ISSN 2355-4185(p), 2548-8546(e)
DOI: https://doi.org/10.24815/jdm.v11i2.41034

The Students' Computational Thinking Ability through Problem-Based Learning in Societal Context

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Received: 02 September 2024; Revised: 31 October 2024; Accepted: 28 November 2024

Abstract. *The ability to think computationally is a new thing assessed in PISA 2022. In mathematics, Indonesia ranks 70 out of 81 countries with an average score of 366, while the global average is 472. This shows the need for improvement in mathematics learning, one of which is through learning models that support computational thinking skills. This study aims to improve students' computational thinking skills on set material using the Problem-Based Learning model by considering students' prior knowledge. This study used a pseudo-experimental method with a nonequivalent control group design. The study population consisted of 224 grade X students in Bantul High School, and the sample was taken randomly using the cluster random sampling technique, resulting in two classes with a total of 64 students. Data were obtained from pretest and posttest, then analyzed descriptively and with two-way ANOVA and effect size. The results showed that prior knowledge did not significantly affect computational thinking ability. However, the PBL model had a significant moderating effect on students' general computational thinking ability. These results indicate that the problem-based learning model effectively improves these skills.*

Keywords*: computational thinking skills, prior knowledge, problem-based learning, societal*

How to cite: Priharvian, S. M., & Ibrahim. (2024). The students' computational thinking ability through problem-based learning in a societal context. *Jurnal Didaktik Matematika*, *11*(2), 302-324. DOI: https://doi.org/10.24815/jdm.v11i2.41034

Introduction

Computational thinking was first introduced by Seymour Papert in 1980 (Lodi & Martini, 2021) and re-popularized by Wing (2006) and Cansu & Cansu (2019). They state that computational thinking is a fundamental mindset everyone, not just computer scientists, can use to solve problems systematically and logically. According to the Minister of Education, Culture, Research, and Technology Regulation No. 008/H/KR/2022, computational thinking is emphasized as the ability to solve problems critically, analytically, systematically, and creatively (Pujiharti et al., 2022).

This ability is also one of the assessment focuses in PISA 2022 (OECD, 2018), as it is essential to help students compete in the modern era (Hinterplattner, 2020; Majumder, 2020; Nadire & Jeppe, 2019; Nuraisa et al., 2019; Ohland, 2019; Rich, 2020; Rodrigues et al., 2016; Saritepeci, 2019; Soboleva, 2021). Computational thinking has four primary indicators: problem decomposition, abstraction, pattern recognition, and algorithmic thinking, which are relevant to mathematical processes in PISA, such as formulating, using, evaluating, and reasoning (OECD, 2023).

However, the PISA 2022 results showed Indonesia ranked 70 out of 81 countries in mathematics, with an average score of 366, below the global average of 472 (OECD, 2023). Other studies also show that Indonesian students' computational thinking skills are still low (Brackmann et al., 2017; Kamil et al., 2021; Nuraisa et al., 2019; Supiarmo et al., 2021; Tangkui, 2023). A 2019-2023 literature review by Mukhibin and Juandi (2023) found that students could perform abstractions and algorithms but struggled with problem decomposition and pattern recognition. The results of the preliminary study in December 2023 also showed that the average achievement of students' computational thinking indicators was still below 50%. This confirms the need to improve the education system to improve students' computational thinking skills.

Various factors can influence skills; one of the fundamental factors influencing computational thinking skills is the learning model used in the classroom. Teachers tend not to innovate and are more dominant in using monotonous learning approaches (Astutik et al., 2022; Ruing & Mardiani, 2021; Zhou et al., 2022), which results in a lack of student interest in learning. This is in line with the results of interviews with teachers and several grade X students at a school in Bantul who said that mathematics learning is currently carried out in class using teacher-centred learning. As a result, this learning model makes students less interested, less able to understand the material, and less active in developing computational thinking skills (Gadanidis et al., 2017; Marcelino et al., 2018), impacting low computational thinking skills.

Computational thinking skills are essential for students as part of problem-solving (OECD, 2018). One learning model that supports this is Problem-Based Learning. In this model, students actively look for relationships (Lehmann, 2023; Shaughnessy et al., 2019), analyze patterns (Palts & Pedaste, 2020), find different ways to solve problems (Ahdhianto & Nurfauzi, 2021; Milicic, 2020), test results, as well as evaluate their friends' thinking. This process provides a new understanding of mathematics related to the problem (Ibrahim, 2012). However, students often struggle to understand the problems due to a lack of familiarity with the context provided in this model (Kebaetse et al., 2024; Mabley et al., 2019). One context that is relevant and close to students is the societal context, which is essential to help students develop social values in the present and future (Carmel, 2023; Igwe & Udoh, 2022; Supke et al., 2024). The social values of society are increasingly eroded due to changing times, such as loss of mutual trust, reduced tolerance, and fading social care (Regiani & Dewi, 2021).

The context of society can help students understand and solve problems systematically, thus stimulating computational thinking skills. In addition to using the Problem-based Learning model, students' prior knowledge must be considered because it is essential in improving computational thinking ability (García-Pẽalvo, 2019; Moru & Mathunya, 2022). This ability is expected to develop according to students' knowledge and background. Students with high prior knowledge tend to achieve more optimal computational thinking improvement than students with low prior knowledge (Sholihah & Mahmudi, 2015). This is in line with the research of Gog et al. (2020), which shows that the higher the students' prior knowledge, the better prepared they are to adapt, understand learning, and build a stronger foundation of understanding.

This study is essential to determine the effect of the problem-based learning model on computational thinking skills in the context of society. The student's prior knowledge, also considered in this study, can provide a detailed picture of improving computational thinking skills in each student with different prior knowledge. Problem-based learning has often been discussed in research. Many researchers have explored problem-based learning and its effects on student's cognitive abilities, such as creative thinking (Febriana et al., 2020; Zulkarnaen et al., 2022), critical thinking (Fadilla et al., 2021), metacognitive ability (Sutarto et al., 2022), identifying structure and language (Pangaribuan, 2022), and computational thinking (Nurasiah et al., 2023; Pratiwi & Akbar, 2022). Although problem-based learning on computational thinking skills has often been discussed, such as the effect (Nurasiah et al., 2023), learning media (Azizah et al., 2024; Fitri et al., 2024), and grade level (Manullang & Simanjuntak, 2023). However, no research has discussed the effect of a Problem-based Learning model in a societal context on computational thinking skills. This study tries to fill the gap in research on determining the effect of the problem-based learning model on computational thinking skills using the context of society and details using students' prior knowledge.

The research questions are: 1) how does a problem-based learning model with social context affect computational thinking ability? and 2) how much does the problem-based learning model with social context influence computational thinking?

Method

This study used a quasi-experimental method with a nonequivalent control group design. The study lasted five meetings, starting with a pretest and ending with a posttest. Learning was conducted during three meetings with the data-centering measures material in experimental and control classes. Learning was carried out simultaneously, although on different days, with the same teacher in both classes to minimize the influence of external variables. The study population consisted of 224 grade 10 students in a high school in Bantul, divided into seven classes with 32 students each. The research sample was randomly drawn using cluster random sampling and consisted of two classes totaling 64 students. The selection was made with a roll of paper: the first fold became the control class, and the rest the experimental class.

Data were collected using field notes and pretest and posttest instruments consisting of four questions based on computational thinking indicators: problem decomposition, abstraction, pattern recognition, and algorithmic thinking (Lee et al., 2014; Pujiharti et al., 2022). The instrument's validity was tested by three experts using the Content Validity Ratio (CVR) of Lawshe (1975). After being improved based on expert suggestions, the instrument was declared valid. The reliability test was conducted on a class that had studied data-centering measurement material, resulting in high reliability with a score of 0.749. Students were grouped into three categories based on normative scores: high, medium, and low. The research data consisted of quantitative and qualitative data. Quantitative data in the form of pretest and posttest scores were analyzed using two-way ANOVA and effect size. Qualitative data was obtained from field notes during meetings in experimental and control classes and then analyzed by classifying, summarizing, and interpreting the information.

Results and Discussion

A two-way ANOVA test was used to determine whether there was a significant difference in posttest results based on learning factors and prior knowledge. The results of the prerequisite test showed that the data were normally distributed and homogeneous. The combined effect of learning and prior knowledge on computational thinking ability was analyzed using a two-way ANOVA test, as shown in Table 1.

Table 1. Two-way ANOVA test results

Source	**F**	**Sig.**
Learning	13,364	0,000
Prior knowledge	3,653	0.061
Learning * Prior knowledge	0.103	0.903

The results of the two-way ANOVA test in Table 1 show no combined effect of learning type (PBL and conventional) and students' prior ability (high, medium, low) on the improvement of computational thinking ability. This means that differences in learning methods and prior ability levels do not cause significant differences in improving these abilities. In addition, the two-way ANOVA test also showed that prior ability alone did not affect the improvement of computational thinking ability. In other words, students with high, medium, or low prior ability experienced improvements that were not significantly different.

Contrary to the prior knowledge factor, the learning factor significantly improved students' computational thinking ability. The results showed that students who participated in Problem-Based Learning experienced a better improvement in computational thinking ability than students with conventional learning. This shows that PBL is effectively applied to all students, regardless of their prior knowledge. The learning process was analyzed during the study based on field notes, including teacher intervention through scaffolding techniques. The intervention was given according to the student group's level of prior knowledge. The results showed that although the intervention was adjusted to the level of prior knowledge, there was no difference in the improvement of computational thinking ability between the groups of students with high, medium, or low prior knowledge.

The learning used in the control class is conventional teacher-centred learning. Students are given practice questions and work on questions by following the problem-solving steps that the teacher has conveyed. This learning tends only to motivate a few students to do the practice questions independently. This finding strengthens the findings of Liljedahl (2021) that only 20% of students tried independently working on the questions using a conventional learning model.

Problem-based learning in the experimental class started with student’s worksheets containing problems in the societal context. This encouraged students to think and experiment with their concepts to find new ideas. This finding supports the research of Ilma and Alfian (2020) and Rahayuningsih et al. (2021), which states that problem-solving through trial and error encourages students to learn math and think. Social-based problems were chosen because they contain values such as democracy, tolerance, pluralism, and social justice, which are essential for creating peace, cooperation, and equality (Arsyad & Rama, 2019; Nur & Makmur, 2020) but are fading (Regiani & Dewi, 2021). Implementing these social values in schools is one way to foster social elements in students' lives (Ilma & Alfian, 2020).

In the control class, teacher-centred learning made many students less motivated, easily distracted, and only followed the teacher without trying themselves. Only a few students learn independently, by Liljedahl's (2021) findings that only 20% of students are willing to do so. In addition, problems that are too similar to examples make it difficult for students to deal with various problems. The experimental class used problem-based learning with worksheets containing social context. This approach helps students think critically and find new solutions, as Ilma and Alfian (2020) and Rahayuningsih et al. (2021) found. The social context was chosen because it contains essential values such as tolerance and cooperation (Arsyad & Rama, 2019; Nur & Makmur, 2020), which are fading (Regiani & Dewi, 2021) and need to be taught again (Ilma & Alfian, 2020).

Although some students had difficulties because they were unfamiliar with the context (Andriana et al., 2022), using social contexts helped reduce the abstractness of mathematics (Rosada & Luthfiana, 2022). The social problems in the worksheet are designed for students to understand the concept of statistics. The worksheets include a teaching module that helps teachers anticipate student difficulties, design strategies, and provide assistance if needed. This is in line with the findings of Bernacki et al. (2021) and König et al. (2019) on the importance of a good lesson plan.

In the experimental class, learning began by clearly conveying the objectives, building students' motivation to learn independently without coercion, and explaining what was expected and the steps to be taken. Explaining the goal, problem, and procedure before students solve the problem is crucial (Shaughnessy et al., 2019). Teachers form heterogeneous learning groups to utilize the diversity of members' knowledge in solving problems together (Liljedahl, 2021). At this stage, students define and analyze the problem, gather information, and divide it into sub-problems to find solutions. Stimulating questions that encourage them to think helps them improve their problem-solving, abstraction, and algorithmic thinking skills. The "Exploration" column in the student worksheet supports all stages.

The process on the “Exploration” sheet is thought to influence the indicators of problem decomposition, abstraction, and algorithmic thinking. Collecting information in the problem is believed to trigger the abstraction indicator because it must be done before abstracting. Students must know and write down the information that will be used to solve the problem systematically and logically in line with the algorithmic thinking indicator. The decomposition indicator is thought to be triggered by activities in the “Exploration” column because students break down general problems into several sub-problems. This is supported by students' answers to question 2 based on the problem decomposition indicator in Figure 1 and Figure 2.

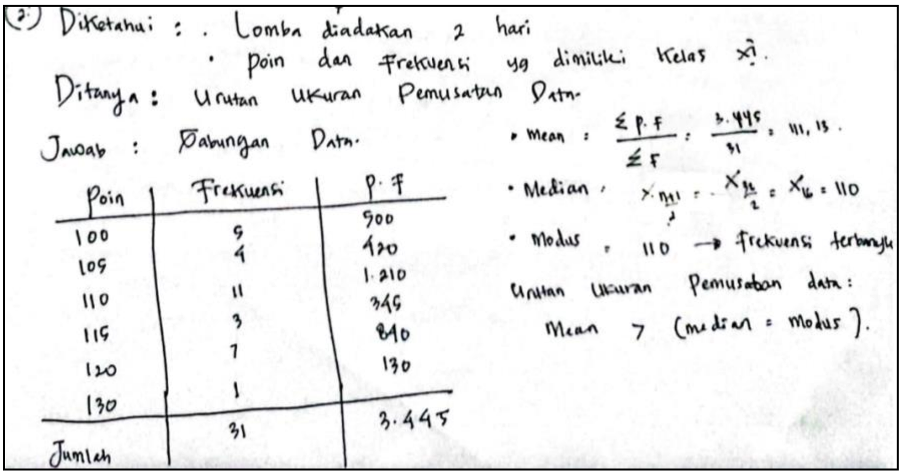


Figure 1. Answer to question 2 by experimental class students

Figure 1 shows that students in the experimental class tend to be able to work on questions with decomposition indicators by understanding the intent of the questions given and can break the questions into several parts to be solved so that they can find the order of data centralization measures based on the data they have. This allows them to determine the order of data centralization measures after comparing the mean, median, and mode calculation results.

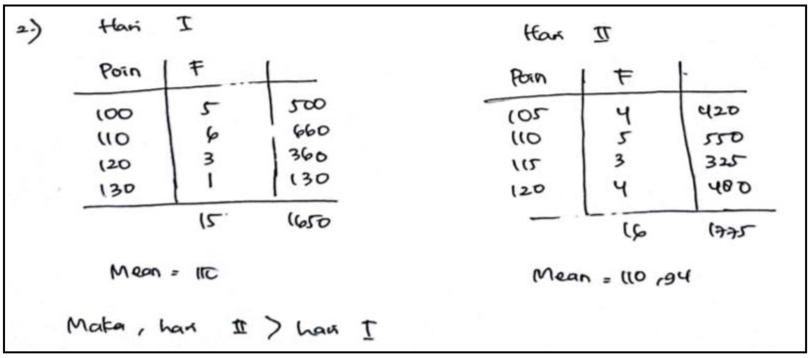


Figure 2. Answers to question 2 from control class students

There is a visible difference between the answers of control and experimental class students in solving question 2. Figure 2 shows that control class students misunderstand the question and cannot solve it correctly. Students assume that the measure of data centralization is only the mean, so they calculate the mean on the first and second days and then sort the two results. Students only focus on the problem without understanding the question's intent correctly. These stages are also thought to impact students' abstraction indicators. This is due to the need to collect information from the problem before filtering and concluding it. Students can fill in the "Exploration" column with information from the problems provided. Figure 3 shows the differences in students' answers in the experimental class when faced with questions with abstraction indicators.

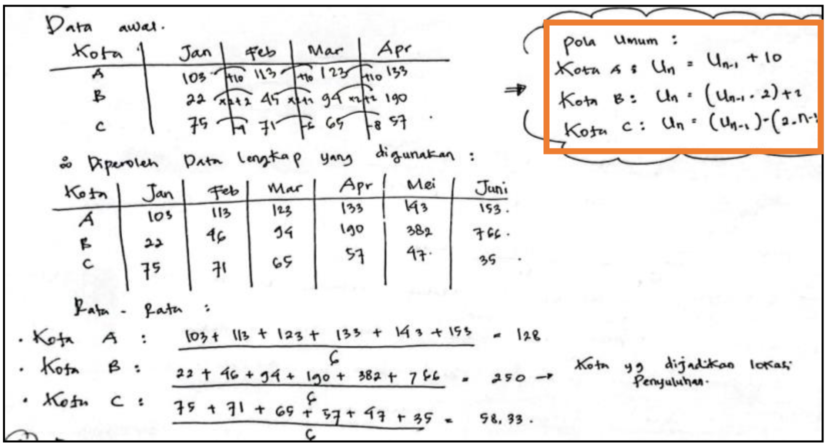


Figure 3. Answer to question 1 by experimental class students

In Figure 3, it can be seen in the sample of experimental class students' answers in more detail by writing down the known information before concluding the general pattern of the data they have. Students write down the difference in contributions from each year based on the data in the question. The difference in contributions written is a form of information collection that will be used to conclude the general pattern. Therefore, students can ensure the solution to the problem in the form of a city with the most NAPZA users as a place for counseling by calculating the mean of each town.

Kota	Des	Jan	Feb	Maret	April	Mei	Jun
A	93	103	113	123	133	143	153
B	10	22	46	94	190	380	766
C	77	75	71	65	57	53	49

Kota B menjadi lokasi penyuluhan dengan jumlah terbanyak

Figure 4. Answers to question 1 from control class students

In contrast to the answers of control class students in Figure 4, students could not collect information based on the data provided properly, so they could not conclude the measure of centralization of the data used in each generation. Students made mistakes in collecting information in the form of errors in observing differences in contributions from year to year in each group. Students only focused on recognizing patterns at the beginning of the data without paying attention to patterns in the following year, which had fatal consequences for the following pattern.

The algorithmic thinking indicator's increased computational thinking skills are caused by the stages of organizing students to investigate. This is due to preparing a systematic and logical solution; students need to write down information from the problem entirely so that readers can understand the solution that has been written and the problem becomes more accessible. Figure 5 proves a difference in the answers written by students in the experimental and control classes on questions with algorithmic thinking indicators.

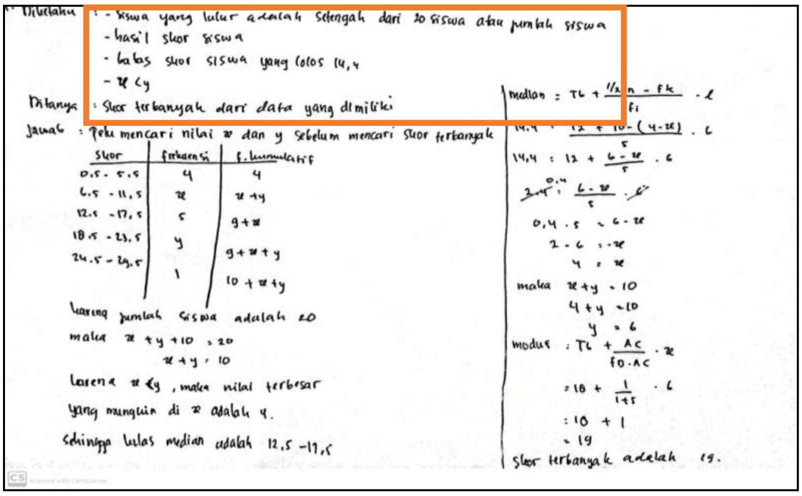


Figure 5. Answer to question 4 by experimental class students

Based on the students' answers in Figure 5, students in the experimental class have a more detailed solution. They start by writing down the information in the problem so that each reader can find the information in detail and the cause and effect of the answer. Problem-solving requires much information to interpret the material that has been studied. This allows students to determine the frequency that is missing in the data. Therefore, students can find the highest score, which can be interpreted as the mode in the group data.

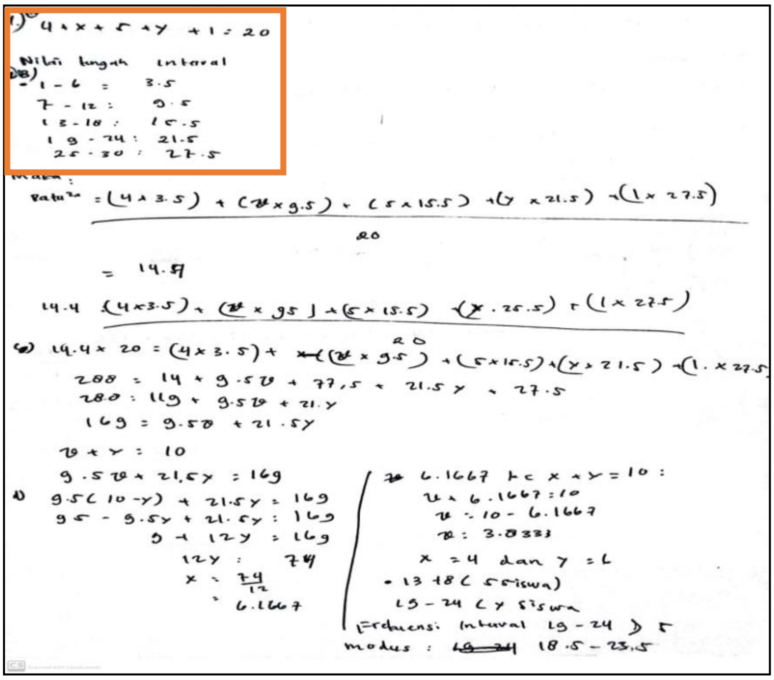
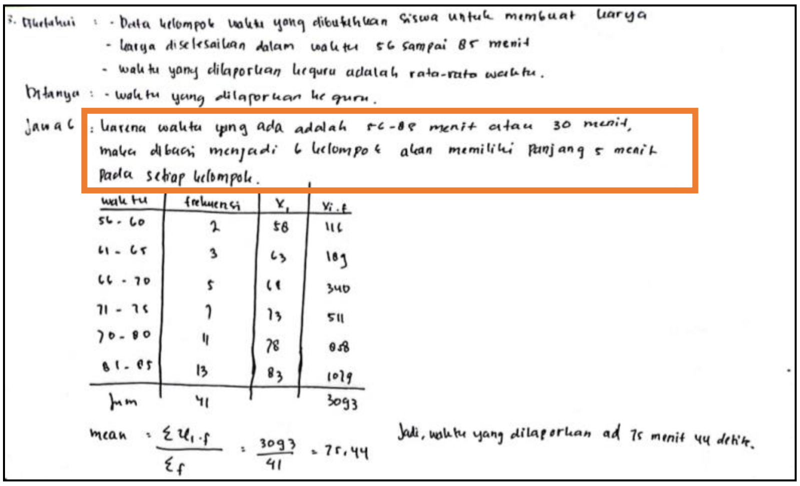


Figure 6. Answers to question 4 from control class students

Students' answers in the control class were not systematic because they did not include important information, so the cause-and-effect relationship between the problem and the answer was difficult to understand. As a result, they often misinterpret the information, as shown in Figure 6, where the value of 14.4 is considered the mean, even though it is the median. Students in the experimental class are better at solving decomposition problems because they are used to identifying information (Shaughnessy et al., 2019), sorting out important information (Palts & Pedaste, 2020), and thinking logically and systematically (Lehmann, 2023). The problem exercises in this class train students to understand the problem, collect, simplify, and filter information to find a solution. The “Exploration” column on the student worksheet supports this process. In contrast, students in the control class, who only worked on routine problems without exploration, had difficulty recording essential information and answering questions. According to Firdaus et al. (2021), lack of practice leads to procedural errors, while conceptual errors occur because students are not actively involved in learning.

Referring to the information and details of the questions obtained, students can continue to the next stage, namely the group discussion process, to find out the problem-solving process using the information they have obtained according to the instructions in the "Discussion" column. After students have collected sufficient data and conducted experiments on the problems they are investigating, they will offer hypotheses, explanations, and solutions. This is thought to trigger increased pattern recognition and algorithmic thinking indicators. This is evidenced by the answers of students in the experimental class to questions with pattern recognition indicators in Figure 7.



3. Diketahui : - Data kelompok waktu yang dibutuhkan siswa untuk membuat karya
- karya diselesaikan dalam waktu 56 sampai 85 menit
- waktu yang dilaporkan ke guru adalah rata-rata waktu.

Ditanya : - waktu yang dilaporkan ke guru.

Jawab : karena waktu yang ada adalah 56-85 menit atau 30 menit, maka dibagi menjadi 6 kelompok akan memiliki panjang 5 menit pada setiap kelompok.

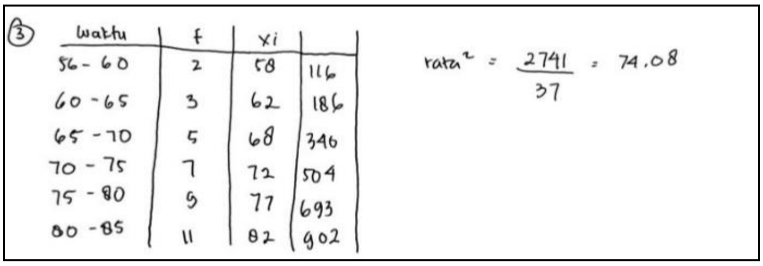
waktu	frekuensi	x_i	$x_i \cdot f$
56 - 60	2	58	116
61 - 65	3	63	189
66 - 70	5	68	340
71 - 75	7	73	511
76 - 80	11	78	858
81 - 85	13	83	1079
Jum	41		3093

mean $= \frac{\Sigma x_i \cdot f}{\Sigma f} = \frac{3093}{41} = 75{,}44$

Jadi, waktu yang dilaporkan ad 75 menit 44 detik.

Figure 7. Answer to question 3 by experimental class students

Figure 7 shows that the student's answers in the experimental class can determine the pattern well so that they can find the right solution to the problem. This begins with writing the hypothesis and explaining that, within 56 to 85 minutes, students can be divided into six groups, each being five long. After the hypothesis and explanation are written, students experiment to prove that the hypothesis regarding the pattern that has been written is correct. This allows them to know the mean of the data because they have complete data after pattern recognition.



3

waktu	f	xi	
56 - 60	2	58	116
60 - 65	3	62	186
65 - 70	5	68	346
70 - 75	7	72	504
75 - 80	9	77	693
80 - 85	11	82	902

rata² $= \frac{2741}{37} = 74{,}08$

Figure 8. Answers to question 3 from control class students

The students in the control class, as shown in Figure 8, did not write a hypothesis or explanation before recognizing the pattern. As a result, their answers were wrong because the patterns used were incorrect. Students also did not record the time data as a group of data and failed to write the frequency pattern correctly. This may be due to students' lack of understanding of the concept of grouped data or inaccuracy in reading the question. As a result, students in the control class could not solve problem number 3 because they used the wrong data.

This difference is thought to be due to the learning model used. The experimental class provided opportunities for students to gather information and make predictions. This is by the definition of pattern recognition in computational thinking, namely the ability to recognize similarities or differences to make predictions, which are essential in problem-solving (Maksum, 2022). In contrast, in the control class, students had little opportunity to predict because the problem was solved directly without recognizing its pattern.

The investigation's implementation stage is thought to impact the algorithmic thinking indicator by compiling solutions to become logical and systematic problem-solving. When students already have a prediction of the solution, they will think about a coherent problem-solving that is believed to be able to trigger the algorithmic thinking indicator. This is evidenced by Figure 9, which displays the experimental class's answers to questions with the algorithmic thinking indicator.

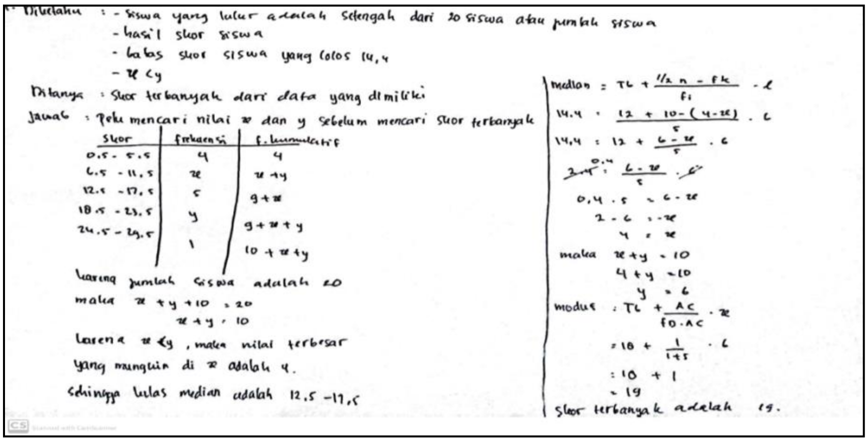


Figure 9. Answer to question 4 by experimental class students

Based on Figure 9, students in the experimental class have systematic and logical problem-solving skills compared to those in the control class. This is because students in the experimental class are accustomed to investigating the problem-solving process systematically and logically to obtain a new concept that has been facilitated in the students' worksheet with the "Discussion" column.

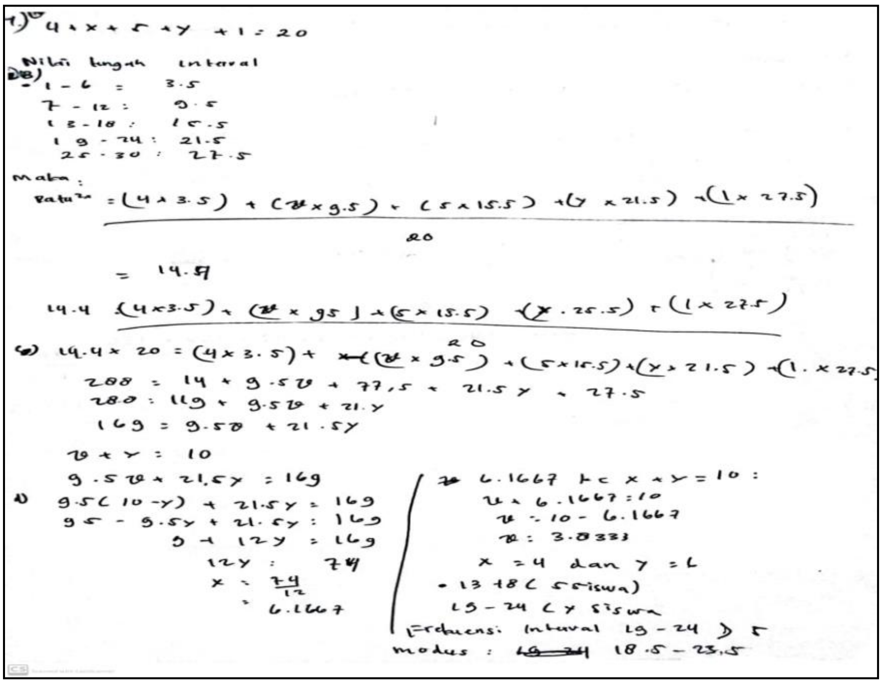


Figure 10. Answers to question 4 from control class students

Students' answers in Figure 10 show that students in the control class gave unstructured answers, so their problem-solving was less precise. They only wrote down the known information without considering other information. This may be due to teacher-centred learning, where students are used to copying the teacher's problem-solving. The lack of variety of problems in learning also makes students unaccustomed to solving non-routine problems. Research shows that algorithmic thinking develops through the habits of analyzing and investigating to find logical and systematic solutions.

In the experimental class, after the discussion, students were asked to write the solution logically and systematically in the "Discussion" column on the worksheet and then present it. Students explained the steps for the solution coherently to show the concepts found. Additional information helps students recognize patterns and solve problems logically according to algorithmic thinking indicators. The final result is recorded in the "Discussion" column to make it easier to understand. This process trains students to think coherently and logically. When comparing results, differences of opinion encourage the group to review solutions and find errors, as shown in the answer to problem number 4 in Figure 11.

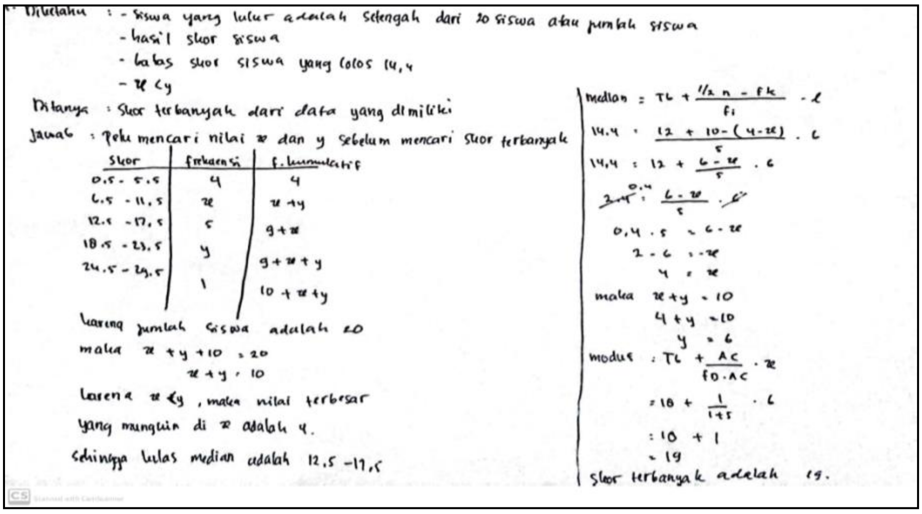


Figure 11. Answer to question 4 by experimental class students

The answers of the experimental class students in Figure 11 show that students can write answers systematically, from writing the information and requests in the question to the correct final solution. It can be seen from the students' answers that students understand what must be done to get results according to the question's request. Students write information and its interpretation on the material, complete the missing data using the median of the group data informed in the problem, and solve the problem by knowing the highest score on the data. As a result, students get a systematic and logical solution to the problem on question 4.

The answers of the control class students looked very different from those of the experimental class. The control class students only wrote the answers without writing down the information and solutions, which was not systematic. This resulted in misunderstanding the information's meaning, so students had the wrong solution. The control class students did not interpret the limit of students who passed as the median but as the mean. As a result, the final solution answers of the control class students were wrong.

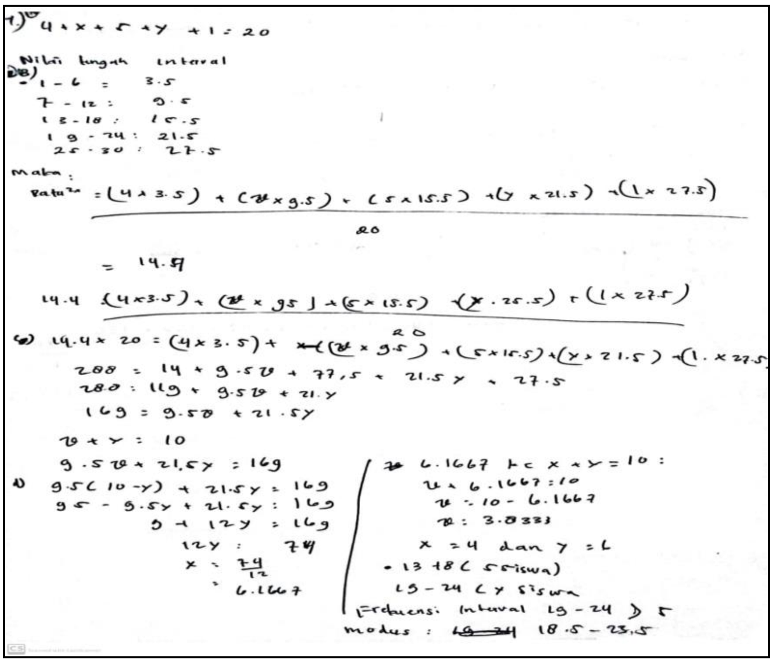


Figure 12. Answers to question 4 from control class students

The systematic and logical answers of experimental class students are thought to be because they are used to solving problems with coherent steps before presenting the discussion results clearly to their friends. During the discussion, they were also trained to critically assess the information presented by other groups. In contrast, students in the control class rarely thought logically and systematically because they were used to working on problems similar to the teacher's examples. Direct delivery of material also makes them less understanding of new concepts. Firdaus et al. (2021) stated that the lack of problem practice is one of the causes of students' procedural errors.

The final stage in Problem-Based Learning is analyzing and evaluating the inquiry process. After group discussions, students and teachers reflect and evaluate the investigation results. The "Conclusion" column in the worksheet helps students draw conclusions based on the new concepts they have learned. This evaluation encourages algorithmic thinking skills, as students understand the flow of problem-solving and statistical concepts through abstraction from their activities. This can be seen in problem number 4, where the experimental class students showed the correct final answer after doing the evaluation. This abstraction process is also reflected in the students' work on problem number 4, as shown in Figure 13. Students in the experimental class show that students can draw conclusions based on analysis and evaluation of the patterns found.

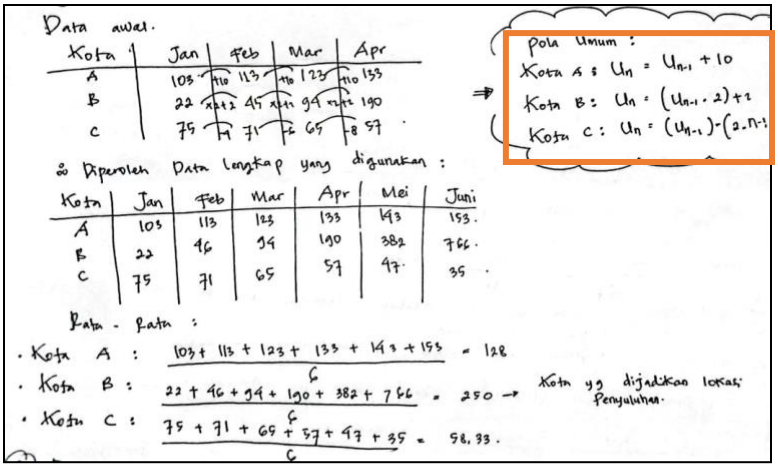


Figure 13. Answer to question 1 by experimental class students

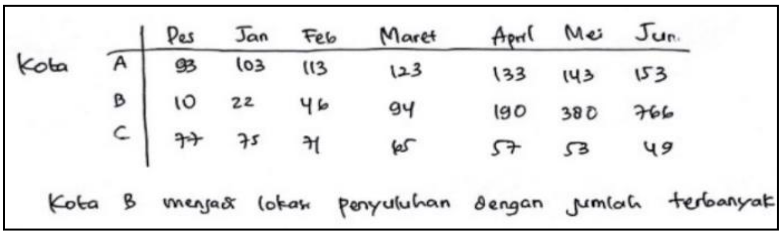


Figure 14. Answers to question 1 from control class students

Students in the experimental class showed superior abilities in determining general patterns based on identified information compared to those in the control class. This can be attributed to the exercises given to students in the experimental class when concluding the information collected to facilitate problem-solving. In addition, after finding a solution to the problem, students are accompanied by the teacher to conclude the new information or concepts they gain after solving the problem.

Posttest answers of the experimental and control classes above show a difference between students in the experimental and control classes caused by the stages of the learning model used in both classes. Students who use the Problem-Based Learning model in society have relatively higher computational thinking skills than control-class students. This study's results align with research conducted by Pratiwi and Akbar (2022) in grade IV of elementary school, which stated that learning using the Problem-Based Learning model influences higher computational thinking skills than conventional learning.

The problem-based Learning model in the context of society impacts computational thinking skills and active student involvement, inductive orientation, and discovery or construction of understanding and knowledge about newly learned concepts so that the knowledge they have becomes more meaningful. This is evidenced by the results of field notes that show an increase in the frequency of expressing opinions and asking questions during the learning process from day to day. This aligns with Arends' (2012) statement that the problem-based learning environment is characterized by openness, active student involvement, and an atmosphere of intellectual freedom.

Cooperation between groups seems to improve daily after using the learning model in a societal context. This change is evidenced by the activities of students who are starting to dare to voice their opinions in groups, do their part of the assignment as best they can, help their group members when they face obstacles in solving problems, and are calmer when there are students who are expressing their opinions. This aligns with societal elements, namely democracy, pluralism, social justice, and tolerance (Ilma & Alfian, 2020).

The result of calculating the effect size on the influence of the problem-based learning model on society is a medium category with a value of 0.667. According to Cohen (1988), a medium effect can be considered large enough to be seen even though it is not as large as a large effect size. This is indicated by the increase in the average posttest of the experimental class compared to the control class. A medium effect indicates a substantial influence that can be considered in decision-making and relevant in many situations, especially in experimental research (Fritz et al., 2012).

Conclusion

The study found that the problem-based learning model did not affect computational thinking skills in the context of society and students' prior knowledge. Providing interventions by the portion of the level of the student's prior knowledge group does not cause differences in improving computational thinking skills. Therefore, the problem-based learning model with societal context can improve computational thinking ability equally between students' prior knowledge groups. This is indicated by the students' scores, which increase together after being given the treatment. However, computational thinking skills were significantly and positively influenced by the problem-based learning model in the context of society and various students' prior abilities. The effect of the problem-based learning model's influence on society was moderate, sufficient to indicate a substantial influence on computational thinking skills.

This study emphasizes the duration students can use to carry out each stage of the problem-based learning model to train their time management skills. Researchers must conduct extensive research on student activities at school involving society before creating problems in student worksheets to have more topics that can be used as problems. The Problem-Based Learning model in the societal context can be used as an alternative by teachers in the classroom to improve students' computational thinking skills. The details of the research results for each societal element and Problem-Based Learning can be used as a problem formulation for further researchers to learn more about the effects caused in each aspect.

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Attachment

Test Instrument for Computational Thinking Skills

1. To prevent drug abuse among teenagers, FORMANZA at P School in collaboration with the Ministry of Social Affairs will hold social counseling on the dangers of drug use in one of the cities. Both organizations are civil society organizations. Therefore, to achieve a common goal, FORMANZA and the Ministry of Social Affairs held a meeting that contained elements of Civil Society, namely the existence of a large area for opinion, social justice and democracy so that all parties can argue for the common good, and tolerance for the final results of the discussion.

   After the meeting, the criteria of the area where the counseling will be held is the area around P School and the area with the highest average drug users. There are 3 areas with drug users among teenagers around School P, namely city A, city B, and city C. The following are data on drug abuse cases among teenagers that are owned in several months

City	Data on the Increase in Drug Abuse Cases among Teenagers				
	Dec	Jan	Feb	Mar	April
A	93	103	113	123	133
B	10	22	46	94	190
C	77	75	71	65	57

   Determine the general pattern of the data provided and which region would be the extension site if the data is from January to June!

2. The Q School OSIM of the Department of Education held a quiz competition in which each batch participated. Each batch sends a maximum of 15 representatives who will participate in the competition for 2 days. Each representative will answer questions individually and will be given points according to the correct answers. After 2 days, each member's points will be combined. Each batch is allowed to confer to choose the measure of data concentration that will be used as the points that will be used as the final points. This opportunity is given so that students can foster a democratic attitude and implement an open public space for opinion. On the second day of the competition, each batch was given the opportunity to send 1 more representative. After the race was over, the points of each student in 2 days were distributed, here is a recap of the points for class XI:

day 1

Point	frequency
100	5
110	6
120	3
130	1

day 2

Point	frequency
105	4
110	5
115	3
120	4

Based on the data, is the order of data centering measures after the two classes are combined Modus > Median > Mean? Explain why!

3. Today, class X students will conduct an entrepreneurial P5 (Projek Penguatan Profil Pelajar Pancasila) program in the form of utilizing used goods which will later be sold in an exhibition in the next 3 months. Each class, has the authority to choose what materials will be used to produce which will later be sold. This is done so that students have the freedom to work and make transactions which are part of the elements of Civil Society, namely the existence of a large public area. In addition to freedom of work and transactions, the P5 project also trains democracy and tolerance when each class discusses to determine the used goods to be used. After the discussion, classes X D and X E chose to use old newspapers as the material for making the work and started making the work at 08.00. The time needed by students to complete their work varies with the range of time needed by students is 56 minutes to 85 minutes. The average time taken by both classes should be reported to the teacher in charge of both classes. The frequency of the groups of time required by students is as follows:

time	frequency
….	2
…	3
…	5
…	7
…	…
…	…

Complete the data! Determine the time to report to the teacher from the data!

4. The Math OSN will be held in the next 2 months. School R plans to send 5 students as representatives of the math field. To prepare for this, students who participate in

the Olympiad will be given exclusive classes for several meetings. Based on the results of the teacher meeting, School R will hold a selection with 30 multiple choice questions to select half of the 20 selection participants, then will be re-selected to select 5 students after attending the exclusive class. The meeting and selection process carried out is a form of Civil Society in the school environment in the form of a meeting that applies a broad public area, democracy, tolerance, and social justice to have a free opinion regardless of rank or anything else. After the selection, here are the results of the students' scores:

score	frequency
0,5-5,5	4
6,5-11,5	X
12,5-17,5	5
18,5-23,5	Y
24,5-29,5	1

Based on these results, the cut-off score for students who qualify is 14,4. If x<y, determine the mode of the data with a logical and systematic solution!