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Implementation of geogebra-assisted creative problem-solving model to improve problem solving ability and learning interest students

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Abstract

Mathematics aims to make students have good problem solving skills based on the junior high school curriculum. However, the reality in the field is that more than 50% of students cannot solve problem-solving problems. This study aims to (1) Analyze the differences in the improvement of the problem-solving abilities of students who received learning with the GeoGebra-assisted CPS model and the problem-solving skills of students who received conventional learning in terms of overall and early mathematics ability (superior and low); (2) Analyzing the differences in learning interest of students who received GeoGebra-assisted CPS learning and students who received conventional understanding; (3) Analyzing the correlation between problem-solving abilities and students' interest in education. The research design employed was sequential explanatory with a quasi-experimental method. The Instruments were written tests, questionnaires, observation sheets, and interview guidelines. The data obtained were analyzed using the Mann-Whitney U test, t-test, and correlation test. The results showed that: (1) The improvement of the problem-solving abilities of students who received GeoGebra-assisted CPS learning was better than students who received conventional learning, and there was no difference in the problem-solving abilities of the superior early mathematical ability and low early mathematical ability groups; (2) The learning interest of students who receive GeoGebra-assisted CPS learning is better than students who receive conventional learning; (3) There is no correlation between problem-solving ability and student interest in learning. Creative problem-solving learning models assisted by GeoGebra applications can improve students' mathematical problem-solving skills and interest in learning.

INTRODUCTION

Mathematics is a universal knowledge that underlies the development of modern technology and has an essential role in various disciplines (Habel & Susilowaty, 2021). Thus, it is necessary to have a strong mastery of mathematics from an early age. Therefore, mathematics subjects need to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically, creatively, and the ability to work together (Lestari, 2015; Maftukhin et al., 2014; Muslimin. et al., 2017). Mathematics is also one of the subjects taught from primary, secondary, and higher education levels (Netriwati, 20 16; Darma et al., 2020; Andiyana et al., 2018). Learning mathematics at the primary and secondary education levels is to prepare students so that they can continually develop logically, rationally,

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critically, carefully, honestly, efficiently, and effectively (Syazali, 2015; Subekti, 2012; Ariyanti et al., 2019). Mustafa (2020) states that solving problems is the main goal in learning mathematics; therefore, the ability to solve problems should be given, trained, and accustomed to students as early as possible. It is necessary to understand issues, create mathematical models, and interpret solutions to improve problem-solving skills (Hairullah, 2021). In every opportunity, learning mathematics should begin with introducing problems that are appropriate to the situation (contextual problems) (Manalu, 2021). Students are gradually guided to master mathematical concepts (Arief & Saman, 2021).

The results of a preliminary study at SMP Negeri 1 Karangampel showed that the average achievement of the mathematics national exam scores in the last three years was still below the minimum completeness criteria, namely 2015, 2016, and 2017 was 52.18, 39.38, and 61.94, and the average daily and mid-semester assessment of students under the minimum completeness criteria. The results of interviews with mathematics teachers at SMPN 1 Karangampel showed that students had difficulty solving story problems. Likewise, in the results of random student interviews, students also had trouble with questions in the form of story questions. They are not familiar and trained in problem-solving and mathematical communication. Learning is usually done conventionally without any innovation in applying appropriate and varied learning models. The teacher only gives subject matter and formulas. Students pay attention and take notes, solve sample questions, take notes, and then do the usual practice questions.

Students have difficulty solving problems and communicating mathematical ideas in solving description problems in the form of story questions wholly and systematically. This raises the concerns of teachers and researchers to improve problem-solving skills, especially in transformational materials. Thus, it can be said that students have not achieved or demonstrated problem-solving abilities. From the interviews with teachers of SMP 1 Karangampel, students' interest in learning is still lacking. For example, questions arise from teachers, not from students. There is still a lack of attention when studying. For example, some students chat and do not focus when learning. While the results of interviews with students still lack interest in learning, these students are weak in calculations. They still think mathematics is complex, and there are too many formulas.

Previous studies stated that mathematical problem-solving abilities were low (Hermawati et al., 2021; Munengsih et al., 2021). Students' low mathematical problem-solving ability is due to students' shared interest in learning in mathematics (Sapitri et al., 2019; Holidun et al., 2018). The level of students' learning interest in mathematics is often associated with success and failure in learning outcomes (Putra, 2017; Karina et al., 2017). Students who have a high interest in learning always try to complete their assignments satisfactorily and solve mathematical problems (Alifia & Rakhmawati, 2018). It can be concluded that student's interest in education is influential in their mathematical problem-solving abilities.

One of the models that are assumed to improve problem-solving abilities and student interest is Creative Problem Solving (CPS) (Kuswanto, 2016). The steps of the creative problem-solving learning model are: (1) Clarification of the problem is an explanation of the problems proposed by students; (2) Brainstorming means that students are given the freedom to express their opinions on how to solve problems; (3) Evaluation and selection are that each class discusses opinions or which strategies are suitable for solving problems; (4) Implementation, at this stage students, determine which strategies are considered to be taken to solve the problem, then apply it until they find a solution to the problem (Putra, 2018; Muti & Budi, 2019; Candrawulan et al., 2013). Where in the learning process, according to the teacher, it is only in charge of directing creative problem-solving efforts to students and in the mission of providing subject matter or discussion topics that can stimulate students to think creatively in problem-solving (Muhali, 2021; Hastuti, 2021).

CPS learning is a series of learning activities whose learning stages are oriented to a collaborative creative problem-solving process (brainstorming) to produce many different ideas, ideas, thoughts, criticisms, suggestions to obtain the best solution (Busyairi dan Sinaga, 2015). One of the goals of this learning process is to train students to apply the concepts they have acquired and understand into the problem-solving process. The stages that teach students' analytical skills in the CPS learning process include the steps of problem finding, scenes of finding ideas, and stages of finding solutions (Sari & Noer, 2017; Malisa et al., 2018).

Success in achieving mathematics depends on several factors. One of the influencing factors is how a teacher learns in the classroom. For this reason, teachers are required to innovate in learning because, according to Syazali (2015), the tendency of learning activities that occur in the classroom is not student-centered but tends to be teacher telling stories or lecturing in delivering material so that there is less feedback to students so that the level of students' understanding of problem-solving does not increase. In addition to learning models, what students need is learning media. One suitable learning media used in learning mathematics is GeoGebra media (Nuritha & Tsurayya, 2021; Witraguna et al., 2021).

Geometry is often found difficult when studied by students. Students find it difficult to imagine the results of a reflection, rotation, and dilation on a flat plane. Some students have not generalized that the reflection of point A(x,y) to the x-axis will produce an image of A' (x,-y). This is also supported by students' learning outcomes who still do not meet the minimum completeness criteria. The same problem was also found in previous research, which revealed that students had difficulty understanding the concepts and variations raised in identifying transformations, including translation, reflection, and rotation. In addition, students also have a problem building proofs of geometric transformations algebraically (Lydiati, 2020). Therefore, a visualization aid is needed, which plays an essential role in understanding geometric concepts (Yuliardi & Casnan, 2017). The same thing was stated by Lydiati (2020), who concluded that educators should teach geometry transformation material with the help of clear images so that students easily understand them. Software that makes it easier for students to understand the concepts of translation, reflection, dilation, and rotation is GeoGebra software (Elvi et al., 2021).

Apart from assisting students in learning, GeoGebra also has other advantages. According to Supriadi (2015), GeoGebra can help students visualize simple mathematical concepts: complicated geometry. According to Septian et al, (2020) some of the benefits of GeoGebra include: (1) Graphs, algebra, and tables are connected and very dynamic; (2) Easy to use but lots of advanced features, (3) Authoring tool to create interactive learning materials as web pages; 4) available in many languages for our millions of users worldwide, and (5) Open source software that is freely available to non-commercial users.

In previous studies, no one has researched the topics discussed in this study, especially on the material of geometric transformations. Each material has a different difficulty level and will show different research results. Several related studies have shown that the use of the CPS learning model can improve mathematical problem solving abilities (Sari et al., 2019); critical thinking skills (Maharani et al., 2021); creative thinking skills (Ginting et al., 2019), and students' adaptive reasoning (Nopitasari, 2016). Several researchers also mentioned that the GeoGebra software was effective in improving mathematical problem-solving abilities (Batubara & Sari, 2020) and concept-understanding abilities (Nurdin et al., 2019). However, previous research has discussed the Geogebra-assisted CPS learning model to enhance mathematical problem-solving abilities and student interest in learning applied to the GeoGebra transformation material. Each material has a different level of difficulty will give different results. So far, based on the observations of researchers, no one has researched the creative problem-solving learning model assisted by the Geogebra application at the 9th-grade junior high school level in geometry transformation material and on affective abilities, namely student interest in learning.

The research objectives that the researchers conducted were to: (1) Analyze the differences in the improvement of the problem-solving abilities of students who received learning with the GeoGebra-assisted CPS model and the problem-solving skills of students who received conventional learning in terms of overall students and Early Mathematics Ability (superior and low); (2) Analyzing the differences in learning interest of students who received GeoGebra-assisted CPS learning and students who received conventional understanding; (3) Analyzing the correlation between problem-solving abilities and students' interest in education.

METHODS

This research phase is sequentially divided into three stages, namely: (1) preparation stage: preliminary study, grouping students and consulting with supervisors; (2) implementation stage: conducting pretest, conducting learning treatment; conducting interviews, analyzing observations, conducting posttests and collecting data; (3) Processing stage: analyzing and writing reports. The following is the data analysis conclusion in the form of the following diagram:

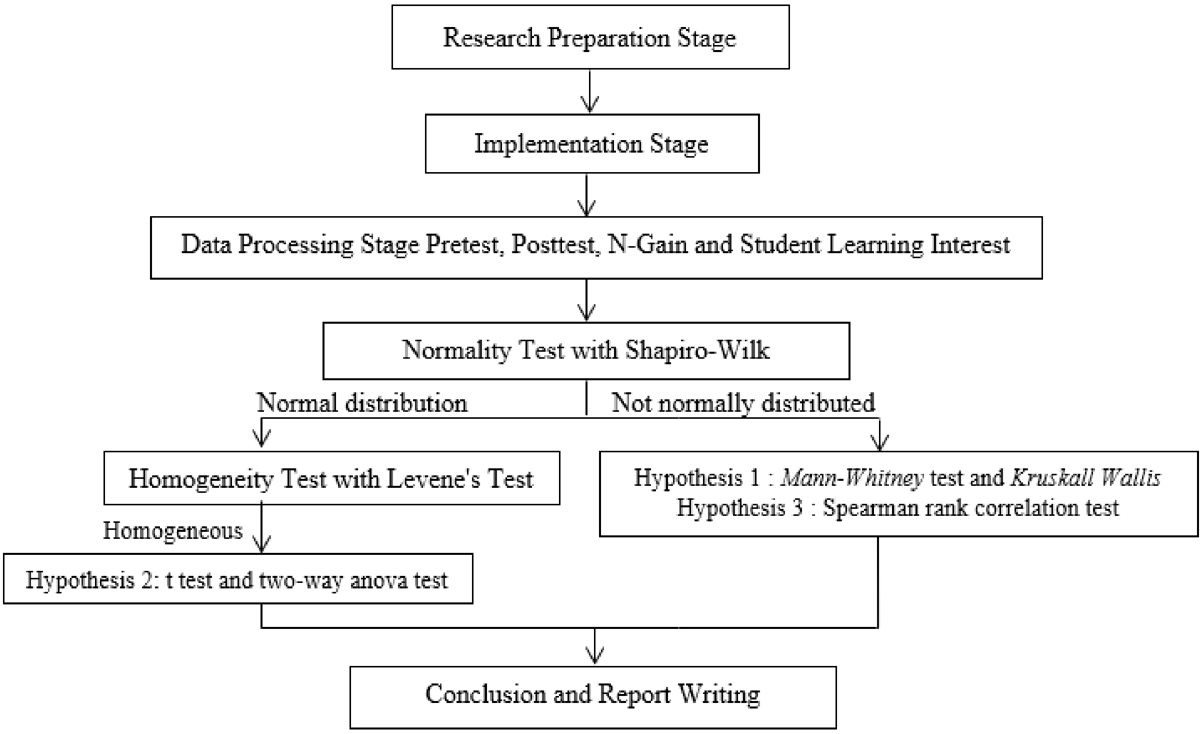

Figure 1. Research Procedure

The design of this research is a sequential explanatory design. This research is a quasi-experimental research at SMP Negeri 1 Karangampel. The independent variable in this study is the Creative Problem Solving (CPS) model. The independent variable in this study is the ability to solve problems and students' interest in learning. Non-equivalent control group, as shown in the following table.

Table 1. Research design

Group	Pretest	Treatment	Post-Test
Natural Experiments (GeoGebra-assisted CPS Learning)	O	X	O
Natural Control (Conventional Learning)	O		O

The population of this study was the entire class IX, with the number of students in the experimental class and control class respectively 42 students. The experimental class received GeoGebra-assisted CPS learning, while the control class received conventional learning. The sample of this study was IX F as the experimental class and IX G as the control class. The research instruments were mathematical problem-solving ability test instruments, student learning interest questionnaires, teacher and student observation sheets, and interview guidelines. Mathematical Problem Solving Ability Instrument Guide (Mawaddah & Anisah, 2015) as follows:

Table 2. Guidelines for Scoring Mathematical Problem Solving Ability

No	Indicator	Student Reaction to Questions	Score
1.	Understanding the problem	Not mentioning what is known and what is being asked	0
		Saying what is known without mentioning what is being asked or vice versa	1
		State what is known and what is asked but not quite right	2
		State what is known and what is asked correctly	3
2.	Planning a solution	Not planning to solve the problem at all	0
		Planning a solution by making a picture based on the problem, but the image is not quite right	1
		Planning a solution by making pictures based on the problem correctly	2
3.	Executing the plan	No answer at all	0
		Carry out the plan by writing down the answers, but the answers are wrong, or only a small part of the answers are correct	1
		Carry out the plan by writing down the answers half, or Most of the answers are correct	2
		Implement the plan by writing down answers completely and correctly	3
4.	Interpret the results obtained	Don't write conclusions	0
		Interpreting the results obtained by making conclusions but not quite right	1

No	Indicator	Student Reaction to Questions	Score
		Interpret the results obtained by making appropriate conclusions	2

The processing of the questionnaire is by transforming the data using a Likert scale (Pranatawijaya et al., 2019):

Table 3. Likert skala scale transformation

Statement	SS	S	N	TS	STS
Positive (favorable)	5	4	3	2	1
Negative (unfavorable)	1	2	3	4	5

The next step is to tabulate data using MSI and Microsoft Excel to find out the average student who uses GeoGebra-assisted CPS learning and conventional learning. The grid from the student learning interest questionnaire used is (Purwoko et al., 2021) are as follows:

Table 4. Questionnaire of Students' Learning Interests

No.	Indicator	Statement		Statement number
		Positive	Negative	
1	Feeling happy	√		2, 3, 10
			√	11, 21, 22
2	Interest in learning	√		1, 8, 23
			√	12, 13, 14, 19
3	Shows attention while studying	√		4, 5, 6
			√	18, 20, 25
4	Involvement in learning	√		6, 7, 9
			√	15, 16, 17

The teacher's ability to manage learning and student learning activities are divided into five score range with categories 1, 2, 3, 4, and 5, namely very poor, less, sufficient, good, and very good. The percentage of the implementation of the observation sheet is classified using the rules for organizing the activities of teachers and students (Ati et al., 2021) as follows:

Table 5. Classification of Teacher Activities Implementation

Classification	Percentage
$x \leq 50\%$	Not good
$50\% < x \leq 65\%$	Not good
$65\% < x \leq 80\%$	Pretty good
$80\% < x \leq 95\%$	Good
$x > 95\%$	Very good

Table 6. Classification of the Percentage of Student Activities

Category	Clasification
0% - 20%	Very bad
21% - 40%	Bad
41% - 60%	Enough
61% - 80%	Good
81% - 100%	Very good

RESULTS AND DISCUSSION

The distribution of students based on the initial ability category is presented in the following table:

Table 7. Grouping of Students Based on Early Mathematical Ability

Group Category	Experiment	Control
Superior	25 students	16 students
Low	17 students	26 students

The group division is based on the average results of three daily assessments on the material before the study. The calculation process is done using excel. The data needed in the calculation are the mean and standard deviation as follows:

Table 8. Calculation of Early Mathematical Ability

	Early Mathematical Ability of the Experimental Class	**Early Mathematical Ability of the Control Class**
Average	47,72	38,10
Standard Deviation	18,32	19,69

The average of the two classes is 42.91, with a standard deviation of 15.58. So that the superior group students have early mathematical ability ≥ 42,91 while students in the low group have early mathematical ability < 42,91.

Based on the posttest results, the average problem-solving ability of students after learning from both classes reached 70.4%, which was the indicator of applying strategies to solve problems, but the answers were still wrong. This is different from the results of observations before learning 23.81% on indicators can identify known, asked elements and the adequacy of the components needed. This is in line with previous research (Sulaeman et al., 2021; Lestari et al., 2021) that applying the Creative Problem Solving (CPS) learning model is one of the efforts to improve students' mathematical problem-solving abilities. Sari & Noer (2017) state that creative problem solving (CPS) can improve students' mathematical problem-solving skills by mastering four stages of problem-solving skills, including understanding problems, planning strategies, carrying out completion plans, and checking results again. With CPS, students can choose and develop their ideas and thoughts, unlike memorization, which uses little thought.

Analysis of increasing mathematical problem-solving ability to see whether there is an increase in mathematical problem-solving ability in the experimental and control classes. Descriptive statistics for improving problem-solving skills are as follows:

Table 9. Descriptive Statistics of N-Gain Problem Solving Ability

Value	**Early Mathematical Ability**	**Experiment Class**					**Control Class**				
		N	x_{min}	x_{max}	$\bar{x}$	**SD**	**N**	x_{min}	x_{max}	$\bar{x}$	**SD**
N-Gain		42	-0,68	0,76	0,10	0,381	42	-0,85	1,00	0,33	0,500
	Superior	25	-0,40	0,76	0,21	0,329	16	-0,23	1,00	0,54	0,403
	Low	17	-0,68	0,75	-0,08	0,394	26	-0,85	1,00	0,21	0,519

Based on Table 9, for the N-Gain score of problem-solving abilities, the average score for students who received GeoGebra-assisted CPS learning was 0.10, lower than those who received conventional learning with an average N-Gain of 0.33. After processing the data, the results of the calculation of the normality test are presented in the following table:

Table 10. N-Gain Normality Test Results Problem Solving Ability

Student					
Gain	**Kolmogorov Smirnov**			**Conclusion**	**Description**
	Statistics	**Df**	**Significance**		
Experimental	0,81	42	0,200	H_0 is rejected	The data is not normally distributed
Control	0,12		0,138		

Based on table 10, the results of the normality test are not normal because the results of the Kolmogorov Smirnov test in the control class value sig. <0,05. Results of the Mann-Whitney U N-Gain Test of Overall Problem-Solving Ability is the value of $\frac{1}{2}$ Sig. (0,009) < α (α = 0,05). This shows the increase in problem-solving abilities of students who receive GeoGebra-assisted CPS learning is significantly better than students who receive conventional learning.

Table 11. Similarity Test Results of Two Average N-Gain Students' Problem-Solving Ability Based on Early Mathematical Ability

Asymp. Sig (2-tailed)	Description
0,051	H_0 accepted

N-Gain data was obtained by the value of Sig.= 0,051 ≥ α (α = 0,05). This means that there is no difference in improving the problem-solving ability of superior early mathematical and low early mathematical abilities. The data analysis results showed a significant increase in students' problem-solving ability who received GeoGebra-assisted CPS learning better than students who received conventional learning. There was no difference in problem-solving abilities of the superior and low early mathematical ability groups. This aligns with research results that align with Partayasa et al, (2020), which shows that problem-solving abilities in learning with the interactive CD-assisted CPS model are better than problem-solving abilities for students who take conventional learning. There are differences in problem-solving abilities between students in the upper, middle, and lower groups in this learning.

According to Soemarmo & Hendriana (2014), the problem-solving ability referred to in this study was measured using mathematical problem-solving abilities indicators. These indicators identify known, asked about, and the adequacy of the elements needed, formulating mathematical problems or compiling mathematical models, making mathematical models of everyday situations or problems and solving them, applying strategies to solve various problems (new types and problems). Inside or outside mathematics, explain or interpret the results according to the original problem, and use mathematics in a meaningful way (Iswara & Sundayana, 2021). Meanwhile, according to Cahyani et al. (2019), the mathematical problem-solving ability is where students try to find a way to achieve goals. It also requires readiness, creativity, knowledge and abilities, and application in everyday life.

GeoGebra-assisted CPS learning is a new thing for both teachers and students. The results of interviews with students stated that students with superior and low abilities in the experimental class after learning using GeoGebra-assisted CPS were better able to solve problems than students in the control class. Because students in the experimental class were helped by the GeoGebra software, problem-solving was immediately visible either in images or in the form of coordinates. However, students still have to work on questions manually without the help of GeoGebra software, namely by formulas or by sketching images. Sometimes some students can only rely on the GeoGebra software. Some students don't bring their laptops, only following the answers of their group friends. The questions given are also not, as usual, namely evaluating problem-solving abilities from everyday problems, but students feel happy and challenged to learn mathematics because the GeoGebra application is an interactive learning media (Sari et al., 2019).

From the results of this study, as previously stated, the problem-solving ability of students who received GeoGebra-assisted CPS learning significantly increased better than students who received conventional learning. There was no difference in problem-solving abilities of the superior and low early mathematical ability groups, so CPS learning was assisted. GeoGebra can be used as a learning model by mathematics teachers at the school, which positively impacts students' mathematical problem-solving abilities by adding laptop/notebook facilities, deepening GeoGebra software, and trying other materials. GeoGebra-assisted CPS learning is a new thing for both teachers and students. The questions given are also not, as usual, namely evaluating problem-solving abilities from everyday problems, but students feel happy and challenged to learn mathematics. This is in line with Laia's (2021) opinion that problem-solving can build a student's confidence in solving mathematical problems. In addition, students who have mathematical problem-solving skills can improve decision-making in everyday life. According to Widodo (2017), the creative problem-solving learning model centered on creative problem solving is expected to make students develop their ability to solve problem-solving. The creative problem-solving learning model is problem-based. The description of students' interest in mathematics is as follows:

Table 12. Descriptive Statistics of Student Interest in Learning

Class	Early Mathematical Ability	Average	Std. Deviation	N	SMI
Experiment	Superior	69,98	7,16	25	125
	Low	68,05	6,91	17	
	Total	69,20	7,04	42	
Control	Superior	69,66	10,06	16	
	Low	63,07	7,34	26	
	Total	65,91	8,87	42	

The following is a summary of the normality test of students' learning interest score data:

Table 13. Normality Test Results of Students' Learning Interest Questionnaire

Class	Kolmogorov-Smirnov		
	Statistics	Df	Sig.
Experiment	0,078	42	0,200
Control	0,095		

Based on Table 13, it can be seen that the value of Sig. is higher than α (α = 0,05). This result shows the students' interest in learning is from a normally distributed population. In this study, to test the homogeneity, the Levene test was used as follows:

Table 14. Homogeneity Test Results of Students' Learning Interest Questionnaire

Levene Statistics	Df 2	Sig.
1,624	82	0,206

From Table 14, it is known that the value of Sig. = 0,206 > α (α = 0,05). This result shows that the student's learning interest questionnaire scores in the experimental and control classes have a variance that is not different (homogeneous). The summary of the statistical tests is presented in the following table.

Table 15. The results of the Average Similarity Test of Students' Learning Interest Questionnaire

T-test for equality of means	
	95% confidence interval of the difference

T	Df	Sig. (2 tailed)	Mean difference	Std. error difference	lower	Upper
1,879	82 78	0,64	3,284	1,748	-193 -196	6,761 6,764

Based on Table 15 above, it is known that the value of Sig. = 0,064 > α (α = 0,05). Because $\frac{1}{2}$ Sig. (0,064) < α (α = 0,05) then H_0 is rejected. This result shows that the learning interest of students who receive GeoGebra-assisted CPS learning is significantly better than students who receive conventional learning. The following are the results of the two-way ANOVA test, which are presented in the table below.

Table 16. The results of the Similarity Test of Two Average Student Interest Questionnaires based on Early Mathematical Ability

Tests of Between-Subjects Effects						
Source		**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Intercept	Hypothesis	368400,535	1	368400,535	1154,485	,019
	Error	319,104	1	319,104[a]		
Kelas	Hypothesis	113,358	1	113,358	1,333	,454
	Error	85,025	1	85,025[b]		
Early Mathematical Ability	Hypothesis	319,104	1	319,104	3,753	,303
	Error	85,025	1	85,025[b]		
Kelas * Early Mathematical Ability	Hypothesis	85,025	1	85,025	1,400	,240
	Error	4860,258	80	60,753[c]		

From Table 16, it is known that early mathematical ability has a Sig value. 0,303 > 0,05. This means no difference in students' interest in learning between superior early mathematical ability and low early mathematical ability. For Class *, the early mathematical ability has a Sig value. 0,240. Because of the value of Sig. > 0,05. This means that early mathematical ability does not affect the two learning classes regarding students' interest in learning. Interest in learning in each lesson is important, especially in implementing mathematics learning, which is less attractive for some students. If students are less interested in learning mathematics, their ability in mathematics will be hampered (Sirait, 2016).

Students' learning interest in the form of impulses from within students psychologically in learning something with full awareness, calm, and discipline so that individuals are active and happy (Sari et al., 2019; Maula & Hidayah, 2019). From the results of interviews with students, it was found that students liked, enjoyed, and were interested in mathematics lessons. Moreover, students had never used the GeoGebra-assisted CPS model, which was new for students. By using GeoGebra-assisted CPS learning, students do not feel bored. Students are challenged to learn new software work in groups with friends to solve problems in the teaching materials given by the teacher. Many of them argue that problems can be solved faster with the help of GeoGebra software, and it's easier not to have to draw Cartesian coordinates first.

Creative Problem Solving (CPS) is a learning model that focuses on teaching and problem-solving skills followed by skill strengthening (Abduloh et al., 2018). This is in line with the results of Anwar et al., (2017) CPS learning model can increase students' interest in learning in each learning cycle. Based on the study results, it can be concluded that the problem-solving ability of Mathematics Education FKIP UNRAM students can be increased by applying the Creative Problem Solving (CPS) learning model in the Complex Analysis course (Turmuzi et al., 2018). In their research, Batubara & Sari (2020) concluded that the increase in the mathematical problem-solving ability of students who received learning using GeoGebra software was higher than the group of students who received learning without GeoGebra software. The increase in the ability to understand mathematical concepts of students who were taught through problem-based learning assisted by autographs is higher than that led through GeoGebra-assisted problem-based learning (Batubara & Sari, 2020).

The relationship between mathematical problem-solving abilities and students' interests can be found using the correlation test as follows:

Table 18. Correlation of mathematical problem solving with student interest

Pearson Correlation	0,190
Sig. (2-tailed)	0,084
N	84

For the relationship between problem-solving abilities and students' interest in learning, a correlation coefficient of 0.190 (very low correlation) is obtained with a significance value of 0,084 > 0,05. This shows no correlation between problem-solving and students' interest in learning.

The results showed no correlation between problem-solving abilities and student interest in learning. This result is in line with the research results of Alayyannur (2018), which shows no relationship between management commitment and knowledge. However, in contrast to research Yuliati (2021) which states that students' mathematical problem-solving abilities significantly influence learning interest, there is a significant positive correlation between learning interests and students' mathematical problem-solving abilities.

The factor that causes there is no correlation between problem-solving ability, mathematical communication, and interest in learning is the absence of a correlation pattern. If problem-solving ability increases, then mathematical communication ability or interest in learning also increases. Or vice versa, if problem-solving ability decreases, then mathematical communication ability or interest in learning decreases. According to Yuliati (2021), students' interest in learning mathematics varies. The variation is caused by internal and external factors from each student, including students' attention to lessons, goals, talents, motivation, environment, and the learning process of mathematics while at school itself.

Some students had a high interest in learning from the interviews, but their test abilities were mediocre because that was their ability. Those whose problem-solving ability results are not good, even though their interest in learning is good because they lack confidence.

CONCLUSIONS

There is no correlation between problem-solving and student interest in learning. The problem-solving ability of students who received GeoGebra-assisted CPS learning was better than students who received conventional learning, and there was no difference in problem-solving between superior and low early mathematical ability groups. The learning interest of students who received GeoGebra-assisted CPS learning was better than students who received conventional learning.

It is recommended to conduct further research with a broader study, for example, from other cognitive and affective abilities. The implication for further research is that during the Covid-19 pandemic, it is hoped to apply creative problem-solving learning models assisted by the Geogebra application on learning platforms such as Google Classroom, MS Teams, learning management systems, and others. They are making GeoGebra application video tutorials that can help students understand its use better. Making learning videos from teachers by applying creative problem-solving learning models assisted by GeoGebra applications will be more effective in current learning.

AUTHOR CONTRIBUTIONS STATEMENT

EDH & EK as article writers. MIZ acts as Research Conceptor. RPY & NMS as mentors in writing articles.

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