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Improving Mathematical Problem Solving Ability and Mathematical Representation through an Inquiry Learning Model with a Coastal Based Contextual Approach on Geometry Material in Junior High School Students in Kairatu District

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Abstract

This was an experimental study with a pretest-posttest control group design that was carried out at Junior High Schools in Kairatu District with a sample of 162 students. The aim of this research is: (1) Improve students' mathematical problem-solving abilities through inquiry learning models with a coastal-based contextual approach to geometry material, (2) Improve students' mathematical representation through inquiry learning models with a coastal-based contextual approach to geometry material, (3) Knowing the differences in increasing mathematical problem-solving abilities and mathematical representation abilities in geometry material for students who receive inquiry learning with a coastal-based contextual approach, (4) Determine the interaction between inquiry learning with a coastal-based contextual approach and conventional learning and students' initial mathematical abilities in the high, medium, and low categories towards increasing students' mathematical problem-solving abilities in geometry material, and (5) Determine the interaction between inquiry learning with a coastal-based contextual approach and conventional learning and early mathematical abilities in the high, medium, and low categories towards increasing students' mathematical representation abilities in geometry material.

From the results of this study, it appears that: (1) The inquiry learning model with a coastal-based contextual approach can improve students' mathematical problem-solving abilities in geometry material, and the results of the improvement are included in the medium category, (2) The inquiry learning model with a coastal-based contextual approach can improve students' mathematical representation skills in geometry material, and the results of the improvement are included in the medium category, (3) There is a difference in the increase in mathematical problem solving abilities and mathematical representation abilities in the geometry material of students who obtain inquiry learning models with coastal-based contextual approaches and conventional learning models, (4) There is no significant relationship between the learning model and the level of early mathematics ability. This can be seen from the results obtained showing that the significant value is 0.311 which means more than the value $\alpha = 0.05$, But the initial level of mathematical ability affects students' mathematical problem-solving abilities, and conversely, the learning model also influences students' mathematical problem-solving abilities, and (5) There is no significant relationship between the learning model and the level of early mathematics ability. This can be seen from the results obtained, showing that the significant value is 0.483, which is more than the value $\alpha = 0.05$, but the initial level of mathematical ability affects the ability of students' mathematical representations, and vice versa, the learning model also influences the increase in students' mathematical representation abilities.

Keywords: Inquiry model, coastal-based contextual approach, problem-solving skills, mathematical representation

1. INTRODUCTION

Mathematics is one of the universal knowledges that underlies the development of science and technology in the Industrial 4.0 era. Mathematics is also a pattern of thinking and requires logical proof; therefore, because mathematics is essentially a human activity through active, dynamic, and generative processes as well as structured knowledge, developing an attitude of critical, objective, and open thinking is very important every individual is facing the development of science and technology in the era of revolution. 4.0.

The Industrial Revolution 4.0 provides opportunities for students to be more active in learning; therefore, the inquiry learning model offers a solution with the following stages: orientation, formulating problems, formulating hypotheses, collecting data, testing hypotheses, and formulating conclusions. The inquiry learning model has

succeeded in improving learning outcomes in several junior and senior high schools in Indonesia. This can be seen in the research, (Lovisia, 2018); (Mayasari, Raharjo and Supardi, 2018), However, current mathematics learning is still focused on procedural skills, one-way communication, monotonous class arrangements, low-order thinking skills, and, depending on textbooks, more dominant routine questions and low-level questions. Low student learning outcomes because teachers rarely provide opportunities for students to solve problems, even to represent their abilities, cause students difficulties in solving the questions given. This is in line with the opinion of Lajdova (Dzhumanazarovna *et al.*, 2022) that the application of analytical skills determines a large part of the successful implementation of preschool and elementary school education and makes it possible to highlight aspects and directions of implementing mathematics education because, to set tasks correctly, it must consider the causes and effects of unresolved issues. Basic mastery of good analytical skills in elementary school students will influence other skills and even abilities in junior and senior high schools, such as the ability to solve mathematical problems and mathematical representations.

Another thing that causes low student learning outcomes is also due to the Corona Virus that has hit the world and even Indonesia, which requires students to study from home with all the limitations that teachers and students have. Learning that takes place online through various learning platforms, such as WhatsApp groups, Google Classroom, Google Meet, etc, according to Mustofa (Saliman, Wijayanti and Hartati, 2023) cannot be directly supervised by the teacher during learning, so discipline, integrity, and social relationships are very important. The learning that is carried out only asks students to solve routine problems or problems that are rote, so as to make students passive in learning. With the Corona Virus, students cannot be invited to study outside the classroom, but learning with nature can improve their problem-solving skills and mathematical representation. Therefore, a learning model that can be used to improve students' problem-solving and representation skills is an inquiry learning model based on a coastal contextual approach.

This coastal-based contextual learning approach was developed from a contextual learning approach. Contextual Teaching and Learnig (CTL) is a learning approach that is emphasized in learning mathematics according to the curriculum implemented in schools. Coastal problems are designed as contextual learning that is close to everyday life so that it can train students' problem-solving abilities and mathematical representations. This is important to do because coastal potential is related to the daily lives of coastal students, so it is interesting to encourage students' thinking processes.

The coastal-based contextual learning approach emphasizes the full involvement of students to be able to find the material being studied and relate it to real-life situations in the coastal areas where they live, so as to encourage coastal students to be able to improve problem-solving skills and mathematical representations. This is in line with the opinion of (Sari and Lutfi, 2023), who suggests that students are encouraged to learn and find solutions to problems through making a list of questions, answering questions, and being able to re-explain their own answers.

2. METHOD

This was an experimental study with a pretest-posttest control group design that was carried out at Junior High Schools in Kairatu District with a sample of 162 students. In this study, the subjects were not randomly grouped, but the researchers accepted their condition as it was (Till Bärnighausen *et al.*, 2017). In this study, two classes were used: the experimental class and the control class. The research design used was as follows:

Table 1. Research Design

Grup	***Pretes***	**Tindakan**	***Postes***
Kelas Eksperimen	O_1	X_1	O_2
Kelas Kontrol	O_3	X_2	O_4

Information:

X_1: Treatment using the CTL-based Inquiry Learning Model

X_2: Treatment using a conventional approach

O_1: Class pretest results of the Inquiry Learning Model based on the coastal CTL approach

O_2: The results of the class posttest learning model Inquiry CTL approach based on Coastal

O_3: Class pretest results using a conventional approach

O_4: Class posttest results using a conventional approach

The population in this study was comprised of students at Kairatu District Public Middle School. The selection of state junior high school students in Kairatu District as the research sample was based on the consideration that the learning model used was inquiry with a coastal-based Contextual Teaching and Learning (CTL) approach, and Kairatu District is a coastal area. The samples in this research were SMP Negeri 1 Kairatu, SMP Negeri 2 Kairatu, and SMP Negeri 5 Kairatu. The instrument used in this study was an instrument to test the ability to solve mathematical problems with 3 questions and a mathematical representation ability test as well as 3 questions. After obtaining the test results, the data is processed using N-Gain introduced by Hake and is simply the absolute gain divided by the maximum gain, as follows:

$$g = \frac{\text{Posttest Score} - \text{Pretest Score}}{\text{Maximum Score} - \text{Pretest Score}}$$, (Hake, 1999)

With the interpretation criteria as follows:

Table 2. Normalized Gain Score Classification

Normalized Gain Score	Interpretation
(<g>) > 0,7	High
0,3< (<g>) ≤ 0,7	Medium
(<g>) ≤0,3	Low

Source: Hake (1999)

The calculation of the normalized Gain score was carried out because this research not only looked at student improvement but also looked at the quality of the increase. After getting the value, proceed with the Two-way ANOVA test.

3. FINDING AND DISCUSSION

3.1 Finding

To test the differences in the increase in mathematical problem solving abilities and mathematical representation abilities in geometry material for junior high school students who received inquiry learning using a coastal-based and conventional contextual approach, the Two-way Anova test was used and a non-parametric test, namely the Wilcoxon signed ranks test, because when using the parametric test, the results obtained are not significant, then further tests were carried out to see the effect of the interaction between inquiry learning with a coastal-based contextual approach and conventional learning with early mathematical abilities in the high, medium, and low categories on problem solving abilities and the effect of the interaction between inquiry learning models with a coastal-based contextual approach and conventional learning with early mathematical abilities in the high, medium, and low categories on students' mathematical representation abilities.

The results of testing data on increasing the ability to solve mathematical problem-solving inquiry learning models with a coastal-based contextual approach are shown in Table 3 below:

Table 3. Average N-Gain Test Results for Mathematical Problem Solving Ability

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
N-Gain Problem Solving Control Class	81	-.60	.74	11.34	.1400	.27520
N-Gain Problem Solving Experiment Class	81	-1.00	.97	25.71	.3174	.35460

Based on the table above, it can be seen that the average (mean) N-Gain of students' mathematical problem-solving abilities in the experimental class is 0.3174, which is included in the medium category, while the control class is 0.1400, which is included in the low category. So that the increase in problem-solving abilities using inquiry learning models with a coastal-based contextual approach is included in the medium category.

The results of testing the data on improving the ability of mathematical representation using an inquiry learning model with a coastal-based contextual approach are shown in Table 4 below:

Table 4. Average N-Gain Test Results for Mathematical Representation Ability

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
N-Gain Mathematical Representation Control Class	81	-.80	.70	8.46	.1044	.26657
N-Gain Mathematical Representation Experiment Class	81	-.40	.90	28.03	.3460	.28697

Based on the table above, it can be seen that the average (mean) N-Gain ability of students' mathematical representations in the experimental class is 0.3460, which is included in the medium category, while the control class is 0.1044, which is included in the low category. From these data, it can be concluded that the improvement of students' mathematical representation skills using inquiry learning models through coastal-based contextual learning is included in the medium category. To find out the increase in students' mathematical problem-solving abilities who obtain inquiry learning models with a coastal-based contextual approach, then a data normality test is first performed to determine whether the data used is normally distributed or not, which is presented in Table 5 below.

Table 5. Data Normality Test Results for Mathematical Problem Solving Ability

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
N-Gain Mathematical Problem-Solving Ability Control Class	.144	78	.000	.954	78	.007
N-Gain Mathematical Problem-Solving Ability Experiment Class	.116	78	.012	.918	78	.000

a. Lilliefors Significance Correction

From the table above, it can be seen that both the data on mathematical problem-solving abilities for the control class and the experimental class are not normally distributed. This is because the significant value is less than α =

0.05. So a non-parametric test was carried out, namely the Wilcoxon signed rank test, which is presented in Table 6 below.

Table 6. Test the Average Difference in Mathematical Problem-Solving Ability

	N-Gain Mathematical Problem-Solving Ability Experiment Class N-Gain Mathematical Problem-Solving Ability Control Class
Z	-4.516[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

From the results of the analysis in the table above, an asymp.sig (2-tailed) value of 0.000 is obtained, which is less than the value α = 0.05, so that it can be concluded that there is a difference in the N-Gain ability of students' mathematical problem solving using inquiry learning models with a coastal-based contextual approach and conventional learning models.

To find out the increase in mathematical representation abilities of students who obtain inquiry learning models with a coastal-based contextual approach, then a data normality test is first carried out to determine whether the data used is normally distributed or not, which is presented in Table 7 below.

Table 7. Data Normality Test Results for Mathematical Representation Ability

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
N-Gain Mathematical Representation Ability Control Class	.113	81	.012	.953	81	.005
N-Gain Mathematical Representation Ability Experiment Class	.059	81	.200*	.988	81	.627

From the normality test table above, in the Kolmogorov-Smirnov[a] column, it can be seen that the N-Gain significance value of the control class in the mathematical representation ability of 0.012 is less than the value of α = 0.05, so that the data is not normally distributed while the data in the experimental class is included in the normally distributed data because the significance value is 0.200 more than α = 0.05, because the two sets of data were not all normally distributed, comparing the differences in the increase between the two groups was carried out using a non-parametric test, namely the Wilcoxon signed rank test. The test results are presented in Table 8 below.

Table 8. N-Gain Average Difference Test of Mathematical Problem Solving Ability

Test Statistics[a]

	N-Gain Mathematical Problem-Solving Ability Experiment Class N-Gain Mathematical Problem-Solving Ability Control Class
Z	-4.807[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

From the test results in the table above, it can be seen that the Asymp.sig value (2-tailed) is 0.000, which is less than the value of α = 0.05, so that it can be concluded that there are differences in the increase in the ability of mathematical representation of students who obtain inquiry learning models with coastal-based contextual approaches and conventional learning models.

To see the effect of the learning model used with the KAM (Initial Mathematical Ability) level in the high, medium, and low categories on problem-solving abilities, it is presented in Table 9 below.

Table 9. Effect of Learning Model with KAM Level on Problem-Solving Ability

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6.238[a]	5	1.248	18.017	.000
Intercept	6.222	1	6.222	89.852	.000
x3	1.735	2	.867	12.525	.000
X4	3.079	1	3.079	44.458	.000
x3 * X4	.163	2	.081	1.175	.311
Error	10.803	156	.069		
Total	27.372	162			
Corrected Total	17.041	161			

a. R Squared = .366 (Adjusted R Squared = .346)

Based on the results of the analysis in the table above, it can be seen that the interaction between the level of students' initial abilities in the high, medium, and low categories obtained a significant value of 0.311, which is more than the value of α = 0.05, so that it can be concluded that simultaneously the level of Student Initial Ability and the learning model have no significant effect, But from the table above, it can also be seen that the level of students' initial abilities in the high, medium, and low categories has an effect on students' mathematical problem-solving abilities, and vice versa, the learning model also influences students' mathematical problem-solving abilities.

In addition to being seen in the table above, to see the effect between the level of students' initial abilities and the learning model used and the effect of problem-solving abilities on the learning model and vice versa, it is presented in the following figure:

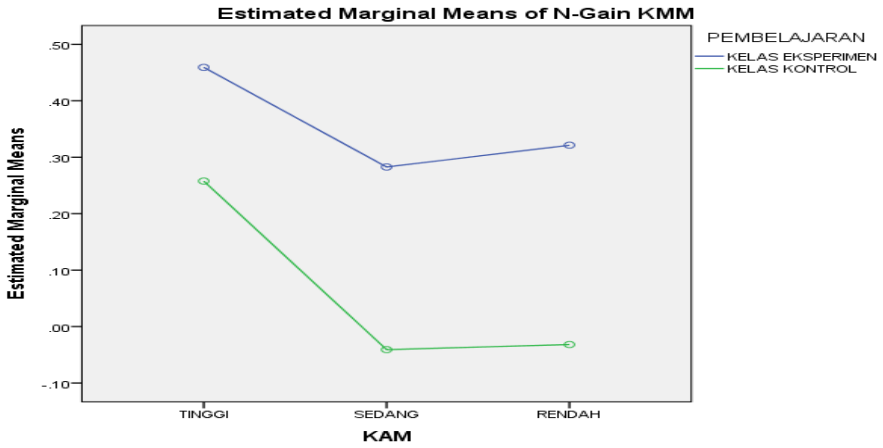


Figure 1. KAM Level Interaction on Learning Models and Mathematical Problem Solving Skills

To see the effect of interaction between inquiry learning with a coastal-based contextual approach and conventional learning with students' initial abilities in the high, medium, and low categories of mathematical representation abilities, see table 10 below.

Table 10. The Effect of the Learning Model on Students' Initial Ability Level on Mathematical Representational Ability

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.767[a]	5	.953	10.758	.000
Intercept	3.415	1	3.415	38.531	.000
x3	1.627	2	.813	9.177	.000
X4	1.280	1	1.280	14.438	.000
x3 * X4	.130	2	.065	.732	.483
Error	13.825	156	.089		
Total	26.420	162			
Corrected Total	18.593	161			

a. R Squared = .256 (Adjusted R Squared = .233)

From the table above, it can be seen that between the level of Student Initial Ability in the high, medium, and low categories and the learning model, there is no significant effect of this happening, because the significance value obtained is 0.483, where this value is greater than the value $\alpha = 0.05$. Meanwhile, from the test results, it can be seen that the level of Initial Mathematics Ability affects students' mathematical representation abilities as well as learning models that influence students' mathematical representation abilities. Apart from being shown in the table above, to see the effect between the Early Mathematics Ability level and the learning model used, as well as the effect of mathematical representation abilities on the learning model and vice versa, it is presented in Figure 2 below.

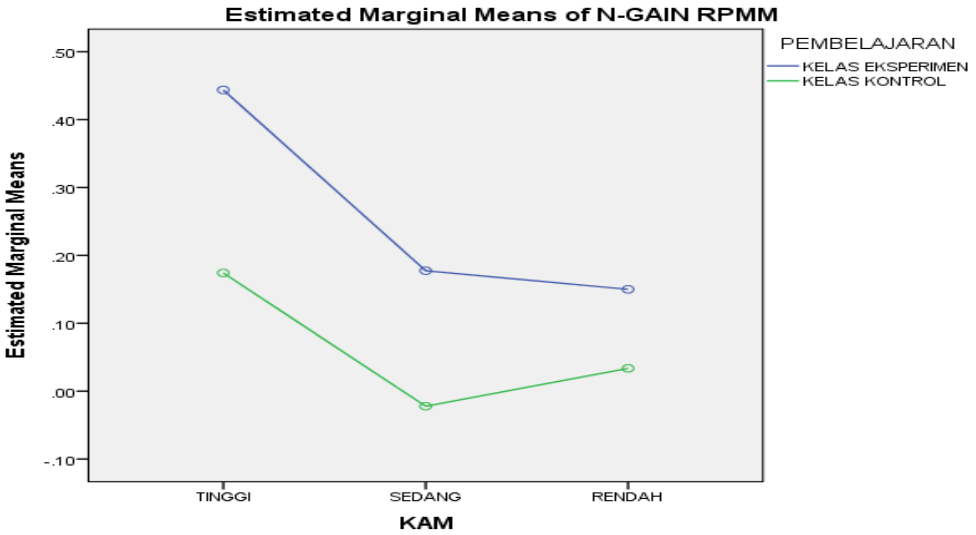


Figure 2. Interaction of KAM Levels on Learning Models and Mathematical Representational Ability

3.2 Discussion

To see the increase in students' mathematical problem-solving abilities, a quantitative descriptive statistical test was used, and it was seen that the average (mean) N-Gain students' mathematical problem-solving abilities were included in the medium category while those for the control class were included in the low category. So it can be concluded that the increase in problem-solving abilities using a coastal-based contextual inquiry learning model is included in the medium category.

The ability to solve problems is a general goal of teaching mathematics. Problem solving, which includes methods, procedures, and strategies, is the core and main process in the mathematics curriculum. Problem solving is a basic skill in learning mathematics. The view that the ability to solve problems is a general goal of teaching mathematics implies that mathematics can assist in solving problems in everyday life as well as in other subjects.

In line with the above, (Xenofontos and Andrews, 2012) states that something is a problem for someone if something is new, according to the conditions that solve the problem (the stage of mental development), and he has prerequisite knowledge. The same thing is also stated in (National Council of Teachers of Mathematics (NCTM), 2000) all students must build new mathematical knowledge through problem solving. This is because in the process of solving problems, students can also try to learn about concepts that are not yet known, so that they can make this learning experience a further learning experience with problems or questions with the same weight. However, in reality, students' mathematical problem-solving skills at school are still classified as medium or low. In line with this, (Surya *et al.*, 2013) said that the low ability of students to solve mathematical problems is also caused by the fact that the process of learning mathematics in class does not improve higher-order thinking skills and is not directly related to real everyday life. To improve their mathematical problem-solving abilities, students need to be given open ended problems so as to provide opportunities for them to produce creative answers. This was also conveyed by (Nadjafikhah, Yaftian and Bakhshalizadeh, 2011) and (Švecová, Rumanová and Gabriela Pavlovičová, 2014). (Subanji *et al.*, 2023) that open-ended problems give students the opportunity to produce creative answers.

In the learning process, students are not given questions related to everyday life or questions of higher-order thinking skills that involve the area around them, especially students who are in coastal areas. According to (Fraihat, Khasawneh and Al-Barakat, 2022), coastal human resources should have good problem-solving skills. This ability can be trained in mathematics by designing a lesson that utilizes coastal potential as a contextual problem. Through contextual learning that utilizes coastal potential as a starting point for learning mathematics, either in the form of math story questions or presented in math student worksheets in junior high school, students can recognize, understand, realize, and become good problem solvers related to coastal potential.

This is in accordance with the inquiry learning model through a coastal-based contextual approach, which makes students more active in the learning process. Students are given the opportunity to construct their own

knowledge, interact with friends, and express their opinions by completing the worksheets that have been provided, so that the learning outcomes are more meaningful.

To see the increase in students' mathematical representation abilities, descriptive statistical tests were used, and it was seen that the average (mean) N-Gain students' mathematical problem solving abilities were included in the medium category while those for the control class were included in the low category. So it can be concluded that the increase in mathematical problem-solving abilities using a coastal-based contextual inquiry learning model is included in the moderate category.

Mathematical representation ability is one of the five process standards in NCTM, in addition to problem solving, communication, reasoning, and connection. According to (National Council of Teachers of Mathematics (NCTM), 2000), representation is the translation of a problem or idea into a new form, including an image or physical model, into symbols, words, or sentences. The ability to represent mathematics is one of the general goals of learning mathematics at school. This ability is very important for students because of its relationship to communication. To be able to communicate something, someone needs representation in the form of pictures, graphs, diagrams, or other forms of representation (Mainali, 2021).

Representational ability is one of the standards of the mathematics learning process that students need to grow into. This process standard should not be delivered separately from mathematics material because representation is the most important thing and the basis or foundation for constructing students' ideas and understanding related to mathematical concepts. The same thing was stated by (Samsuddin and Retnawati, 2024), who stated that mathematical representation abilities are needed by students to find and create a tool or way of thinking for communicating mathematical ideas from abstract to concrete so that they are easier to understand.

Thus, the inquiry learning model through a coastal-based contextual approach can make students more active in the learning process to develop their mathematical representation abilities. Students are given the opportunity to construct their own knowledge, interact with friends, and express their opinions by completing the worksheets that have been provided, so as to produce more meaningful learning.

In this study, to see differences in increasing problem-solving abilities, and the ability of students' mathematical representations to obtain inquiry learning models with a coastal-based contextual approach and the conventional learning model used the normality test and homogeneity test as the initial conditions for carrying out the hypothesis test, but when the test was carried out, it turned out that the data was not normally distributed, so a non-parametric test was carried out, namely the Wilcoxon signed rank test.

From the results of the tests conducted, it can be seen that there is a difference in the increase (N-Gain) in the mathematical problem-solving abilities of students who use the inquiry learning model with a coastal-based contextual approach and conventional learning models. The same thing can be seen in the test results for mathematical representation abilities, namely that there is a difference in the increase (N-Gain) in the mathematical representation abilities of students who use inquiry learning models with coastal-based contextual approaches and conventional learning models. Thus, both problem-solving abilities and mathematical representation abilities have differences in improvement (N-Gain) using inquiry learning models with coastal-based contextual approaches and conventional learning models.

To see the effect of the interaction between inquiry learning with a coastal-based contextual approach and conventional learning with Early Mathematical Ability in the high, medium, and low categories on mathematical problem solving abilities, a Two-way ANOVA test was carried out, so as to produce a significant value of 0.390, which means more than the value of $\alpha = 0.05$, so that it can be concluded that together the level of Early Mathematics Ability and the learning model have no significant effect, But from the test results, it was also found that the level of Early Mathematics Ability in the high, medium, and low categories had an effect on students' mathematical problem-solving abilities, and vice versa, the learning model also had an effect on increasing students' mathematical problem-solving abilities.

This is in line with the opinion of (Polya, 2004), cited by (Suherman *et al.*, 2001), that math problems will not be a problem for a student, if the student (1) have the ability to solve it in terms of mental maturity and knowledge; (2) I want to finish it. Meanwhile, according to Gagne, quoted by (Muntean, 2013), problem solving is a type of learning that has the highest and most complex level compared to other types of learning. The importance of problem-solving abilities in students, especially in mathematics, can be seen in Branca's statement (Hasan, 2024), which states that (1) Problem-solving ability is a general goal of learning mathematics; (2) Problem

solving includes methods, procedures, and strategies, which are the core and main processes in the mathematics curriculum; (3) Problem solving is a basic skill in learning mathematics.

From the description above, it can be concluded that students who get the inquiry learning model through a coastal-based contextual approach have no effect on the level of Early Mathematics Ability. While the test results also found that the level of Early Mathematics Ability in the high, medium, and low categories had an effect on students' problem-solving abilities, and conversely, the learning model also influences the increase in students' mathematical problem-solving abilities.

To see the effect of the interaction between inquiry learning with a contextual approach based on the coast and conventional learning with Early Mathematics Ability in the high, medium, and low categories The two-lane ANOVA test was carried out on the ability of mathematical representation to produce between high, medium, and low Initial Mathematics Ability levels; a significant value of 0.483 was obtained, which is more than the value of $\alpha = 0.05$, so that it can be concluded that together, the level of Initial Mathematics Ability and the learning model do not have a significant effect, But from the test results, it was also found that the level of Initial Mathematics Ability in the high, medium, and low categories had an effect on students' mathematical representation abilities, and vice versa, the learning model also had an effect on increasing students' mathematical representation abilities. This is in accordance with what was stated by (Wigati *et al.*, 2023) that each student's differences in representing their thoughts are because everyone has different brain abilities in absorbing, managing, and conveying information, so individual ways of learning are different.

The same thing was stated by (Jitendra *et al.*, 2016) that "Representations can promote learning when instruction supports understanding the representations before using them to elucidate mathematical concepts" which means representations can support learning when instruction supports understanding representations before using them to explain mathematical concepts. Based on this opinion, it can be said that it is necessary to give students an overview of mathematical representations before inviting them to apply mathematical representations to solving everyday problems.

Further, According to (Halat and Peker, 2011), "teachers are tasked with supporting students learning of abstract mathematical concepts. Although most students easily pick up rudimentary knowledge through the use of concrete objects, we ask to our students to use symbols and other mathematical notation to represent their understanding" Teachers can provide learning by teaching abstract mathematical concepts; although students more easily understand concrete concepts, by using mathematical symbols and notation, students can represent their understanding.

From the description above, it can be concluded that students who get the inquiry learning model through a coastal-based contextual approach have no effect on the level of Early Mathematics Ability. The test results also found that the level of Initial Mathematics Ability affected students' mathematical representation abilities, and conversely, the learning model also affected the increase in students' mathematical representation abilities.

4. CONCLUSION

Based on the results of the research and discussion described above, the conclusions in this study are: The inquiry learning model with a coastal-based contextual approach can improve mathematical problem-solving skills in geometry material in junior high school students, and the results of increasing problem-solving abilities using a coastal-based contextual inquiry learning model are included in the moderate category whereas the inquiry learning model with a coastal-based contextual approach can improve the ability of mathematical representation of geometry material in junior high school students, and the results of increasing the ability of mathematical representation using a coastal-based contextual inquiry learning model are included in the medium category;

Differences in increasing mathematical problem-solving skills and mathematical representation abilities in geometry material for junior high school students who receive inquiry learning with a coastal-based contextual approach and conventional learning models whereas there is no significant effect between the learning model and the level of Early Mathematics Ability. This can be seen from the obtained significant value of 0.311, which is more than the value $\alpha = 0.05$, but the level of Early Mathematical Ability affects students' mathematical problem-solving abilities, and conversely, the learning model also influences students' mathematical problem-solving abilities, and there is no significant effect between the learning model and the Early Mathematics Ability level. This can be seen from the obtained significant value of 0.483, which means more than the value of $\alpha = 0.05$, but

the level of Early Mathematics Ability affects students' mathematical representation abilities, and vice versa, the learning model also influences students' mathematical representation abilities.

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REFERENCES

Dzhumanazarovna, S.A. *et al.* (2022) 'Training of future teachers for the implementation of continuity of preschool and primary Mathematical education', *Cakrawala Pendidikan Jurnal*, 41(2), pp. 531–540. Available at: https://doi.org/10.21831/cp.v41i2.43641.

Fraihat, M.A.K., Khasawneh, A.A. and Al-Barakat, A.A. (2022) 'The effect of situated learning environment in enhancing mathematical reasoning and proof among tenth grade students', *EURASIA Journal of Mathematics, Science and Technology Education*, 18(6). Available at: https://doi.org/10.29333/ejmste/12088.

Halat, E. and Peker, M. (2011) 'THE IMPACTS OF MATHEMATICAL REPRESENTATIONS DEVELOPED THROUGH WEBQUEST AND SPREADSHEET ACTIVITIES ON THE MOTIVATION OF PRE-SERVICE ELEMENTARY SCHOOL TEACHERS', *TOJET: The Turkish Online Journal of Educational Technology*, 10(2), pp. 259–267.

Hasan, A. (2024) 'Problem-Based Math Learning Strategies To Improve Students' Problem-Solving Skills', *The Journal of Academic Science*, 1(1), pp. 22–26. Available at: https://doi.org/10.59613/rm65x686.

Jitendra, A.K. *et al.* (2016) 'Is Mathematical Representation of Problems an Evidence-Based Strategy for Students With Mathematics Difficulties ?', *Exceptional Children*, 83(1), pp. 8–25. Available at: https://doi.org/10.1177/0014402915625062.

Lovisia, E. (2018) 'Pengaruh Model Pembelajaran Inkuiri Terbimbing terhadap Hasil Belajar', *Science and Physics Education Journal (SPEJ)* [Preprint]. Available at: https://doi.org/10.31539/spej.v2i1.333.

Mainali, B. (2021) 'Representation in Teaching and Learning Mathematics', *International Journal of Education in Mathematics, Science, and Technology (IJEMST)*, 9(1), pp. 1–21. Available at: https://doi.org/10.46328/ijemst.1111.

Mayasari, F., Raharjo, R. and Supardi, Z.A.I. (2018) 'PENGEMBANGAN PERANGKAT PEMBELAJARAN INKUIRI UNTUK MENUNTASKAN HASIL BELAJAR SISWA PADA MATERI SISTEM ORGANISASI KEHIDUPAN', *Jurnal Penelitian Pendidikan IPA* [Preprint]. Available at: https://doi.org/10.26740/jppipa.v2n2.p53-57.

Muntean, L.S.T. (2013) 'Problem solving centered learning, a possible model for educational practice', *Journal Plus Education*, 9(2), pp. 192–196.

Nadjafikhah, M., Yaftian, N. and Bakhshalizadeh, S. (2011) 'Mathematical creativity: some definitions and characteristics', *Procedia - Social and Behavioral Sciences*, 31(2011), pp. 285–291. Available at: https://doi.org/10.1016/j.sbspro.2011.12.056.

National Council of Teachers of Mathematics (NCTM) (2000) *Principles and standards for school mathematics*. Reston, VA: The National Council of Teachers of Mathematics, Inc.

Polya, G. (2004) *How to Solve It: A New Aspect of Mathematical Method*. Princeton: Princeton University Press.

Saliman, Wijayanti, A.T. and Hartati, Y. (2023) 'Effects of online learning on responsibility character of junior high school students in Yogyakarta', *Cakrawala Pendidikan*, 42(1), pp. 189–197. Available at: https://doi.org/10.21831/cp.v42i1.53910.

Samsuddin, A.F. and Retnawati, H. (2024) 'Mathematical representation: the roles, challenges and implication on

instruction', *Journal of Physics: Conf. Series 1097* [Preprint]. Available at: https://doi.org/1088/1742-6596/1097/1/012152.

Sari, A.A.I. and Lutfi, A. (2023) 'Students' Critical Thinking Skills in Mathematics Learning through an Inquiry Approach', *Jurnal Simki Pedagogia*, 6(1), pp. 118–129. Available at: https://doi.org/10.29407/jsp.v6i1.225.

Subanji *et al.* (2023) 'Student's creative model in solving mathematics controversial problems', *Cakrawala Pendidikan*, 42(2), pp. 310–326. Available at: https://doi.org/10.21831/cp.v42i2.55979.

Suherman, E. *et al.* (2001) *Contemporary mathematics learning strategy*. Bandung: JICA.

Surya, E. *et al.* (2013) 'Improving of Junior High School Visual Thinking Representation Ability in Mathematical Problem Solving by CTL', *IndoMS. J.M.E*, 4(1), pp. 113–126. Available at: https://doi.org/10.22342/jme.4.1.568.113-126.

Švecová, V., Rumanová, L. and Gabriela Pavlovičová (2014) 'Support of Pupil's Creative Thinking in Mathematical Education', *Procedia - Social and Behavioral Sciences*, 116, pp. 1715 – 1719. Available at: https://doi.org/10.1016/j.sbspro.2014.01.461.

Till Bärnighausen *et al.* (2017) 'Quasi-experimental study designs series—paper 1: introduction: two historical lineages', *Journal of Clinical Epidemiology*, 89, pp. 4–11.

Wigati, M. *et al.* (2023) 'Description of understanding mathematical concepts ability based on brain domination', *International Journal of Multidisciplinary Research and Literature*, 2(2), pp. 242–249. Available at: https://doi.org/10.53067/ijomral.v2i2.

Xenofontos, C. and Andrews, P. (2012) 'Prospective teachers' beliefs about problem-solving: Cypriot and English cultural constructions', *Research in Mathematics Education*, 14(1), pp. 69–85. Available at: https://doi.org/10.1080/14794802.2012.657439.