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ARTICLE

Relationship between problem solving ability in physics and computational thinking skills

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Abstract

The rapid development of technology today does not only require problem solving skills, other thinking skills such as computational thinking skills are needed in solving complex problems. This study aims to investigate the relationship between problem solving abilities in physics, especially vibrations and waves, and computational thinking skills. This study uses a correlation research design in which the relationship between two variables of problem-solving ability and computational thinking is observed. By using data from 21 eighth grade junior high school students who had participated in wave learning, it was found that the correlation between the two variables was in the moderate category. These data indicate that problem solving abilities contribute to students' computational thinking skills. Discussion of the results of this study will be discussed in more detail in this article.

Keywords: Problem solving, computational thinking, oscillation and wave

1. Introduction

Problem solving skills in this modern era are gradually increasing in accordance with changes in character, improvements in technology and several other things that have an effect, especially in the world of education. This skill helps students determine why a problem occurs and how to solve it (Cahyani and Setyawati 2017). In the 2013 curriculum, problem solving skills are seen as an important part of all student's life skills and teachers must be able to apply them in the context of learning in the classroom. Therefore, the existence and development of problem-solving skills is needed, especially for the next generation.

Solving Skill has been done a lot. For example, the problem-solving abilities of Physics teacher candidates in solving Rotational Dynamics questions was examined by the researcher (Ginting, n.d.). The results of this study indicate that the habit of solving problems at a higher level is needed in the rotational dynamics concept. In addition, the application of the PBL (Problem Based Learning) model has improved students' problem-solving abilities (Yuberti 2015). The results of this study indicate that there is an increase in students' problem-solving abilities. In other research, students who use problem solving strategies are called expert problem solvers because they can solve physics problems more efficiently than students who do not use problem solving strategies (Ince 2018). Some of these studies indicate that problem solving skills are still an attraction for researchers in physics education.

Meanwhile, the rapid development of technology today does not only require problem-solving skills, other thinking skills that are more systematic in solving complex problems are also needed, in this case, computational thinking skills. Computational thinking skills are defined as a mental ability to apply basic thoughts and concepts originating from modern digital computer science in everyday life, these skills contain abilities that resemble how computers work (Ansori 2020). In a different context, Wing (2008) regards computational thinking skills as a type of analytical thinking. These computational thinking skills can also be used as an alternative to improve problem solving abilities and improve students' critical thinking skills (KAWURI 2017). Although computational thinking skills are related to problem solving including physics problem solving, research results regarding the correlation between physics problem solving abilities and computational thinking abilities are still rarely found in the context of teaching in Indonesia. In fact, the computational thinking skills of students at various levels of education in Indonesia are still very worrying (De la Harpe, Cronjé, and Rothman 2020).

Based on the description above, this study aims to examine how the correlation relationship between students' physics problem-solving skills and computational thinking skills. The relationship between problem solving skills and computational thinking skills in this case is based on two important reasons. First, computational thinking skills are an important part of problem-solving skills. Second, computational thinking skills can spur students to find solutions to problems by making stages of completion; this is similar to Physics problem solving skills.

2. Literature Framework

2.1 Problem solving skills

Problem solving skills are skills that are used by carrying out several stages in determining problem solutions from identifying problems, making solving plans, conducting experiments, and checking again. The ability to identify the nature of the problem, deconstruct (break it down), and develop a series of effective Actions to address the challenges associated with it (Eyisi 2016). Kruliik and Radnik define problem-solving skills are the means by which a person acquires prior knowledge, skills, and understanding to meet the demands of an unusual situation. Apart from that, indicators of problem-solving skills are used as spearheads in implementing learning methods.

Characteristics that are synonymous with problem solving skills are problems that are solved unusually. One of the uses of problem-solving skills related to the real world can be integrated to solve problems and competition in the real world as well (Taconis, Ferguson-Hessler, and Broekkamp 2001). The purpose of the problem-solving skill. With regard to physics problem solving skills have stages that are properly integrated in the process to achieve the goal. Because understanding physics material requires thinking and reasoning in order to solve physics problems.

Indicators of problem-solving skills are divided into several components such as procedures, manipulation, identifying concepts, noting similarities, differences and analogies, identifying critical things, and choosing the right framework. According to Polya problem solving skills have 4 indicators, namely: understanding problems, planning solutions, solving problems, and checking. From some of these opinions it can be concluded that Problem Solving Skills has four indicators, namely identifying problems (attempts to understand problems so that problems can be explained and measured), formulating problems (attempts to focus problems so they can be tested), implementing strategies (activities undertaken to problem solutions), and verifying solutions (checking back problem solutions).

Table 1. The indicators of problem-solving skills

Indicator	Sub-indicator
Identify problem	Students are able to understand the information contained in the problem.
Formulate problem	Students are able to focus on problems and are able to understand where the problem is going in order to be able to create problem-solving strategies.
Apply strategy	Students are able to make solutions to get solutions.
Verify solution	Students check back the solution to the problem.

2.2 Computational thinking skills

According to ISTE, computational thinking skills are an approach to problems and designing systems that make complex problems into a set of smaller problems that can be solved by organizing, analyzing, representing, and automating solutions (Lamprou and Repenning 2018). Computational Thinking as a way of understanding and solving complex problems using computer science techniques and concepts such as decomposition, pattern recognition, abstraction and algorithms is seen by many experts as one of the abilities that supports many dimensions of the 21st century education (Ansori 2020). Computational thinking skills are thought processes to formulate problems and solutions, so that these solutions are effectively carried out by an information processing agent, which can be a "computer", robot, or human (Tresnawati et al. 2020). Thinking computationally does not mean thinking like a computer, but thinking about computing where a person is required to (1) formulate a problem in the form of a computational problem and (2) devise a good computational solution (in the form of an algorithm) or explain why no suitable solution was found. The essence of computational thinking is abstraction.

Table 2. The indicators of computational thinking skills

Indicator	Explanation	Sub-indicator
Decomposition	Identify complex problems into smaller parts to make it easier to process.	Students are able to identify information that is known from the problems given.
Pattern recognition	Generalize and transfer the problem-solving process to a set of similar problems. Pattern recognition is drawing data from problems.	Students are able to recognize the same or different patterns and characteristics to solve the problems given in building solutions.
Algorithm	Writing automatic solutions through thinking algorithms (sequential steps). Steps to solve the problem.	Students are able to mention the logical steps used to compile a solution to a given problem.
Abstraction	Extracting the important parts of a problem and ignoring the unimportant ones, making it easier to focus on solutions: in other words, the process of representing the data that has been obtained.	Students are able to name patterns and draw conclusions from the patterns that have been given.

Cognitive abilities that form the basis of computational thinking skills are spatial abilities, reasoning abilities, and problem-solving skills. The essence of computational thinking skills is abstraction. If computational thinking is to be used everywhere, then it will touch everyone directly or indirectly

(Wing, 2008). From these several opinions it can be concluded that computational thinking skills are skills that are organized with several stages starting from decomposition, pattern recognition, algorithms and generalization.

Computational thinking skills can be further supported by the following attitudes: Confident and confident in dealing with and managing complexity, Persistent and diligent in working in dealing with difficult problems, Tolerant of ambiguity, Ability to deal with "open ended problems", and Ability to communicate and work together in a team to achieve a goal or produce a solution. Computational thinking has four operational skills including decomposition, pattern recognition, abstraction and algorithmic thinking (Danindra 2020). Computational thinking skills quoted from Bebras have several indicators: decomposition, abstraction, algorithms, and problem pattern recognition (Danindra 2020). An explanation of the four indicators can be seen in Table 2.

2.3 Relationship between problem solving and computational thinking skills

The relationship between computational thinking skills and problem-solving skills is related to one another. Problem-solving skills that are synonymous with creativity and computational thinking skills that are synonymous with algorithms are two things that cannot be separated. Just as computational thinking skills are not only essential for the development of computer programs, they can also be used to support problem-solving skills across all disciplines. Computational thinking skills are able to work together and have harmony with problem solving skills. Size, complexity can lead to problem solving failure but with some rational guidance (computational thinking skills) can help solve. The relationship between these two skills also shows their influence on age as revealed by Despina Desli and Anastasia lioliou in “Relationship between Computational Estimation and Problem Solving” (Desli and Lioliou 2020; Li et al. 2022).

There are several relevant previous research to support this present study. First, Wididingrum examines computational thinking skills entitled "Meta-Analysis of Scratch Media on Computational Thinking Skills of High School Students in Learning Physics" (Widiningrum et al. 2021). The purpose of this study is to examine scratch media in relation to students’ computational thinking skills. By mapping the results of research from previous studies on physics learning at the high school level, the scope of Scratch’s media and the wide range of skills are analyzed. The research method used is Systematic Literature Review. The results of this study reveal that Scratch media is able to improve students’ Computational Thinking skills because it is designed to develop creativity, the ability to think systematically, collaboratively and realize algorithms so that they are able to apply logical patterns that can make complex concepts simple in learning physics. Second, Gunawan Supiarma examines computational thinking skills with the title "Students’ Computational Thinking Processes in Solving Pisa Problems Change and Relationship Content Based on Self-Regulated Learning" (Supiarmo, Mardhiyatirrahmah, and Turmudi 2021). The purpose of this study is to describe students’ computational thinking processes in solving PISA questions about change and relationship content based on self-regulated learning at the junior high school level.

Further, the third, Fajrul Wahdi Ginting examines problem solving skills with the title "Analysis of Problem-Solving Ability of Prospective Physics Teacher Students in Solving Rotational Dynamics Questions" (Ginting, n.d.). This study uses a quantitative descriptive analysis method which aims to analyze the problem-solving abilities of physics teacher candidates in solving rotational dynamics questions. The results showed that students’ lack of training in solving problem solving on more complex questions was a factor in the low value of problem solving. The value of the results of student problem solving abilities is highest when solving problems with low problem difficulty. Many students begin to experience difficulties in carrying out the problem-solving process on questions that represent high complexity. It can be concluded from this study that the problem-solving skills possessed by prospective physics teacher students are still low which results in a low level of ability to solve complex problems in questions. In addition, the lack of deep understanding of physics concepts is an obstacle in solving physics problems. The last, Hesti Cahyani and Ririn Wahyu Setiawati studied problem solving skills with the title "The Importance of Increasing Problem-Solving Ability through PBL to Prepare a Superior Generation to Face MEA" (Cahyani and Setyawati 2017). This study aims to see and analyze the importance of increasing problem-solving abilities through PBL to prepare a superior generation in facing MEA. The results of this study indicate that students' problem-solving abilities must be supported by appropriate learning methods. The learning method to improve problem solving abilities is Problem Based Learning (PBL). PBL is here used as a context for students to learn about critical thinking and problem-solving skills to acquire essential knowledge and concepts. The PBL learning model used integrates real world problems as a context for students to learn actively, think critically, and intellectual skills in improving problem solving skills.

3. Research Method

3.1 Research design

This study uses a quantitative research method with a correlation analysis approach. This method is used to investigate the relationship between the measurement results of two different variables at the same time (Androniceanu et al. 2020). The variable that wants to be examined for its correlation in this study is between problem solving skills and thinking skills. computing. The level of relationship or the strength of the relationship is expressed in the correlation coefficient which is between negative one and positive one.

3.2 Participants

The participants in this study were eighth grade junior high school students. The participants were 20 eighth grade students aged between 14 and 15 years (M=14.5). Before the participants were involved in the test process to collect data on problem-solving skills and computational thinking, they took part in the physics learning process for two meetings on vibration and waves. The physics learning process takes place using a problem-solving approach. After the learning process, participants were involved to take tests of problem-solving skills and computational thinking for the concepts of Vibration and Waves.

3.3 Instruments

The problem-solving skill test developed in this study refers to the skill indicators that have been developed by Polya. The four selected sub-indicators are identifying problems, formulating problems, implementing strategies, and verifying solutions. The reason for using these indicators is in accordance with research needs in the form of research subject matter. Before being used, the test instrument was measured for validity and reliability (Rahardja et al. 2019). Validity was determined by using expert and construct validity. In this study, the validity of the expert was carried out by two experts from Physics Education who assessed the feasibility of the instrument based on the suitability of the concept, language and indicators. The results of the assessment of the two experts revealed that the problem-solving skills instrument was appropriate in terms of the dimensions of the concept, language, and accuracy of the indicators. The total number of questions is 8 questions. In addition, validity and reliability testing is also carried out by testing the test instrument on students who have learned the concepts of Vibration and Waves. The equation used to calculate its validity is the Moment Product formula.

The computational thinking skills test in this study uses questions that have been made by Bebras Indonesia. The test instrument used contains 8 questions with each indicator consisting of 2 questions. The indicators are decomposition, pattern recognition, algorithms, and abstraction. The reason for using this instrument is because Bebras is the agency for developing computational thinking skills in Indonesia and the test questions have been adapted to the thinking level of junior high school students.

3.4 Data analysis

After collecting data using tests, the data obtained will be analyzed using descriptive and inferential statistical calculations. The steps in analyzing research data are carried out by analyzing scores, conducting prerequisite tests, normality tests, linearity tests, correlation tests, and determining the coefficient of determination.

- Scoring Techniques and Descriptive Statistics: The data from the results of the computational thinking skills test and the multiple-choice problem-solving skills test are interval data. The results of tests of computational thinking skills and problem-solving skills are given a score of 1 if it is correct and 0 if it is wrong, after which the score is changed to a scale of 100. This step is called the right only method.
- Normality Test: In carrying out normality test calculations in this study using the IBM SPSS Statistics 25 application. Normality test calculations are used to determine whether the distribution of problem-solving skills test data and computational thinking skills tests is normally distributed. The normality test in this study used the Shapiro Wilk technique with a significance level of 5%, the use of this technique was adapted to the small number of samples. If the probability of the statistic being tested is greater than 5% then the data is normally distributed and vice versa.
- Linearity Test: The calculation of the linearity test is used to find out that there is a linear relationship between the two variables. The calculation of the linearity test in this study uses the IBM SPSS Statistics 25 application. By utilizing the Analysis of Variance (ANNOVA) table, namely by looking at the significance level of linearity with the test criteria if the value is <0.05 then it is said to be non-linear and if the significance is > 0.05 then is said to be linear.
- Simple Correlation: Simple correlation test calculations are used to find out the relationship between computational thinking skills and problem-solving skills. Simple correlation calculations use IBM SPSS Statistics 25. This correlation technique is used to prove the relationship between variables when the variable data is in the form of intervals or ratios and the data source is the same. The Use of Simple Correlation Interpretation is used based on a research method book.
- Significance Test: The relationship that applies to the entire population needs to be tested for significance. With a significant test it can show how much influence the independent variables partially have on the dependent variable. Significance testing is used to determine whether or not the results of the correlation calculation obtained in the correlation (generalization) are applicable. Significance test was calculated using IBM SPSS Statistics 25.
- Coefficient of Determination: The coefficient of determination is useful for calculating how influential the computational thinking skill variable is on the problem-solving skill variable. By using the coefficient of determination, it can be seen how the influence of computational thinking skills (Y) on problem solving skills (X) with results in the form of numbers. The calculation of the coefficient of determination is calculated using IBM SPSS Statistics 25.

4. Result of the research

4.1 The representation of problem-solving skills

The representation of problem-solving skills is measured using a test instrument which consists of 8 questions with each indicator of problem-solving skills represented by 2 questions. Test results are presented by counting the number of correct answers and converting the number into a percentage of correct answers. The percentage is displayed based on indicators of problem-solving skills. The data can be seen in Figure 1.

It can be seen from the picture above that there are as many as 37% of students getting the students' correct answers contained in the indicator of implementing the strategy. This is due to the daily activities of students in learning often use questions that are similar to indicators of implementing strategy questions. Meanwhile, the percentage of other indicators with the lowest rating answered correctly by students is an indicator of identifying problems. For indicators of

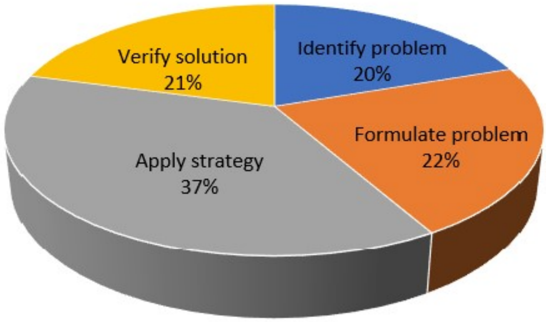

Figure 1. Percentage of aspects of problem-solving skills

identifying problems, the percentage of students who have the correct answer is 20%. The indicator for formulating a problem has a percentage of students who get correct answers by 22%. For the percentage of indicators verifying solutions, 21% of students get correct answers for these indicators. There is a difference in percentage for indicators of implementing strategies with other indicators because questions with indicators other than or outside of implementing strategies are still not well recognized and applied in student learning.

Table 3. The descriptive statistics of problem-solving skills

Measurement	Score
Minimum score	25
Maximum score	87.5
Mean	60
Standard deviation	16.27
Number of data	21

Based on Table 3 it can be observed that the minimum score of students taking the problem-solving skills test is 25. This value is far below the class average, which is 60. Meanwhile the maximum score of students taking the problem-solving skills test is 87.5. This value has a difference of 27.5 above the class average. Meanwhile, the deviation for this problem-solving skill score is 16.27, where this score is below the average value. The deviation value below the average indicates that the distribution of problem-solving skills scores is homogeneous. This shows that of the 20 students who took the problem-solving skills test, almost all students were able to complete at least one indicator of problem-solving questions.

4.2 The representation of computational thinking skills

The representation of computational thinking skills contains a description of the scores of students' computational thinking skills obtained through the computational thinking skills test instrument. This test instrument consists of 8 questions consisting of four indicators of computational thinking skills: abstraction, decomposition, algorithm, and pattern recognition. This shows that each indicator of computational thinking skills is measured using 2 questions. Details of the percentage of students who answered correctly for each indicator can be seen in Figure 2.

From the picture above it can be seen that the pattern recognition indicator was mostly answered

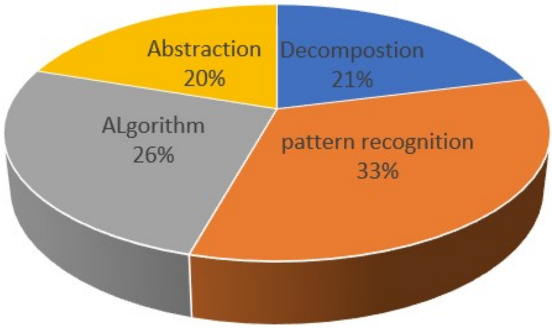

Figure 2. Percentage of aspects of computational thinking skills

correctly by students with a percentage of 33%. Some students who answered incorrectly in this indicator were due to a lack of understanding of the images provided in the questions. Meanwhile, students who answered correctly in questions with pattern recognition indicators were due to having started to understand the images available in the questions. For indicators of computational thinking skills such as indicators of algorithms, abstraction, and decomposition have a low percentage for students to answer correctly. The percentage of students for each of these indicators is 26%, 20%, and 23%, respectively. This low percentage is because students have not been able to explore where the question is going. This difference shows that students' computational thinking skills are still or have not been recognized by students so that many are still unable to answer questions on the computational thinking skills test. The descriptive statistical data for computational thinking skill scores can be observed in Table 4.

Table 4. The descriptive statistics of computational thinking skills

Measurement	Score
Minimum score	25
Maximum score	75
Mean	50.625
Standard deviation	13.12
Number of data	21

Based on Table 4, it can be observed that the minimum score of students taking the computational thinking skills test is 25. This score is below the class average score, which is equal to 50.625. While the maximum score of students taking the computational thinking skills test is 75. This score has a difference of 24.375 above the class average. Meanwhile, the deviation for this computational thinking skill score is 13.12, where this score is below the average value. The deviation value below the average indicates that the distribution of computational thinking skill scores is homogeneous. This shows that of the 21 students who took the computational thinking skills test, almost all students were able to complete at least one indicator of computational thinking skills.

4.3 The relationship between problem-solving skills and computational thinking skills

After collecting data and describing the representation of problem-solving skills and computational thinking skills, the next process is to test the hypothesis regarding the correlation relationship between problem-solving and computational thinking. Before carrying out a simple correlation test, several tests such as the normality test and linearity test are determined to ascertain whether the data is normal and linear. In carrying out the test, data analysis was carried out using SPSS statistical software so that the calculation process is more precise and avoids calculation errors.

First, the normality test was carried out on the two research variables, namely problem-solving skills and computational thinking skills. The normality test aims to determine whether the variables to be analyzed in this study are normally distributed or not. If normally distributed, parametric inferential statistics can be used. Based on the normality test, it can be seen that the variables of problem-solving skills and computational thinking skills are normally distributed. This can be observed from the Asymp value. Sig (2-tailed) which is greater than the significance level of 0.05. The two normality test data for the two variables above can be seen in Table 5.

Second, after the results of the normality test show that the data are normally distributed, the next step is to carry out a linearity test with the Anova test (Analysis of variance) to find out whether the two research variables are linear. Based on the results of the linearity test, it can be seen that the calculated F value using SPSS is smaller than F table (0.429 < 3.24) while the significance or probability value is greater than the final limit (0.735> 0.05). Thus, the results of the analysis using ANOVA show that the variable of problem-solving skills with the variable of computational thinking skills is linear (F=0.429; sig.=0.735; sig>0.05).

Finally, testing the hypothesis in this study uses a simple correlation analysis using Pearson Correlation. Once the correlation coefficient is known, a significance test is carried out which functions to generalize the results of the analysis to the population. As it is known that the hypothesis in this study is that there is a significant relationship between problem solving skills and computational thinking skills. After going through simple correlation calculations using SPSS, a Pearson correlation value of 0.574 (moderate) is obtained. Because the simple correlation significance level obtained is 0.008, which means it is smaller than 0.05, it can be concluded that HO is rejected and HI is accepted in the form of a positive correlation relationship. This means that there is a significant relationship between problem solving skills and computational thinking skills, with a simple correlation significance level of less than 0.05. If you analyze the data further, the coefficient of determination for this correlation is 0.33, where this value comes from the square of the Pearson correlation (r). This shows that 33% of this correlation arises due to the learning factors that are carried out.

5. Discussion

From the results of the problem-solving test, it was found that the indicators of implementing strategies were more answered correctly by students compared to other indicators of KPM. The results of this study are in line with the results of research where the indicator with the highest percentage is the indicator of implementing a strategy compared to the other three indicators (Taconis, Ferguson-Hessler, and Broekkamp 2001). This is because students have not been able to understand the problem properly, and are not used to checking back the results of problem solving. In addition, why the indicator of implementing the strategy is the most powerful is the delivery from the most prominent teacher is in the indicator of implementing the strategy. On the contrary, the reason why the indicators for identifying problems, formulating problems, and verifying solutions are weak is because students do not yet recognize questions and a weak understanding of the material makes it difficult to be able to improve this. This is in accordance with research that the lack of deepening of physics concepts results in difficulties in solving physics problems using problem solving techniques (Ginting, n.d.).

In the context of this study, it can be concluded that students' problem-solving skills are still low. This can be seen from the large number of students who answered incorrectly in questions with indicators of identifying problems, formulating problems and verifying solutions. Even though it is still low, this can be improved with the right methods, one of which is the PBL (Problem Based

Learning) technique (Cahyani and Setyawati 2017).

Meanwhile the results of the computational thinking skills test were not much different from the results of the problem-solving skills test with only one indicator that looked strong. An indicator that looks strong is the pattern recognition indicator. This indicator was answered correctly by students because it was helped by the pictures in the questions and students were able to study the pictures in the questions well. This resulted in the strong ability of students in pattern recognition indicators. However, the strength of this indicator is inversely proportional to the results of the research that students' computational thinking skills are limited in the pattern recognition stage (Supiarmo, Mardhiyatirrahmah, and Turmudi 2021). In contrast, in this study other indicators of computational thinking skills (decomposition, algorithms and abstraction) were still too foreign to students because they had never been studied, causing students to be unable to answer questions correctly. The results of this study require teachers to increase teacher creativity in concocting more meaningful learning activities so as to be able to encourage changes in students' abilities in decomposition, algorithm and abstraction indicators (Eyisi 2016).

In this context, it can be concluded that the representation of students' computational thinking skills is still relatively low because only the percentage of pattern recognition indicators is high. The results of this study are inversely proportional to the results of research that students with low computational thinking skills have not been able to recognize and find the same or different patterns or characteristics in solving a given problem to build a solution.

Finally, the results of data analysis found a correlation between problem solving skills and computational thinking skills with a correlation value of 0.574 (moderate level). With a positive correlation coefficient, the relationship that occurs is positive, which means that for each increase in problem solving skills, there is also an increase in computational thinking skills and vice versa. From this study it can be concluded that computational thinking skills are a bridge to problem solving techniques in problem solving skills. The results of this study are in line with the research that computational thinking skills are used as a problem-solving approach (Androniceanu et al. 2020). By reviewing pattern recognition indicators on computational thinking skills and indicators of implementing strategies on problem solving skills; both have the strongest percentages. This shows that the pattern recognition indicator is a benchmark for computational thinking indicators because the dominant strategy in computational estimation items is closely related to successful estimation of problem solutions.

6. Conclusion

The representation of problem-solving skills in this study is still relatively low because there is only one high indicator, namely the indicator of implementing a strategy. The indicator of implementing the strategy is said to be strong compared to the other three indicators due to the habits of students who are used to working on problems with indicators of implementing strategies. In an effort to improve problem solving skills, the use of Problem Based Learning (PBL) can be an alternative solution even if it is only able to encourage the ability to implement strategies. Not much different from problem solving skills, the representation of computational thinking skills is also still relatively low where only one indicator looks strong, namely the pattern recognition indicator. The reason for this is that the pictures contained in the problem of computational thinking skills make the factors that cause this indicator to have a higher proportion of students answering correctly. Finally, this study reveals the relationship between problem solving skills and computational thinking skills. The relationship that occurs between problem solving skills and computational thinking skills is at a moderate level and is positively correlated with a correlation value of 0.574. The coefficient of determination between these two skills is 33%, where this value is due to the use of the PBL in class.

The research results found have implications for the field of education as well as for further research. The low problem-solving skills and computational thinking skills of junior high school students encourage teachers to master these two thinking skills more. The advantage of mastering this skill for teachers is to support teachers in implementing Science-Physics learning that emphasizes thinking skills. If the teacher has strong abilities in both of these skills, problem solving skills and computational thinking skills in students can be improved more easily. With the correlation relationship that occurs, collaboration between these two skills will become a problem-solving technique that can encourage students' thinking skills. Although the use of problem-based learning in this study contributed to determining the positive correlation between the two thinking skills, other researchers who aim to develop this research may choose other learning approaches that are more appropriate in training problem solving and computational thinking skills. In addition, if you want to use the same learning approach used in this study, other researchers should be more careful in applying all stages of the problem-based learning approach model.

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