik dalam mengemas model pembelajaran dan media yang digunakan, serta penerapan pembelajaran masih konvensional dan kurang interaktif. Tujuan penelitian ini adalah untuk menguji pengaruh model inkuiri terbimbing berbantuan software GeoGebra terhadap kemampuan berhitung siswa kelas IV. Metode penelitian yang digunakan adalah kuantitatif dengan desain quasi eksperimen dengan Non-Equivalent Control Group Design. Populasi penelitian sebanyak 76 siswa, dengan penentuan sampel menggunakan teknik sampling jenuh, 38 siswa sebagai kelas kontrol dan 38 siswa pada kelas eksperimen yang akan diberikan pembelajaran menggunakan model inkuiri terbimbing berbantuan software GeoGebra. Pengumpulan data dilakukan dengan metode tes berupa uraian yang diperoleh setelah 5 kali perlakuan. Instrumennya menggunakan seperangkat tes yang berbentuk uraian. Teknik analisis data menggunakan statistik deskriptif dan statistik inferensial (uji-t). Hasil uji hipotesis menunjukkan rata-rata skor kelompok eksperimen lebih besar dibandingkan rata-rata perolehan skor kelompok kontrol. Berdasarkan hasil analisis data dapat disimpulkan bahwa terdapat pengaruh yang signifikan model inkuiri terbimbing berbantuan software GeoGebra terhadap kemampuan berhitung siswa kelas IV. Jadi, kegiatan pembelajaran menggunakan software GeoGebra dapat membantu memvisualisasikan konsep matematika sehingga dapat meningkatkan kemampuan berhitung siswa.

A B S T R A C T

Students' numeracy skills are still low because mathematics is presented abstractly. Moreover, teachers are less attractive in packaging the learning models and media used, and the application of learning is still conventional and less interactive. The aim of this research is to testThe influence of the guided inquiry model assisted by GeoGebra software on the numeracy abilities of class IV students. The research method is quantitative with a quasi-experimental design with a Non-Equivalent Control Group Design. The study population was 76 students, with sample determination using saturated sampling techniques, 38 students as the control class and 38 students in the experimental class who would be given learning using the guided inquiry model assisted by GeoGebra software. Data was collected using a test method in the form of descriptions obtained after 5 treatments. The instrument uses a set of tests in the form of descriptions. Data analysis techniques use descriptive statistics and inferential statistics (t-test). The results of hypothesis testing showed that the average score of the experimental group was greater than the average score gain of the control group. Based on the results of the data analysis, it can be concluded that there is a significant influenceguided inquiry model assisted by GeoGebra software on the numeracy abilities of class IV students. So, learning activities using GeoGebra software can help to visualize mathematical concepts which can improve students' numeracy skills.

1. INTRODUCTION

Numeracy skills are skills possessed by a person and are not limited to the ability to perform calculations, but also include the ability to apply concepts that have been learned such as the ability to measure, use and interpret statistical information, understand and use shapes, locations and directions,

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critical thinking skills regarding quantitative and mathematical information, and many other things (Putra et al., 2022; Susanti, 2020; Tasya & Abadi, 2019). In the implementation process, numeracy skills become basic abilities that students must have as a provision in solving real world problems, therefore efforts to increase numeracy literacy must be carried out from an early age so as to obtain optimal results.(Kamsurya & Masnia, 2021; Wiyata & Suwartini, 2022). It was further explained that numeracy skills can help students see and discover the concept of numbers in everyday life, being a link between the mathematics that students learn at school and the mathematics that is embedded in real situations (Dahlan et al., 2019; Patriana et al., 2021).Students' numeracy skills can include three things, including measuring, analyzing information, and interpreting analysis results (Patriana et al., 2021; Yulianti et al., 2019).Measurement refers to students' ability to use various kinds of numbers or symbols related to basic mathematics in solving daily life problems (Perdana & Suswandari, 2021; Wiyata & Suwartini, 2022).Meanwhile, the ability to analyze information is displayed in various forms (graphs, tables, charts, diagrams, and so on). Furthermore, the ability to interpret the results of the analysis is used to predict and make decisions (Ulfa et al., 2022).

However, the reality on the ground shows that the numeracy abilities of Indonesian students are still below average. In 2015 Indonesia's PISA results experienced another improvement, obtaining an average score of 386 (Anderha & Maskar, 2021; Devya et al., 2022). In 2018, the average PISA mathematics score for Indonesia decreased again to 379. The average PISA assessment score in all countries that are members of the OECD is 500, this indicates that the PISA mathematics score of Indonesian students is still quite far below the average (Ulfa et al., 2022; Wardhani, 2022).In more detailThe results of observations and interviews conducted at SD Negeri 1 Banjar Jawa, Buleleng District, show that the mathematical numeracy abilities of class IV students at SD Negeri 1 Banjar Jawa are still relatively low. The factor causing the hampered numeracy skills of class IV students at SD Negeri Banjar Jawa is the lack of use of innovative learning models in learning activities. The media used in learning is also less interesting. Lack of attention and guidance from teachers in the learning process that actively involves students and the application of learning that is still conventional and less interactive. The low numeracy ability of class IV students is proven by the results of the geometry learning scores (quadrilaterals) of class IV students at SD Negeri 1 Banjar Jawa with a total of 76 students, 41 of whom were declared to have learning scores below the KKM, with details in class IV A There were 19 students who achieved a score below the KKM, and in class IV B there were 22 students whose score was below the KKM, with a KKM score of 72. If this is allowed to continue, this will of course have an impact on not achieving mathematics learning objectives well.

One effort that can be made to overcome this problem is to apply the guided inquiry learning model, where this model is a learning model in which the teacher guides students in carrying out activities by giving initial questions or clues that can lead students into a discussion to discover solution to problem (Fahrurrizal et al., 2019; Puspitasari et al., 2019). In the guided inquiry learning model, students are required to discover concepts through necessary instructions from a teacher (Budiasa & Gading, 2020; Wiyata & Suwartini, 2022).These instructions generally take the form of guiding questions. Apart from questions, the teacher can also provide necessary explanations when students carry out experiments, for example an explanation of how to carry out experiments (Ilhamdi et al., 2020; Widani et al., 2019). Through the guided inquiry model, students will learn more oriented towards guidance and instructions from the teacher so that students are able to understand lesson concepts well (Lubis, 2020; Widani et al., 2019). The application of the guided inquiry learning model in the learning process is able to increase students' understanding of the material being studied, because students learn to search for and find information related to the material being studied themselves (Firdaus & Wilujeng, 2018; Ilhamdi et al., 2020). There are several stages or syntax of the guided inquiry learning model, including investigating a phenomenon, focusing on questions, planning an investigation, carrying out an investigation, analyzing data and evidence, building new knowledge, and communicating new knowledge (Prasetiyo & Rosy, 2020; Sohibi & Siswanto, 2018).

The application of the guided inquiry model can be accompanied by Geo Gebra media, where GeoGebra is a dynamic mathematics program for learning and teaching mathematics in schools (Octariani & Rambe, 2018).GeoGebra is basically a computer program specifically designed for teaching mathematics, especially geometry and algebra (Faradisa, 2019; Wiyata & Suwartini, 2022). GeoGebra Software is an innovative tool that integrates technology for learning, because in GeoGebra Software there is a mixture of algebra and geometry (Fahrurrizal et al., 2019; Novilanti & Suripah, 2021). GeoGebra software in learning activities can present interesting learning material, make it easier for students to construct geometric shapes, and make it easier for students to solve math problems given by the teacher (Suciati et al., 2022; Wiyata & Suwartini, 2022). GeoGebra software also has the ability to handle variables for numbers, vectors, points, plane shapes and three-dimensional shapes (Ilhamdi et al., 2020; Rohim,

2021). GeoGebra has several benefits as a supporting tool in learning mathematics, such as being more accurate and faster in making geometric drawings than using a pencil and ruler, making it easier for students to understand geometry by using animation features and virtual displays in GeoGebra software so that students get a more visible visual experience. good and interesting, the results of students' drawings can be used as feedback to ensure their correctness, and the properties that apply to a geometric object can be analyzed by teachers or students quickly (Rachman & Nuriadin, 2022; Suciati et al., 2022; Tamam & Dasari, 2021).

Several studies that have been conducted previously revealed that the application of the STAD modelGeogebra assistance significantly influences students' mathematical communication skills (Naldi et al., 2023). Other research results reveal thatMathematics learning using the inquiry learning model with GeoGebra software media has an effect on students' mathematical creative reasoning abilities (Suciati et al., 2022).The results of further research revealed thatThere is an influence of the MMP learning model assisted by GeoGebra on students' mathematical problem solving abilities (Jayanti et al., 2019).Based on several research results, it can be said that the GeoGebra inquiry model and media are significantly able to help the student learning process. It's just that in previous research, there have been no studies that specifically discuss the analysis of the use of Geogebra software as an aid to the guided inquiry model in improving students' numeracy skills. So this research focuses on this study with the aim of testing the effect of the guided inquiry model assisted by GeoGebra software on the numeracy abilities of class IV students

2. METHOD

This research is of a quantitative type with a Quasi Experimental Design approach, with the design namely Non Equivalent Pre-Test Post-Test Control Group Design.The experimental design uses 2 groups. The experimental group received special treatment, namely using a guided inquiry model assisted by GeoGebra software. However, the control group was only taught according to general learning at school. This study had a population of 76 students in class IV of SD Negeri 1 Banjar Jawa. The sampling technique used is saturated sampling, using the t test to measure the equality of numeracy abilities in determining the experimental class. The experimental group was found to be class IV B with a total of 38 students, the control group was class IV A with a total of 38 students. Data was collected using a description test, with the instrument being a test sheet in the form of a description/essay. The variables used are the Guided Inquiry Model assisted by GeoGebra Software and Numeracy Ability. The test instrument grid and assessment rubric in Table 1, and Table 2.

Table1. Numeracy Ability Test Instrument Grid

Learning Outcomes (CP)	Learning Objectives (TP)	Numeracy Indicator	Question Indicator	No. Question
At the end of phase B, students can compare the characteristics of various flat shapes from quadrilaterals, triangles, polygons and circles and compare the characteristics of various geometric shapes of blocks and cubes.	Draw various flat shapes. Draw various geometric shapes.	Use mathematical tools to recognize mathematical structures or to describe mathematical relationships.	Using mathematical tools to draw various flat shapes. Using mathematical tools to draw various geometric shapes.	1, 2, 3, 4
	Calculate the perimeter and area of a flat shape.	Write down the process of reaching a solution to conclude mathematical results.	Write down the process to reach a solution in calculating the perimeter and area of a flat shape.	5, 6
	Correctly choose the shape of the cube and block geometric nets.	Use various kinds of representations (images, tables, graphs, symbols, notations, diagrams) in problem solving.	Using various representations to correctly select the meshes of cubes and blocks.	7
	Create precise nets from cubes and blocks.	Use mathematical tools to recognize mathematical structures or to	Use mathematical tools to create nets from cubes and blocks.	8

Learning Outcomes (CP)	Learning Objectives (TP)	Numeracy Indicator	Question Indicator	No. Question
	Determine the perpendicular and parallel sides and edges of cube and cuboid shapes.	describe mathematical relationships. Use various kinds of representations (images, tables, graphs, symbols, notations, diagrams) in problem solving.	Using various representations to determine the perpendicular and parallel sides and edges of cube and cuboid figures.	9, 10

Table 2. Numeracy Ability Test Scoring Rubric

Identify Known, Questionable and Adequacy of Required Elements	Determine the Right Strategy to Solve the Problem	Solve the Problem	Score
There is no answer	There is no answer	There is no answer	0
There are answers, but there are a few errors in identifying what is known, what is asked, and the adequacy of the required elements.	There are answers, but there is a slight error in determining the right problem-solving strategy.	There are answers, but there are a few errors in solving the questions that arise.	1
Correct and precise answers in identifying what is known, asked, and the adequacy of the required elements.	Correct and appropriate answers in determining the right problem-solving strategy.	Correct and precise answers in solving the questions that arise	2

The data that has been collected will later be analyzed using descriptive and inferential statistical analysis techniques. The use of descriptive statistics is useful in explaining data obtained by grouping data to find out the average, standard deviation, mode, median, minimum value, maximum value, range and amount of data for each variable studied. Next, use inferential statistics, namely testing the hypothesis with a t-test with the polled variance formula. To test the hypothesis if the t value is calculated>ttable, then H0 is rejected and H1 is accepted, at a significance level of 5% with dk = n1 + n2 – 2. Before testing, the data was tested first with a normality test, namely the Shapiro-Wilk test, a homogeneity of variance test with the Levene's Test of Equality assisted SPSS program. And the N-Gain test is carried out by comparing the pretest and posttest results.

3. RESULT AND DISCUSSION

Result

Based on the results of the analysis of the experimental group's numeracy ability, the pre-test mean was 55.39, the lowest score was 40, and the highest score was 75. Meanwhile for the experimental group's post-test numeracy ability, the mean was 83.03, the lowest score was 70, and the highest score obtained was 95. Then for the results of the analysis of numeracy abilities in the control group, the pre-test mean was 57.76, the lowest score was 40, and the highest score was 75. Meanwhile for the post-test numeracy abilities in the control group, the mean obtained was 68.82, the lowest score was 55, and the highest score obtained was 85. Next, from the pre-test and post-test results, the normalized gain score was searched to determine the increase in students' numeracy abilities. With the results obtained, namely the mean value of the gain score of the experimental group, namely 0.622. Meanwhile, the mean value of the gain score for the control group is 0. 261. These results show that the gain in numeracy ability scores of students who take part in learning with guided inquiry model assisted by GeoGebra software had a higher average than control group students.

The data that has been obtained is tested first with prerequisite tests, results are obtained significance value in the Shapiro-Wilk column for the post test value for the experimental group, namely 0.052 and 0.071 for the control class so that the data is normally distributed. Next, in the

homogeneity test, a significance value of 0.241 was obtained, so it can be concluded that the significance value of Levene's statistical test is > 0.05, so the variance between data groups is declared homogeneous. After all the prerequisites are met, proceed with the t-test which results in Table 3.

Table 3. Recapitulation Of T-Test Analysis Results

No.	Sample Group	N	et al	Average Gain Score	S2	T count	T table	Information
1.	Experiment	38	74	0.622	1.632	8.480	1.666	H0 is Rejected
2.	Control	38		0.264	0.887			

The data in table 3 shows that the ttable value, = 1.666 and the results of the t test analysis obtained tcount = 8.480, so tcount>ttable (8,480>1,666). This accepts H1, which means thatThere is a significant influence of the guided inquiry model assisted by GeoGebra software on the numeracy abilities of class IV students at SD Negeri 1 Banjar Jawa. The average gain score in the numeracy ability of experimental group students was 0.622, which was greater than that of the control group, namely 0.264, so it can be concluded that the application of the guided inquiry model assisted by GeoGebra software had an effect on the numeracy ability of class IV students at SD Negeri 1 Banjar Jawa.

Discussion

The results of data analysis in the research show that There is a significant influence of the guided inquiry model assisted by GeoGebra software on the numeracy abilities of class IV students at SD Negeri 1 Banjar Jawa. Furthermore, the gain value of the numeracy ability scores of students who take part in learning withguided inquiry model assisted by GeoGebra softwarehad a higher average than control group students. These results then show thatIncreasing students' numeracy skills can be influenced by the guided inquiry model and with the help of GeoGebra software (Suciati et al., 2022; Wiyata & Suwartini, 2022). The application of the guided inquiry model assisted by GeoGebra software on students' numeracy skills can be effective in student learning, because students are more actively involved in the learning process in class. In the learning process, students are invited to examine and formulate a problem using representations in the form of images which they will solve through investigative activities with their group (Budiasa & Gading, 2020; Wiyata & Suwartini, 2022). This activity encourages students to improve their numeracy skills in indicators using various kinds of representations in problem solving. Numeracy ability is basically an ability that is closely related to mathematical problem solving because one indicator of numeracy ability is using various kinds of representations in problem solving (Kamsurya & Masnia, 2021; Wiyata & Suwartini, 2022).

Besides software GeoGebra's improvement in students' numeracy skills is also influenced by the guided inquiry learning model, where the modelGuided inquiry places more emphasis on student activities maximally to search and find the essence of the material being studied (Fahrurrizal et al., 2019; Puspitasari et al., 2019). Through this activity, students in their groups carry out investigations using GeoGebra software which they then record for analysis. Investigative activities in inquiry can develop students' abilities in interpreting information, measuring, coordinating and organizing data. Students are also encouraged to organize findings in the form of diagrams, pictures, tables and graphs so that they can produce a conclusion (Fahrurrizal et al., 2019; Lubis, 2020; Widani et al., 2019). Furthermore, in the guided inquiry learning process students will be required to be directly involved in solving the problems given during the processlearningand gain new knowledge so that it can be understood more easily in his mind (Prasetiyo & Rosy, 2020; Sohibi & Siswanto, 2018). This can help students to improve their understanding of the material being studied, because students learn to search and find information related to the material being studied themselves (Ilhamdi et al., 2020; Rohim, 2021).

Using GeoGebra software in learning activities can help students carry out investigations. GeoGebra software can enable students to easily see in detail the shapes of flat shapes and spatial shapes in geometry material, so that students can more easily understand the material being investigated (Suciati et al., 2022; Wiyata & Suwartini, 2022). GeoGebra in mathematics learning can be used to demonstrate or visualize mathematical concepts, as a tool to help construct mathematical concepts, and make it easier for students to investigate or show the properties that apply to a school geometric object (Octariani & Rambe, 2018). GeoGebra has several benefits as a supporting tool in learning mathematics, such as geometric drawings can be made quickly and accurately instead of using a pencil and ruler, students can easily understand geometry by using the animation and virtual display features in the GeoGebra software so that students get a more visible visual experience. good and interesting, the results of students' drawings can be used as feedback to ensure their correctness, the properties that apply to a geometric object can be

analyzed by teachers or students quickly (Rachman & Nuriadin, 2022; Suciati et al., 2022; Tamam & Dasari, 2021).

The results obtained in this study are in line with the results of previous research, which also revealed that the application of the STAD modelGeogebra assistance significantly influences students' mathematical communication skills (Naldi et al., 2023).Other research results reveal that Mathematics learning using the inquiry learning model with GeoGebra software media has an effect on students' mathematical creative reasoning abilities (Suciati et al., 2022). The results of further research revealed thatThere is an influence of the MMP learning model assisted by GeoGebra on students' mathematical problem solving abilities (Jayanti et al., 2019).So, based on several research results, it can be said that the GeoGebra inquiry model and media are significantly able to help the student learning process.

4. CONCLUSION

Based on the results of the research analysis that has been carried out, it can be concluded thatThere is a significant influence of the guided inquiry model assisted by GeoGebra software on the numeracy abilities of class IV students at SD Negeri 1 Banjar Jawa.These results show that the gain in numeracy ability scores of students who took part in learning using the guided inquiry model assisted by GeoGebra software was on average higher than the control group students. Geogebra has several benefits as a supporting tool in learning mathematics.

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