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# The relationship between self-efficacy and computational thinking skills of fifth grade elementary school students

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## Abstract

Self-efficacy and computational thinking skills are necessary in this technological development age. However, only some studies still discuss the relationship between the two variables. The purpose of this study is to determine the form of relationship between self-efficacy and computational thinking skills of fifth-grade elementary school students. This study applied correlational quantitative research without accompanying the treatment of the subjects. The respondents for this study were 84 fifth-grade students from three public schools in Pekanbaru. Two types of instruments are used in this study, including questionnaires and computational thinking skills tests. The results showed a correlation coefficient of -0.036 with Sig. (2-tailed) 0.747 > 0.05. That is, there is a very low relationship, it has a negative direction, and it is not significant between self-efficacy and computational thinking skills of fifth-grade elementary school students. Self-efficacy contributes to the influence of computational thinking skills by only 0.12%, and other factors influence the remaining 99.88%. This study is expected to provide an overview of self-efficacy and computational thinking skills of fifth-grade students in Pekanbaru and is expected to be an additional reference for further study.

**Keywords:** computational thinking skill; relationship; self-efficacy

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## Introduction

The development of science and technology must be supported by resources. The most important resource is human resources (Yudha, 2019). Humans are required to be able to evolve with the times. If the human being is not able to adjust himself, he will be selected in the midst of intense human competition (Ansori, 2020).

Technological developments are influenced by the development of science in education. The world of education is required to use technology to assist the implementation of learning so that students are increasingly literate in technology so as to advance science and education (Lestari, 2018). In the age of technological development requires the world of education to integrate critical thinking skills, problem solving, communicative, innovative, collaborative, literacy, emotional awareness, cultural competence (Umar, 2018).

Basic computational thinking skills are essential for individuals of all ages as we move into the mid-21st century (Kalelioğlu et al., 2016; Wing, 2014). According to the Organization for Economic Co-operation and Development (OECD), 71% of students did not reach the minimum competency in mathematics. Therefore, having problem-solving skills is very important for students to master as future individuals who will enter the wider world. This indicates that there are still many students in Indonesia who have difficulty handling situations that require problem solving skills with mathematics. One approach to developing problem solving skills is to start from computational thinking skills (Afifah & Kusuma, 2021).

Computational thinking is an interweaving of problem-solving stages consisting of ideas, opportunities, challenges encountered in order to develop the chosen solution (Fajri et al., 2019). This way of thinking is a thought process in solving problems that originated in computer science but can be applied in any discipline, especially mathematics (Cahdriyana & Richardo, 2020). Mathematics is a science that is divided into four parts, namely arithmetic, algebra, geometry and analysis with arithmetic including number theory and statistics (Azizah & Farisi, 2020). Mathematics is a science that always develops in accordance with the demands of human needs for technology (Kamarullah, 2017).

Computational thinking skills have four main elements, and thoses four main elements are decomposition, pattern recognition, abstraction and algorithms (Sa'diyyah et al., 2021). These four main elements are used as indicators in this study. The decomposition indicator is the process of decomposing complex problems into simpler ones so that they are easier to solve. The pattern recognition indicator is creatively identifying similarities or differences that exist in a problem so that it can make a person's critical and creative thinking time more efficient if this stage continues to be familiarized. The abstraction indicator is an activity of seeing the problem as a whole or can be called a skill that minimizes the complexity of irrelevant attributes of an entity and replaces attributes that have similar functions with a single construction. The abstraction indicator is an activity that looks at the problem as a whole or can be called a skill that minimizes the complexity of irrelevant attributes of an entity and replaces attributes that have similar functions with a single construction so as to

find an easier solution (Cansu & Cansu, 2019). The algorithm indicator is the preparation of alternative and effective steps to solve a problem.

Although the importance of students' computational thinking skills in solving problems is undoubted, the problem arises that computational thinking skills have not been applied in the mathematics learning curriculum in elementary schools. This is supported by a statement from Veronica et al. (2022) which states that mathematics learning in Indonesia has not led to computational thinking skills.

A person needs self-confidence to be able to do something. If a person only has a skill or potential in himself but does not have the confidence to be able to do and apply it, then that ability is just useless. If someone does not have confidence in doing something, there will certainly be a mismatch between expectations and results (Asiyah et al., 2019). When someone only has computational thinking skills, it is not enough if they do not have self-efficacy. One needs self-efficacy to be able to do something, one example is computational thinking skills.

Beliefs about one's own capacity is called self-efficacy which is an individual's ability to manage circumstances by convincing himself that he is able to organize and carry out an action appropriately (Latifah, 2018). Albert Bandura is a psychological figure who explains that belief has the ability to organize and carry out an action in achieving goals as self-efficacy (Rustika, 2012). So, it can be interpreted that efficacy provides an influence on computational thinking skills.

Self-efficacy greatly influences the outcome of an action or deed. Self-efficacy can generate new ideas. Someone with high self-efficacy is more likely to have different ideas than usual to solve a problem (Paulus & Coskun, 2017). Individuals who have a high level of self-efficacy are more motivated to achieve (Gibson et al., 2009). Individuals with low levels of self-efficacy can hinder progress and become passive (Gibson et al., 2009). That is, if an individual does not have self-confidence, then he does not dare to do something, making the individual an undeveloped person. People who have lost confidence immunize themselves from being hurt by not trying again, by fatalistic attributions, and even by recalling the biography of their failures in a way that is consistent and justifies the belief that they are incapable (Flammer, 2015).

Bandura and Locke (2003) explain that there are four aspects of self-efficacy that are used as indicators in this study, including magnitude is a person's belief about his ability to deal with various levels of task difficulty; generality is an individual's belief in the level of breadth of the field of tasks that can be achieved; strength relates to high perseverance in the face of difficult problems and obstacles.

Thinking skills in the development of self-efficacy play a considerable role, because people with high intelligence will be better able to remember and examine the various events they have experienced, so that the conclusions that will be made become more precise (Rustika, 2012). Conversely, if someone has a low level of intelligence, it will be difficult to remember and analyze the various events he has experienced.

Bandura (1994) states that people with high confidence, they approach difficult tasks as challenges to be mastered, not as threats to be avoided. Self-efficacy fosters intrinsic interest

and deep-rooted preoccupation in activities. They set themselves challenging goals and maintain a strong commitment to them. They increase and sustain their efforts in the face of failure.

High self-efficacy and positive self-regulatory behaviors are reliable for academic success in learning (Landrum, 2020). This shows that self-efficacy is needed in learning mathematics to apply computational thinking skills.

Increasing positive attitudes in students will have a positive influence on their achievement success (Durak & Saritepeci, 2018). Based on this statement, it can be interpreted that if someone has high self-efficacy, then he has a high level of computational thinking skills as well. There have been many previous studies that discuss self-efficacy and research that discusses computational thinking skills, for example a study conducted Agus (2021) entitled "The Relationship Between Self-Efficacy and Students' Mathematics Critical Thinking Ability" which obtained the results of a positive relationship between self-efficacy and critical thinking ability of junior high school students in mathematics subjects. Not only that, research from Mulyani et al. (2020) also discussed self-efficacy with the title "Correlation between Elementary School Students Mathematics Self-Efficacy and Motivation" and concluded that there is a positive and significant relationship between mathematics self-efficacy and learning motivation of elementary school students. While previous studies that discuss computational thinking skills include, "The Relationship between Computational Thinking and Polya Problem Solving in Mathematics Learning in Elementary Schools" by Veronica et al. (2022) with the acquisition of research results stating that computational thinking and Polya's problem solving have a relationship in each process.

From the literature review conducted by the researchers, some of these studies represent that most studies only discuss the relationship of self-efficacy with other variables and the average subject used is junior or senior high school students. There are still few studies that use elementary school students as their subjects. Similarly, most studies that discuss computational thinking skills only relate computational thinking skills with other variables. Previous studies discussed self-efficacy and computational thinking skills separately. Based on the theory presented by Albet Bandura that self-efficacy has a potential influence on computational thinking skills, so researchers are interested in proving this theory on the object of this research, namely fifth grade elementary school students in Pekanbaru on the grounds of relevance between the object and the research instrument. Fifth grade elementary school students are considered mature enough to fill out this research instrument. Starting from the background of the problem that has been described, thus this research aims to find out how the form of relationship between self-efficacy and students' computational thinking skills and how much self-efficacy and computational thinking skills of fifth grade elementary school students in Pekanbaru. This research makes ($H_1$) the existence of a relationship and ($H_0$) the absence of a relationship between variables as a hypothesis.

## Methods

This research is a quantitative correlation study using a survey as a data collection method. Quantitative research is used to examine a population or sample using research instruments, statistical data analysis and aims to prove the truth of a previously established hypothesis (Sugiyono, 2019). The survey method is a method that aims to obtain data about beliefs, opinions, characteristics, attitudes, so that a relationship between variables is obtained from a population with instruments such as observations, tests, interviews, or questionnaires (Sugiyono, 2019).

This study used two research instruments, namely tests and non-tests. Instruments obtained from previous studies that have gone through validity and reliability tests with results that meet the standards. The questionnaire instrument to measure the level of student self-efficacy was obtained from Faradilla (2021) with a reliability score of 0.860. Meanwhile, the test instrument to measure the level of students' computational thinking skills was obtained from research by Putra et al. (2022) with a validity score of 92.36% and a reliability score of 0.81. The samples used in both instruments have the same characteristics as the samples that researchers use, namely both using fifth grade elementary school students. In total, there were 84 samples used by researchers from the population of all fifth-grade students at three elementary schools in Pekanbaru. Questionnaires are the most suitable instrument for self-efficacy variables because basically questionnaires allow researchers to examine the attitudes, beliefs, behaviors, and special characteristics of research respondents to produce data with a high level of validity and reliability and data results that are linear with the research objectives. Likewise, the test instrument has the advantage of being able to measure students' mastery of learning material so that it is used to measure students' computational thinking skills.

The sample was obtained using simple random sampling method to work on 20 statements of self-efficacy questionnaire with Likert measurement scale and 22 items of math computational thinking skills. The research instrument for the self-efficacy variable consists of three main indicators, namely magnitude, strength, generality, while for the computational thinking skills variable consists of four indicators, including decomposition, pattern recognition, algorithm, and abstraction.

Figure 1 is an example of a computational thinking skills question with a pattern recognition indicator. Students are asked to be able to determine the next shape or pattern of a math problem.

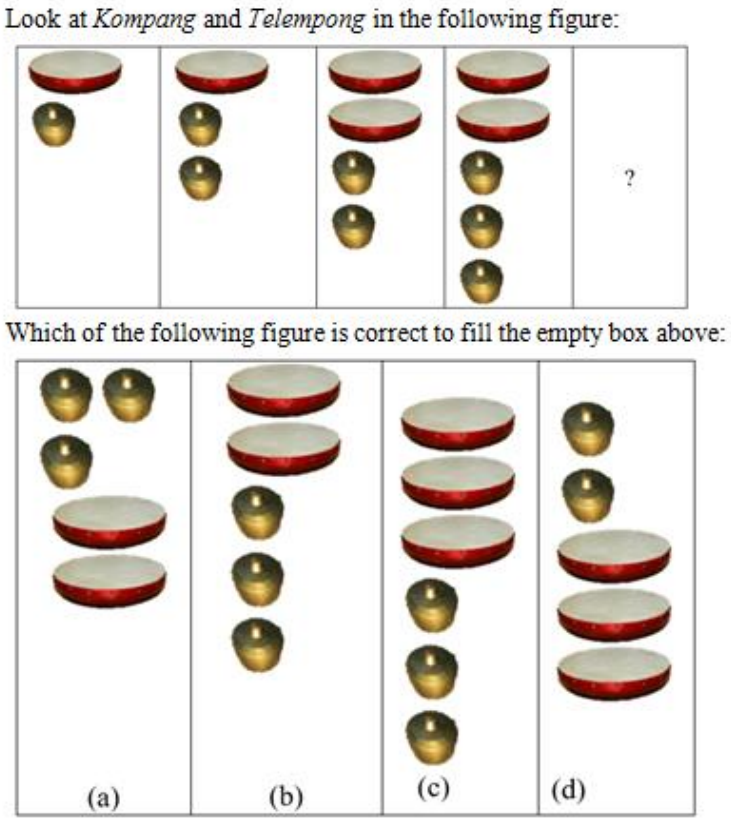


**Figure 1.** Item 15 of the computational thinking test (Putra et al., 2022)

Meanwhile, Figure 2 is an example of an abstraction indicator of computational thinking skill problem. The problem asks students to be able to determine the total route to go to the festival venue.

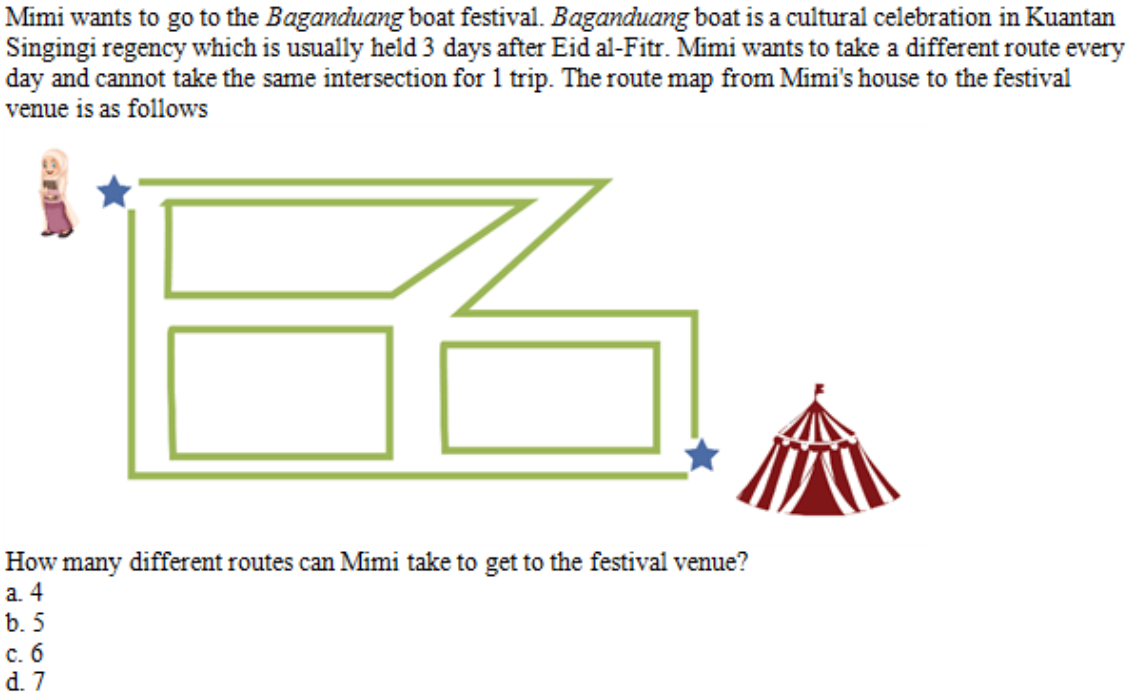


**Figure 2.** Item 22 of the computational thinking test (Putra et al., 2022)

The level of student self-efficacy in this study was measured based on the following criteria according to the rules from Faradilla (2021).

**Table 1.** Provisions for self-efficacy categories

| Score Range | Category |
|---|---|
| 66 – 80 | Very High |
| 51 – 65 | High |
| 36 – 50 | Low |
| 20 – 35 | Very Low |

Meanwhile, the level of students' computational thinking skills was measured based on the criteria according to the rules of Gunawan (2022).

**Table 2.** Terms of the computational thinking skills test category

| Interval | Category |
|---|---|
| 81 – 100 | Very High |
| 61 – 80 | High |
| 41 – 60 | Medium |
| 21 – 40 | Low |
| 0 – 20 | Very Low |

The significant level of α or the error rate in this study is 5% or 0.05. In the initial step of processing research data, normality and reliability tests were carried out as research prerequisite tests. The normality test in this study obtained a result of 0.2 for self-efficacy and 0.083 for computational thinking skills which indicated that the data was normally distributed because it was greater than (α = 0.05). Meanwhile, the linearity test obtained a result of 0.189 > α = 0.05, so it can be concluded that there is a linear relationship between self-efficacy and computational thinking skills. It should be emphasized that all data analysis carried out in this study used SPSS version 25 software.

After the prerequisite test is carried out, then the hypothesis test is carried out to determine the form of the relationship between self-efficacy and computational thinking skills using the Product Moment correlation test technique assisted by SPSS software version 25. The significant level of α or the error rate in this study is 5% or 0.05. Furthermore, a significant test was carried out, to find out how meaningful the results of the hypothesis test obtained. The purpose of the significant test is to determine whether the hypothesis test results can represent the entire population.

The next step is the coefficient of determination test to find out how much influence between variables. This means how much the influence of self-efficacy contributes to computational thinking skills. Finally, a linear regression test is conducted to estimate how high the value of the dependent variable is when the value of the independent variable is changed (Sugiyono, 2019) with a simple general equation: $\hat{Y} = a_o + b_o X$. The value of a is the price of $\hat{Y}$ when X = 0 (constant price), while the value of b is the direction number or regression coefficient which shows the number of increases or decreases in the dependent variable based on the independent variable.

# Results

## Students' self-efficacy

The self-efficacy variable has three main indicators, namely magnitude (level of task difficulty), strength (strength of belief), generality (breadth of belief). From the questionnaire filled out by 84 respondents, the average score per self-efficacy indicator was 79.54% and categorized as high. This means that fifth grade elementary school students in Pekanbaru have an average score of self-efficacy per indicator that is good enough. The results of the analysis can be seen in Table 3 below.

**Table 3.** The average self-efficacy score per indicator

| Indicator | Total of respondents | Total score | Percentage | Category |
|---|---|---|---|---|
| Magnitude | | 1002 | 74.55% | High |
| Strength | 84 | 2697 | 80.26% | Very High |
| Generality | | 1690 | 83.82% | Very High |
| Mean | | | 79.54% | High |

Table 4 shows that the highest percentage of self-efficacy of fifth grade elementary school students in Pekanbaru is shown by the high category with a frequency of 44 and a percentage of 52.38%.

**Table 4.** Category of self-efficacy of fifth-grade elementary school students

| Category | Interval | Frequency | Percentage |
|---|---|---|---|
| Very High | 66 – 80 | 39 | 46.42% |
| High | 51 – 65 | 44 | 52.38% |
| Low | 36 – 50 | 1 | 1.19% |
| Very Low | 20 – 35 | 0 | 0% |

It can also be seen in the very low category which obtained a percentage and frequency of 0. This indicates that self-efficacy in fifth grade elementary school students in Pekanbaru is categorized as high with a mean of 64.15 and a standard deviation of 6.98.

## Students' computational thinking skills

The variable of computational thinking skills has four main indicators, namely decomposition, algorithm, pattern recognition, and abstraction. Based on the research results, out of 22 test items done by 84 respondents, the average score of computational thinking skills per indicator was 35.61% and categorized as low. This means that fifth grade students at elementary schools in Pekanbaru have a low average score of computational thinking skills per indicator. The results of data analysis can be seen in Table 5.

**Table 5.** The average computational thinking skills score per indicator

| Indicator | Total of respondents | Total score | Percentage | Category |
|---|---|---|---|---|
| Decomposition | 84 | 138 | 32.85% | Low |
| Algorithm | | 134 | 39.88% | Low |
| Pattern Recognition | | 222 | 44.04% | Medium |
| Abstraction | | 151 | 25.68% | Low |
| **Mean** | | | 35.61% | Low |

After being described based on each indicator, STable 6 presents the results of computational thinking skills data based on the scores obtained by each student. This aims to determine the category of variable Y (computational thinking skills).

**Table 6.** Category of computational thinking skills of fifth-grade elementary school students

| Category | Interval | Frequency | Percentage |
|---|---|---|---|
| Very High | 81 – 100 | 0 | 0% |
| High | 61 – 80 | 1 | 1.19% |
| Medium | 41 – 60 | 32 | 38.09% |
| Low | 21 – 40 | 40 | 47.61% |
| Very Low | 0 – 20 | 11 | 13.09% |

In Table 6, the highest percentage of 47.61% is in the low category with an interval value of 21 - 40 and a frequency of 40 students. This indicates that fifth-grade students at elementary schools in Pekanbaru have low computational thinking skills with a mean of 34.95 and a standard deviation of 12.50.

## Hypothesis and significance analysis

Hypothesis testing is useful to determine the relationship between independent and dependent variables in a study. In this study, self-efficacy as the independent variable and computational thinking skills as the dependent variable. Hypothesis testing uses Pearson Product Moment correlation test technique. The hypothesis of this study by making ($H_1$) the existence of a relationship or ($H_0$) the absence of a relationship between self-efficacy and computational thinking skills of fifth grade students. The correlation test results of self-efficacy variables with computational thinking skills variables can be seen in Table 7.

Table 7 shows the value of $r_{count}$ or correlation coefficient of -0.036 is included in the very low category with a negative correlation. So, it can be concluded that there is a very weak relationship between the variable (X) self-efficacy and the variable (Y) computational thinking skills. The negative sign means that the correlation is not in line. If variable X is high or increases, then variable Y is low or decreases.

**Table 7.** Correlation test results of self-efficacy with computational thinking skills

**Correlations**

| | | Self-efficacy | Computational thinking skills |
|---|---|---|---|
| Self-efficacy | Pearson Correlation | 1 | -.036 |
| | Sig. (2-tailed) | | .747 |
| | N | 84 | 84 |
| Computational thinking skills | Pearson Correlation | -.036 | 1 |
| | Sig. (2-tailed) | .747 | |
| | N | 84 | 84 |

After testing the hypothesis, a significance test is then carried out to determine whether the correlation results found apply to the entire research population or not. The significance test decision-making requirement is if the significance > (α = 0.05), then $H_0$ is accepted and $H_1$ is rejected. If the significance < (α = 0.05), then $H_0$ is rejected and $H_1$ is accepted. Table 8 indicates a significance value of 0.747> (α = 0.05), then $H_0$ is accepted and $H_1$ is rejected. This means that the strength of the relationship between variables X and Y is not significant.

**Table 8.** The results of the significance test of variable X with variable Y

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 39.047 | 12.739 | | 3.065 | .003 |
| | Self-efficacy | -.064 | .197 | -.036 | -.323 | .747 |

## Coefficient of determination

Finding the coefficient of determination aims to determine how much influence between variables. The coefficient of determination in this study can be seen in table 9. Table 9 indicates a coefficient of determination of 0.12%. This means that self-efficacy influences computational thinking skills by 0.12% and the remaining 99.88% is influenced by other factors.

**Table 9.** Coefficient of determination of variables X and Y

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .036[a] | .001 | -.011 | 12.57064 |

### Linear regression test

The linear regression test serves to estimate the average value of the dependent variable knowing the value of the independent variable (Riadi, 2016). Based on Table 8, the value of a, namely the price of Yˆ when X = 0 (constant price), obtained 39.047, the value of b, namely the direction number or regression coefficient which shows the number of increases or decreases in the dependent variable based on the independent variable, obtained -0.064 with a significance value of 0.747. Thus the regression equation is obtained $\hat{Y} = a_o + b_o X = 39.047 + (-0.064)X$. If b is positive, then variable Y is expected to increase and if b is negative, then variable Y is expected to decrease (Sugiyono, 2019). The interpretation is that if variable X self-efficacy increases by one unit, then variable Y computational thinking skills can be expected to decrease by 0.064 at a constant 39.047.

After getting the regression equation, the interpretation is that if variable X self-efficacy increases by one unit, then variable Y computational thinking skills can be expected to decrease by 0.064.

## Discussion

### Students' self-efficacy

The high and low self-efficacy possessed by a person will affect every activity he does (Rangkuti et al., 2021). Individuals who have a high level of self-efficacy are more motivated to achieve (Gibson et al., 2009). Self-efficacy is an important factor in determining whether or not a student achieves Schunk and DiBenedetto (2020). Based on the results of data analysis, students' magnitude indicator is in the high category. This indicates that fifth-grade elementary school students in Pekanbaru believe that they are able to solve math problems, however, get challenges to solve difficult mathematical tasks. This is in accordance with Bandura (1997) opinion that a person's ability can be measured through the level of difficulty of various problems.

Apart from that, even though students feel uncertain about being able to solve difficult math tasks, they still try to solve them with high perseverance. This is evidenced by the results of the analysis of the strength indicator answered by students in the questionnaire with 80.26% and categorized as very high. Students will persevere in overcoming existing obstacles. He will continue to work on his assignments and not easily give up and survive when faced with difficulties (Mulyani et al., 2020).

The very high results of the analysis of the generality indicator indicate that students are very aware of their limits. So, they will work on tasks that they feel capable of completing. Usually, students who have very high self-efficacy will act in a positive direction, they believe they can complete difficult tasks. When students consider themselves to be in a good condition, it will grow motivation in the student to learn mathematics and be optimistic in solving math problems. Meanwhile, when students feel that they are in a bad condition, students will tend to be pessimistic in solving math problems (Mulyani et al., 2020). They will last longer and actively complete the task. This finding has similarities to statement of

Bandura (1997) that students who have high self-efficacy will show great interest in learning, work harder, last longer, and achieve more. They do not hesitate to complete difficult tasks and are encouraged to use cognitive and metacognitive learning strategies (Zimmerman, 2005).

Overall, the results of the analysis found that fifth grade elementary school students in Pekanbaru have high self-efficacy. From the analysis of students' self-efficacy, they have high self-efficacy but feel unable to do difficult math tasks and tend to avoid them. This contradicts Bandura (1994) statement that those with high self-efficacy will approach difficult situations with the belief of being able to control the situation.

## Students' computational thinking skills

From the results of the data analysis obtained, students are more able to recognize patterns seen from the given mathematical problems. Students find it difficult for skills that require deeper analysis, such as decomposing mathematical problems into simpler problems to be solved, abstracting problems to a more general domain, and preparing problem solving steps. Students tend to find it easier to solve problems that are clearly visible to their sense of sight and have difficulty in solving problems that require reasoning and imagination.

Having pattern recognition skills is not enough to master computational thinking skills, because reasoning is very important in mathematics education, especially computational thinking skills (Maharani et al., 2020). Judging from the students' abilities that exist only in the pattern recognition indicator and low in other indicators, it can be concluded that the computational thinking skills of grade V elementary school students in Pekanbaru are in the low category. This finding is supported by the conclusion of Olmo-Muñoz et al. (2020), which found that the students had a low starting level in terms of computational thinking skills. In line with this, Mufidah (2018) also supports that the level of computational thinking skills possessed by students in Indonesia is still at a low level and requires further maximization. Whereas computational thinking skills are very important in the future to be mastered by students (Grover et al., 2013). However, in reality, mathematics learning in Indonesia has not yet led to computational thinking skills (Veronica et al., 2022).

## Relationship between self-efficacy and students' computational thinking skills

To find out the form of relationship between self-efficacy and students' computational thinking skills, previously the prerequisite tests of normality and linearity were carried out with qualified results. After the prerequisite tests were met, the hypothesis test was continued, and the results showed that there was a low and insignificant relationship between self-efficacy and computational thinking skills. Insignificance means that the low relationship between self-efficacy and computational thinking skills does not apply to all fifth-grade students in elementary schools in Pekanbaru.

There is a negative relationship between self-efficacy and students' computational thinking skills. This statement is obtained from the results of regression analysis which obtained the results if self-efficacy increases by one unit, then computational thinking skills

can be expected to decrease by 0.064. Self-efficacy gives 0.12% influence on computational thinking skills and the remaining 99.88% is influenced by other factors.

The results of this study show that students have a high level of self-efficacy does not necessarily give the result that students' computational thinking skills are also high. In fact, it shows that there is only a very low relationship between the two variables. This is contrary to the statement from previous research stated by Asiyah et al. (2019) that if someone does not have confidence in doing something, there will be a mismatch between expectations and results.

## Conclusion

The self-efficacy of fifth grade elementary school students in Pekanbaru is in the high category. Students understand the limits of their abilities, so they will choose only simple math problems and try to persevere in solving these math problems. Meanwhile, the computational thinking skills of fifth grade elementary school students in Pekanbaru are in the low category. Students are only able to determine the pattern of mathematical problems that are clearly visible to the sense of sight, but to solve math problems that require further analysis and reasoning, many students have difficulty. So, this results in a very weak and negative relationship between self-efficacy and students' computational thinking skills.

The existence of a weak relationship in this study is an opportunity for future research to further explore what factors affect the computational thinking skills of elementary school students. Thus, it can be a perfection of this research as well as an additional reference about the realm of self-efficacy and computational thinking skills of elementary school students considering the lack of studies that discuss these two things.

According to the researcher's perspective, what makes the low relationship between self-efficacy and computational thinking skills is because computational thinking skills have not been applied in the mathematics learning curriculum in elementary schools. So many students find it difficult to do the computational thinking skills test.

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## Conflicts of Interest

The authors declare that there is no conflict of interest.

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## Author Contributions

**Nursadila Safitri:** Conceptualization, writing - initial draft, editing, and visualization; **Zetra Hainul Putra:** Writing - review & editing, formal analysis, and methodology; **Jesi Alexander Alim:** Formal analysis, validation and supervision; **Ayman Aljarrah:** Review and editing the manuscript.

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