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Creative Performance Self-Efficacy and Mathematical Problem-Solving: Analyzing Students' Strategies in Number Patterns

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Abstract: Learning mathematics is important for developing critical thinking and problem-solving skills. However, improving students' creativity and self-confidence is still a major concern, especially in solving complex mathematical problems. This study analyzes the relationship between Creative Performance Self-Efficacy (CPSE) and mathematical problem-solving ability on number pattern material. The research method used is descriptive qualitative, with participants of grade VIII students of Jambi City 1 Junior High Schools selected based on high and low CPSE categories. Data was collected through CPSE questionnaires, problem-solving tests, and semi-structured interviews. The study showed that CPSE is not always directly proportional to mathematical problem-solving ability. Students with high CPSE do not always perform better than those with low CPSE. Some students with low CPSE can develop more systematic and practical problem-solving strategies. In contrast, students with high CPSE have difficulty understanding problems and executing the right solutions. Factors such as conceptual understanding, accuracy, and learning experience also influence problem-solving success. The conclusion of this study confirms that a learning approach that only focuses on improving CPSE is not practical enough without strengthening conceptual understanding and problem-solving strategies. Therefore, a scaffolding-based learning approach, problem-based learning (PBL), and differentiated instruction are needed to accommodate the needs of students with different CPSE profiles. In addition, metacognitive strategies such as self-evaluation, error-based learning to identify errors, and reflective discussions to evaluate solutions are also essential to implement.

Keywords: creative performance self-efficacy, mathematical problem-solving, students' strategies, number patterns.

▪ INTRODUCTION

Mathematics Learning is important for developing critical thinking skills, logical reasoning, and problem-solving. These skills greatly help students face the challenges of everyday life and support the right decision-making (Agbata et al., 2024; Harris, 2019). However, mathematics learning in Indonesia still faces major challenges, especially in increasing students' creativity and self-confidence. PISA 2022 data shows that Indonesia is ranked 66th out of 81 countries with an average mathematics score of 366, reflecting the low mathematical literacy level and students' self-confidence (OECD, 2022). This finding emphasizes the importance of paying more attention to developing students' self-confidence, which is one of the keys to success in mathematics learning.

Self-efficacy is an individual's belief in their ability to carry out tasks and achieve certain goals despite facing obstacles. Creative Self-Efficacy (CSE), as part of Self-Efficacy, specifically describes an individual's belief in their ability to produce creative and original solutions. This creativity is very important in solving mathematical problems that are often complex. CSE consists of two main dimensions: Creative Thinking Self-Efficacy (CTSE) and Creative Performance Self-Efficacy (CPSE). CTSE focuses on beliefs in the ability to think creatively, while CPSE relates to beliefs in expressing creative performance (Abbott, 2010). A deep understanding of CPSE is essential to ensure

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that students are confident in thinking creatively and able to demonstrate real results from that creativity.

Previous studies have confirmed the importance of Self-Efficacy in supporting mathematical problem-solving abilities. High Self-Efficacy has been shown to have a positive and significant correlation with this ability, where students can better evaluate information, use symbols, and solve problems effectively (Kusuma et al., 2024). In addition, self-confidence plays an important role, especially among junior high school students, who have high self-confidence, significantly increasing their ability to solve mathematical problems (Putra & Hendriana, 2023). Positive Self-Efficacy perceptions directly affect students' attitudes in solving mathematical problems (Çelik et al., 2024). Other studies have shown that Self-Efficacy significantly affects mathematical problem-solving abilities, both in general contexts and through learning innovations such as using hypermedia based on augmented reality (Andrini, 2024). However, most of these studies focus more on Self-Efficacy in general in the problem-solving process without highlighting the aspect of mathematical creativity.

In addition to supporting problem-solving, Self-Efficacy also has a positive relationship with mathematical creativity (Herianto et al., 2024; Ovat et al., 2024) and creativity in general (Wang et al., 2024). Self-confidence as part of Self-Efficacy is also related to creative thinking skills in mathematics (Gunawan et al., 2022). In addition, Self-Efficacy contributes significantly to students' academic achievement and creative thinking skills (Shone et al., 2023). Creative Self-Efficacy positively correlates with mental motivation among high-achieving students (Alzahrani & Alqudah, 2022). However, these studies have not explored the role of specific dimensions such as Creative Performance Self-Efficacy (CPSE). This fact indicates a research gap that needs to be bridged further to understand the relationship between CPSE and mathematics learning.

Although the dimensions of Creative Self-Efficacy (CSE), including Creative Performance Self-Efficacy (CPSE), have been introduced by Hung (2018) and Abbott (2010), their studies focused more on the world of work and professionalism rather than on formal education, especially in mathematics. Research linking CPSE with mathematical problem-solving abilities remains very limited in mathematics learning. Several studies, such as those conducted by Ye et al. (2024) and Jaenudin (2023), highlight the importance of creativity in problem-solving because creativity allows students to think flexibly, explore various ideas, and generate new solutions beyond standard approaches. Creativity also encourages innovative thinking and various approaches to solving mathematical problems, improving students' problem-solving skills (Subanji & Nusantara, 2022). However, previous studies have not analyzed how CPSE affects students' creative performance during the stages of mathematical problem-solving.

Therefore, this study will examine the role of CPSE at each stage of problem-solving, according to Polya. At the Understanding the Problem stage, CPSE supports students' confidence in grasping new concepts despite facing obstacles. During the Devising a Plan stage, CPSE contributes to students' confidence in strategizing and proposing innovative solutions. Furthermore, at the Carrying out Plan stage, CPSE plays a role in fostering students' persistence in trying solutions, adapting, and accepting criticism. Finally, Looking Backstage, CPSE encourages reflection, evaluation of solutions, and curiosity about mathematical concepts. Thus, CPSE emerges as a key factor in building students' confidence, persistence, and creativity in solving mathematical problems.

This study offers novelty by analyzing the influence of Creative Performance Self-Efficacy (CPSE) on students' ability to solve mathematical problems on number pattern material. This material was chosen because it requires logical and creative thinking and encourages students to recognize patterns, make predictions, and explore various solutions (Nurhidayati & Abadi, 2024; Purwasih & Dahlan, 2024). In addition to being a basis for more complex mathematical concepts, number patterns provide space for students to develop innovative solution strategies, which are one of the performances of CPSE, namely creativity. In solving number pattern problems, students need self-confidence and perseverance, which are also two main aspects of CPSE to understand concepts, propose solutions, and evaluate the results. Therefore, number patterns are the proper context to examine the relationship between CPSE in solving mathematical problems.

The challenge in learning number patterns often lies in students' low confidence in their abilities, which is one of the factors inhibiting creativity. Based on initial observations in class VIII of SMP Negeri 1 Kota Jambi, many students doubted the number of patterns they created. This doubt reflects the existence of internal obstacles in the form of low Creative Performance Self-Efficacy (CPSE), which hurts students' problem-solving abilities and creativity. This situation shows the importance of in-depth research to explore students' CPSE, especially in mathematics learning, which requires high creativity.

This study aims to analyze students' CPSE in solving mathematical problems on the material of number patterns. So that it can see how the relationship between students' CPSE in solving number pattern problems. By exploring the factors that influence CPSE, such as emotionality and accuracy, it is hoped that this study can provide new, more profound insights into the contribution of CPSE to the success of mathematics learning. In addition, the results of this study are expected to be an essential reference in designing effective learning strategies to improve students' creative problem-solving abilities. Thus, this study not only fills the gap in the literature but also provides practical implications for the development of more innovative and creativity-oriented mathematics learning.

▪ METHOD

Participants

The participants of this study were students of class VIII of SMP Negeri 1 Kota Jambi. The selection of participants was carried out using a purposive sampling technique. All research participants were first given a Creative Performance Self-Efficacy (CPSE) questionnaire. Based on the questionnaire results, four students were selected as research subjects, with the criteria being that two had high CPSE and two had low CPSE. The selection of this criterion aims to identify students' CPSE in solving mathematical problems at various levels of ability, both high and low. The number of four subjects was chosen to consider time efficiency because too many subjects will take longer, especially in the interview process conducted on each research subject.

The results of the Creative Performance Self-Efficacy (CPSE) questionnaire scores from all grade VIII students of SMP Negeri 1 Kota Jambi were categorized into three categories, namely high, medium, and low (Azwar, 2015). These categories are arranged based on the predetermined questionnaire score classification guidelines. The data from the CPSE score grouping results are presented in detail in Table 1.

Table 1. Student CPSE categories

Intervals	Category
$X < \mu - 1.0\sigma$	Low
$\mu - 1.0\sigma \leq X < \mu + 1.0\sigma$	Currently
$X \geq \mu + 1.0\sigma$	High

Research Design and Procedures

This study used a qualitative descriptive design to describe the phenomenon in detail (Moser & Korstjens, 2017) and explore the research participants' experiences (Bradshaw et al., 2017). The researcher conducted direct observations of the research subjects and analyzed data from the results of tests completed by the subjects and in-depth interviews. The results of the data analysis were then described to describe students' Creative Performance Self-Efficacy (CPSE) in solving problems on the number pattern material.

The research procedure consists of three main steps: preparation, data collection, and resolution. In the preparation stage, the researcher designed a Creative Performance Self-Efficacy (CPSE) questionnaire, a problem-solving test on number pattern material, and interview guidelines. Next, at the data collection stage, participants were given a CPSE questionnaire to determine the research subjects. The selected subjects were then given a problem-solving test on the number pattern material. After completing the test, the researcher interviewed the subjects to investigate their problem-solving process. This interview also explores how the subjects found solutions to the problems. During the interview process, subjects were allowed to reflect on their work by reviewing and rethinking the solutions they had created. Researchers collected data from the CPSE questionnaire, problem-solving tests, and interviews in the resolution stage. The collected data were then analyzed to understand better problem-solving ability and its relationship to creative performance self-efficacy.

Instruments

The data collection instruments in this study were adjusted to the data collection techniques used. The instruments consisted of the Creative Performance Self-Efficacy (CPSE) questionnaire, problem-solving test instruments, and interview guidelines. The CPSE questionnaire used the Revised Model CPSE II Inventories, which was adopted from a research instrument developed by Abbott (2010). The CPSE questionnaire consisted of 15 statements, including 8 positive statements and 7 negative statements. This instrument used a Likert scale with 5 assessment points. For positive statements, scores were given with a range of values: strongly agree (5), agree (4), less agree (3), disagree (2), and strongly disagree (1). Conversely, for negative statements, scores were given in reverse: strongly agree (1), agree (2), less agree (3), disagree (4), and strongly disagree (5). The CPSE questionnaire matrix used in this study is presented in Table 2

Table 2. CPSE questionnaire matrix

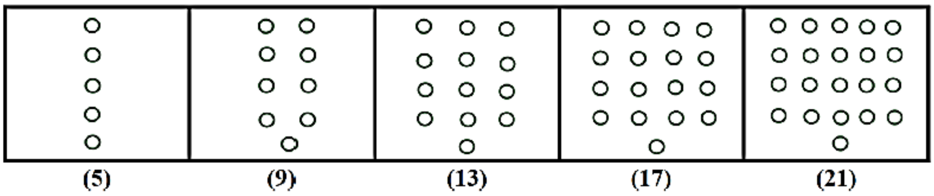
Indicator	Description	Item Number		Number of Items
		Positive	Negative	
Domain	Belief in understanding something you want to learn.	1. 3. 14	7. 11	5
	Start learning something despite obstacles.			
	Teach yourself how to do something new.			
Field	Confidence to create novelties that others will choose.	5. 8	2. 12. 15	5
	Convince others that what you are doing is the best			
Personality	Confidence to come up with new ideas.	4. 10. 13	6. 9	5
	Have fun with new ideas after learning from others			
	Maintaining curiosity about something			

The problem-solving test instrument in this study was in the form of questions about number patterns formed from marble arrangements. The marble arrangements were put into a box divided into five spaces. Based on the patterns formed, students were asked to answer the following questions:

1. The formula for the nth term of the arrangement of marbles formed!
2. Based on the pattern that has been formed, make several other marble arrangements based on the patterns that you know!
3. Based on the question in point (b), how many marbles are in the 7th box according to the pattern you made?

The problem-solving test instrument used in this study is shown in Figure 1.

Baskara has some marbles and wants to arrange them into a box divided into five spaces. Next, Baskara arranges the marbles he has into the spaces of the box with a pattern like the picture below:



Based on the picture above, determine:

a. The formula for the nth term of the arrangement of marbles formed by Baskara!
b. Based on the pattern Baskara has formed, make several other marble arrangements based on your known patterns!
c. Based on the question in point (b), suppose Baskara has one more box with the same number of spaces, namely five spaces; then how many marbles are in the 7th box according to the pattern you made?

Figure 1. Number pattern problem-solving test instrument

The researcher used the Creative Performance Self-Efficacy (CPSE) questionnaire instrument adapted from Abbott (2010) and the number pattern problem-solving test. To ensure its content and construct validity, this instrument was validated by two mathematics education lecturers through several stages. First, content validity was tested by asking experts to assess the suitability of the questionnaire items with the CPSE concept and number pattern problem-solving. Second, construct validity was analyzed through expert judgment to ensure that each indicator reflects the CPSE aspect being studied. Based on the validation results, the researcher will revise the instrument according to the input of experts so that it is in accordance with the research objectives and can measure the desired aspects accurately.

The semi-structured interview aims to explore the students' mathematical problem-solving process in depth. This interview focuses on three main indicators. The first indicator is understanding the problem, which includes the student's ability to identify the information known and asked from the problem. The second indicator is the students' strategy to simplify and model the situation in a more structured form. The third indicator is the student's reflection on the problem-solving process that has been carried out, including evaluating the solutions obtained. Focusing on these three indicators is expected to provide comprehensive insight into students' abilities in solving mathematical problems.

Data Analysis

The data analysis technique in this study was carried out through three main steps: data reduction, data presentation, and conclusion. Data reduction focused on students with high and low Creative Performance Self-Efficacy (CPSE) levels in solving number pattern problems. Data from the CPSE questionnaire, test results, and interviews were summarized and arranged systematically to support further analysis. Data presentation is done by systematically compiling information to facilitate concluding research findings. The information is classified and identified based on student answers that match the CPSE indicators. This data is then presented according to the stages of problem-solving in each research subject's answer, each indicator, and each stage of problem-solving. The conclusion is done by identifying the achievement of aspects or components of CPSE in solving number pattern problems. This conclusion is verified through a re-examination of the results of the CPSE questionnaire, tests, and interviews to ensure the accuracy and validity of the research findings. To ensure the validity of the findings, this study applies data triangulation by comparing the results of the CPSE questionnaire, number pattern tests, and interviews. The questionnaire measures students' beliefs about their creativity, the test evaluates problem-solving abilities, and the interviews delve deeper into the strategies and challenges faced. By connecting these three data sources, triangulation ensures that the findings are more valid and consistent. If there are differences in results, further analysis is carried out to understand the causes so that the conclusions obtained are more accurate and comprehensive.

▪ RESULT AND DISSCUSSION

Based on the results of the Creative Performance Self-Efficacy (CPSE) questionnaire that has been distributed to students, categorization was carried out according to Table 1. The average CPSE score obtained was 47.96, with a standard deviation of 6.46. Based on these values, students were grouped into three categories: high, medium, and low CPSE, as shown in Table 3.

Table 3. Results of categorization of prospective cpse questionnaire subjects

CPSE Student Group	Range	Frequency	Percentage
Low	$x \leq 41.50$	3	10.34
Currently	$41.50 \leq x < 54.42$	20	68.97
High	$x \geq 54.42$	6	20.69

From the results of this categorization, two subjects from the high CPSE category and two subjects from the low CPSE category were selected for further analysis. The selection of these subjects is shown in Table 4.

Table 4. List of selected subjects

No.	Student Code	Category
1.	S1	High
2.	S2	High
3.	S3	Low
4.	S4	Low

The selection of this subject aims to analyze more deeply the differences in problem-solving strategies between students with high and low CPSE levels. Furthermore, the results of the CPSE questionnaire for the research subjects can be seen in Table 5.

Table 5. Results of the CPSE questionnaire by research subjects

No	Statement	Research Subject Answers			
		S1	S2	S3	S4
Understanding the problem					
1.	I am confident that I can learn and understand the new mathematical concepts taught by the teacher.	4	4	4	4
2.	I am not confident in learning new math concepts when I don't know the math formulas by heart.	3	5	2	1
3.	I became less confident in learning new concepts when my math test scores were bad.	4	2	1	1
Devising a plan					
4.	I became insecure when my friends criticized my self-discovered problem-solving strategies.	4	1	2	2
5.	I dare to suggest a different way to solve math problems, even if it takes a long time.	4	5	3	4
6.	I am confident when explaining the new strategy I found to solve a math problem to my friends.	4	4	3	2
7.	I am confident that I can find new things in the real world that are related to the mathematical concepts I am studying.	4	5	5	2

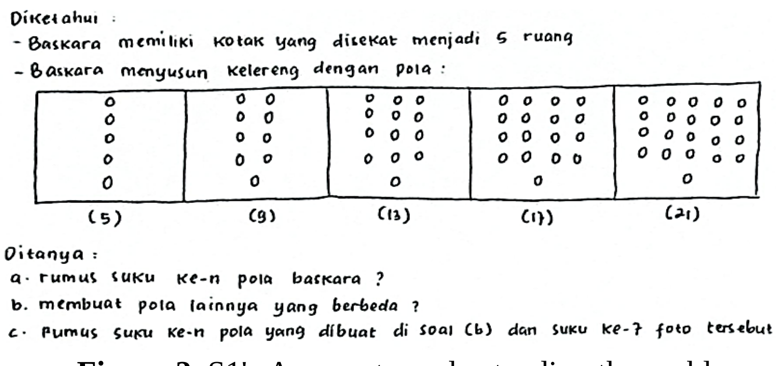
No	Statement	Research Subject Answers			
		S1	**S2**	**S3**	**S4**
8.	I have the potential to be a creative individual in mathematics learning.	4	5	3	3
9.	I don't dare to convey new ideas that I found in solving math problems when asked by the teacher.	4	5	1	1
Carrying out plan					
10.	I will not give up studying the newly taught math material, even if it feels difficult.	5	5	2	4
11.	I will surely get new ideas for solving math problems after learning through group discussions.	3	4	3	4
12.	I became unsure when the math problem-solving strategies I found differed from those of my friends.	3	2	1	1
Looking back					
13.	After the lesson, I was embarrassed to ask the teacher about the math concepts I wanted to know.	5	5	3	1
14.	I cannot provide a logical argument supporting the new solution to my proposed mathematical problem.	3	5	2	1
15.	I was curious about an unsolved math problem at school and continued it immediately when I got home.	4	5	2	5
Total		58	62	37	36
Research Subject Categories		High	High	Low	Low

Based on the CPSE questionnaire by the research subjects presented in Table 5, each research subject was analyzed using CPSE indicators in solving number pattern problems. This analysis includes indicators of personality, domains, and fields that are relevant to the problem-solving process. The explanation of the research results is compiled based on the answers to the CPSE questionnaire, which includes problem-solving indicators and CPSE indicators. In addition, interviews with each subject were also used to enrich the data. Further descriptions of the research results are presented for each subject based on these findings.

S1 (Subject with High CPSE)

Understanding the problem

The test results show subject S1 understands the problem well, a seen in Figure 2.


Diketahui :
- Baskara memiliki kotak yang disekat menjadi 5 ruang
- Baskara menyusun kelereng dengan pola :

(5) (9) (13) (17) (21)

Ditanya :
a. rumus suku ke-n pola baskara ?
b. membuat pola lainnya yang berbeda ?
c. rumus suku ke-n pola yang dibuat di soal (b) dan suku ke-7 foto tersebut

Figure 2. S1's Answer to understanding the problem

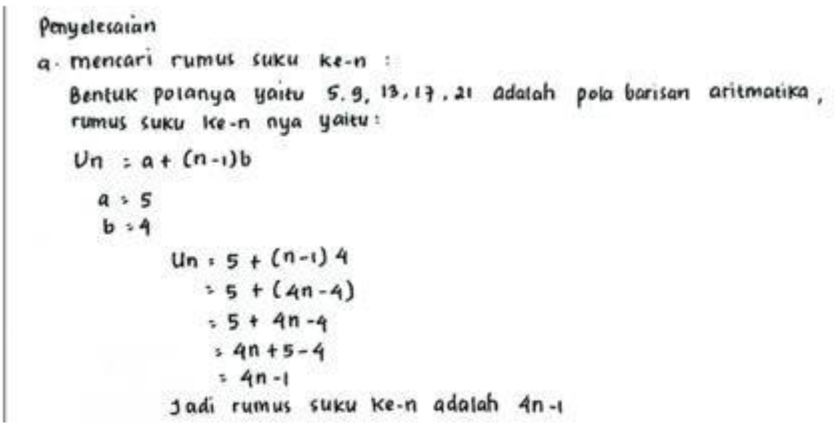
Based on S1's answer in Figure 2, the researcher interviewed to dig deeper into the Understanding the Problem process. The following is a transcript of S1's interview on the Understanding the Problem section:

P	:	*Have you ever solved a problem with a format like this before?*
S1	:	*Ever Miss*
P	:	*In your opinion, what information is given in the question?*
S1	:	*After I read the question, the information I obtained was like the number of boxes owned by Baskara, which were divided into 5 spaces after Baskara arranged the marbles in a pattern like the one in the picture, namely the pattern 5, 9, 13, 17, 21. That's all, Miss.*
P	:	*Okay, next, what problem do you have to solve from this question?*
S1	:	*From this question, we are asked to find the formula for the nth term of the Baskara pattern, create another different pattern, then find the formula for the nth term of the pattern created in question (b) and find the 7th term of the pattern.*

The results of this study indicate that S1's self-confidence in understanding new mathematical concepts is an important factor that influences his ability to solve problems. Based on the results of the CPSE questionnaire in Table 5, S1 was able to connect previous knowledge with new concepts without being affected by unsatisfactory test scores or limited memorization of formulas. This ability is reflected in the test results in Figure 2; S1 can write down the information in the problem, including the number of boxes owned by Baskara, the arrangement of marbles formed by Baskara, and redraw the arrangement of marbles. In addition, S1 can also identify problems that need to be solved, such as finding the U_n formula, making patterns, and determining the U_7 of the arrangement of marbles made by Baskara. Further interviews strengthened this finding; S1 revealed that previous experience in solving similar problems made it easier to understand the problem. This finding confirms that self-confidence and previous learning experiences play an essential role in the problem-understanding stage.

Devising a plan

The test results show that subject S1 is good at Devising a plan, as seen in Figure 3.


Penyelesaian
a. mencari rumus suku ke-n :
Bentuk polanya yaitu 5, 9, 13, 17, 21 adalah pola barisan aritmatika, rumus suku ke-n nya yaitu :
$Un = a + (n-1)b$
$a = 5$
$b = 4$
$Un = 5 + (n-1)4$
$= 5 + (4n-4)$
$= 5 + 4n - 4$
$= 4n + 5 - 4$
$= 4n - 1$
Jadi rumus suku ke-n adalah 4n-1

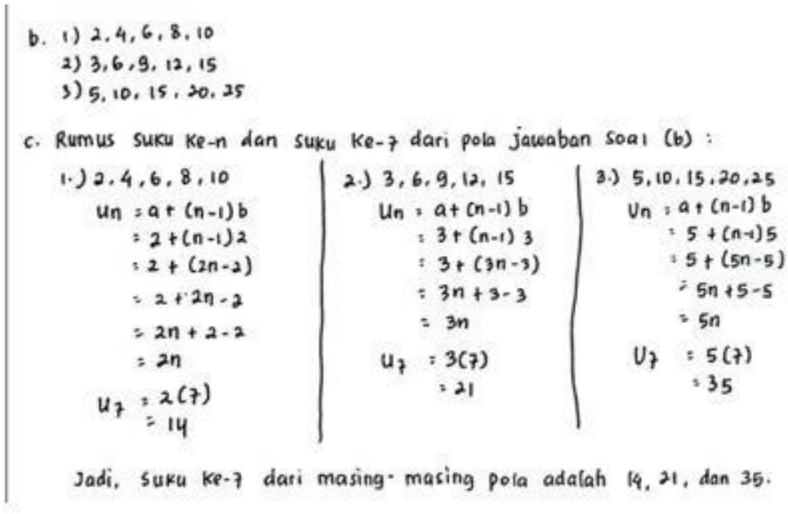


Figure 3. S1's answer in devising a plan

Based on S1's answer in Figure 3, the researcher interviewed to dig deeper into the devising a planning process. The following is a transcript of S1's interview on the devising a plan section:

P : *Well, from what you mentioned above, you are asked to look for different patterns. So, how do you find a pattern that fits the problem?*
S1 : *We made the pattern based on our creativity Miss, like remembering patterns that we have learned and then modifying them according to our creativity.*
P : *From the results you remember, how many patterns can you form?*
S1 : *We made 3 patterns.*
P : *In your opinion, is there any other way or pattern other than the one you chose to solve the problem?*
S1 : *There is Miss, another way that fits. But, here, I adjust to the question, namely according to the pattern that Baskara made.*
P : *While you were coming up with the idea, did you look at your friends?*
S1 : *No, Miss, it's all my idea; no one sees my friends'.*

The results of the CPSE questionnaire in Table 5 show that S1 has high self-confidence in designing problem-solving strategies and does not hesitate to propose solutions even though they are different from his friends. The test results in Figure 3 show that S1 has succeeded in systematically compiling the solution steps, such as determining the Un formula for the marble arrangement pattern before calculating the number of marbles in the U7. The interview also revealed that S1 was able to modify patterns that had been learned and develop new strategies based on his creativity. The integration of self-confidence and creativity has been shown to support S1's ability to design mathematical solutions significantly.

Carrying out plan

Based on the test results in Figure 3, S1 is carrying out the plan well. After that, the researcher interviewed to dig deeper into the problem-solving process carried out by S1. The following is a transcript of the S1 interview on the part of the carrying out plan:

P : According to what you wrote, can you explain how you determined the formula for the nth term of the patterns you created?

S1 : So, according to what we made, for the first pattern we made, it was 2, 4, 6, 8, and 10, Miss. So the formula or $U_n = a + (n+1)b$, now a the first term, and b is the difference between terms; from the pattern that has been made, the first term is 2, and the difference is 2. Next, we just enter it into the formula, then 2+(n-1)2. After that, we multiply 2 by the one in the brackets so that it becomes 2+2n-2, and the result is 2n.

P : Okay, so that is it for the first pattern you've made. Is the method the same as the other patterns you've made?

S1 : Yes, it's the same as the other patterns. So, just like before, we use the formula a+(n+1)b, then we substitute the first term and the difference, then we get the formula for the nth term of the second pattern, which is 3n, and for the third pattern, the result is 5n

P : Well, if we look again at the question in part (c), we are not only asked to find the formula for the nth term but also the number of marbles in the 7th box.

S1 : Oh yeah, so we already got the formula for the U_n. So, if we want to find the U_7, we enter n as 7. For the first pattern, the formula is 2n, so 2 times 7 means 14; for the second one, 3n means 3 times 7, the result is 21; for the third one, the formula is 5n, so 5 times 7, the result is 35. That is roughly it, Miss.

The results of the CPSE questionnaire in Table 5 show that S1 is determined to solve problems independently even though he is less confident in the effectiveness of group discussions. Based on the test results in Figure 3, S1 could carry out the plan well by using the Un formula; S1 substituted the first term and the difference into the formula. Furthermore, S1 succeeded in creating three different new patterns. In the next stage, S1 found the number of marbles in the U7 of each pattern. He first determined the Un formula for each pattern, then substituted the number 7 into the formula to obtain the number of marbles in the U7. The interview also revealed that S1 consistently followed the planned steps and succeeded in solving the problem correctly. S1's independence and self-confidence supported his success in implementing the problem-solving plan.

Looking back

Based on the test results in Figure 3, S1 wrote down the conclusions of his calculations in detail. Furthermore, the interview transcript shows S1's habit of rechecking his answers:

P : Okay, yesterday, when you were working on this question, did you double-check it after you finished before handing it in?

S1 : Yes Miss, we will double check, so we can rest assured that we won't be thorough.

The results of the CPSE questionnaire in Table 5 show that S1 has a high curiosity and often rechecks his answers to ensure accuracy. In the test, S1 rechecks his calculation results by writing down detailed conclusions, including formulas and the final results. The interview also confirmed this habit, emphasizing that S1 always ensures the accuracy of his answers before submitting them. This critical and meticulous attitude consistently supports S1's ability to produce accurate and logical solutions.

The results of this study indicate that undergraduate students with high CPSE are characterized by an intense curiosity and a habit of rechecking answers. This finding aligns with the study of Kusuma et al. (2024), which found a positive relationship between self-efficacy and problem-solving success. However, CPSE does not solely influence undergraduate success; it is more influenced by deep conceptual understanding and effective logical thinking strategies. Hung (2018) and Abbott (2010) emphasize the importance of CPSE in encouraging creativity, but this study shows that creativity alone is not enough without adequate conceptual understanding and learning experiences. This finding is also supported by Aulia et al. (2019), Hidayat et al, (2022), and Irhamna et al. (2020), who emphasized that good conceptual understanding and learning experiences are essential to successful problem-solving.

These results align with Polya (1973) model, which emphasizes four stages of problem-solving: understanding the problem, devising a plan, carrying out the plan, and looking back. S1 showed strength in the evaluation stage by looking back at his calculations, but success in devising and carrying out a plan depended on conceptual understanding. In addition, S1 also used metacognitive strategies such as self-evaluation and planning, but optimal results were only achieved if supported by strong conceptual abilities. This shows that high CPSE must be balanced with correctly understanding concepts and strategies to solve mathematical problems effectively.

Other findings suggest that S1s were less confident in the effectiveness of group discussions, in contrast to previous studies that emphasize the benefits of group discussions in improving understanding and critical thinking skills (Fung et al., 2016; Johnson & Galluzzo, 2014; H. Silva et al., 2018). S1s' preference for independent work reflects the importance of learning independence in developing self-efficacy (Navyola, 2022; Octariani, 2017). However, this independence may also limit opportunities for new perspectives, often gained through group interactions. These findings suggest the need for flexible learning approaches to meet students' diverse learning needs.

S2 (Subjects with High CPSE)

Understanding the problem

The test done by S2 shows that he does not understand the problem well. This can be seen in Figure 4, which contains the results of working on the issue. Furthermore, based on the interview transcript with S2 in the section on understanding the problem:

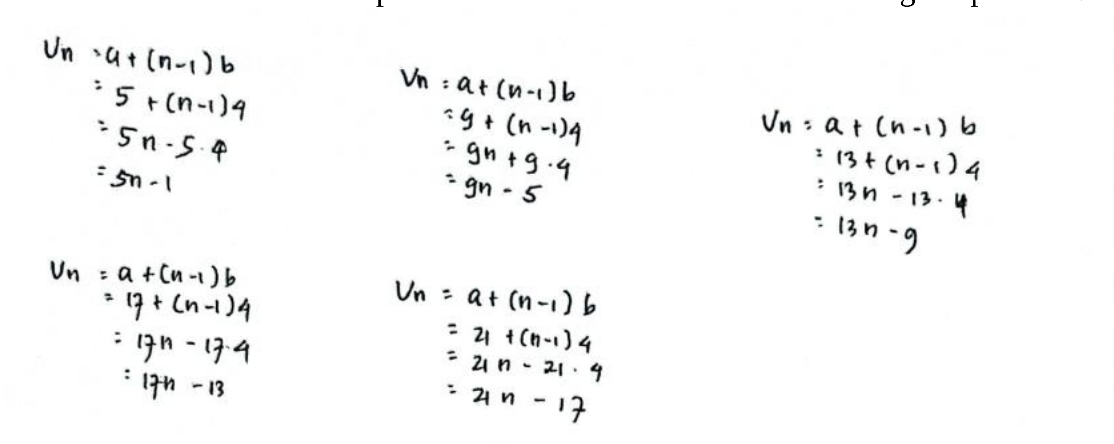


Figure 4. S2's answer to understanding the problem

P : *In your opinion, what information is given in the question?*
S2 : *Is this related to the problem or what, Miss?*
P : *Yes, it is related to the question given.*
S2 : *Here, I already know the formula formed by Baskara; some are asked to make the pattern. But I don't know the pattern, so that's how it is, Miss*
P : *Okay, so that's what you understand from the question.*
S2 : *Yes, Miss, that's what we got.*
P : *What problem do you think needs to be solved from this problem?*
S2 : *Determine the formula and look for known patterns; that's all, Miss.*

Based on the results of the CPSE questionnaire in Table 5, S2 can learn and understand the mathematical concepts taught by the teacher. However, S2 sometimes feels less confident when getting lousy test scores. The test results in Figure 4 show that S2 understands the basic concept using the Un formula but does not write down the known and asked information or describe the marble arrangement pattern. The interview revealed that S2 had difficulty understanding the number pattern in the problem and could not clearly state the information that was known and asked. This finding shows that although S2 understands the general mathematical concept, he has not been able to connect the information in the problem with the number pattern requested.

Devising a plan

Based on Figure 4, S2 has not been able to formulate a good devising a plan. The interview results reinforce this finding. The following is a transcript of the interview with S2 regarding the stages of Devising a plan:

P : *Okay, how did you get the pattern yesterday, and where did you get the idea to write that answer?*
S2 : *This is from the formula Un, where Un=a+(n-1)b, and then we enter the number with the n unknown, so the result is like that?*

At the stage of devising a plan, the results of the CPSE questionnaire in Table 5 show that S2 felt confident in proposing a new strategy. However, S2 became hesitant when his strategy was criticized. In the test in Figure 4, S2 used the Un formula based on the terms available in the question, resulting in five different Un formulas. In addition, S2 was not yet able to compile an alternative pattern for the given problem. In part b of the question, S2 also failed to determine the nth-term formula according to the requested pattern because the approach was still not quite right. This finding was further clarified through interviews, which revealed that S2 only focused on substituting the available terms without being able to create a new pattern or determine a general formula. This shows that even though S2 has confidence, he has difficulty appropriately planning the steps to solve the problem.

Carrying out plan

Based on the test results presented in Figure 4, S2 has not carrying out plan properly. The interview results reinforce this finding. The following is a transcript of the interview with S2 regarding the Carrying out plan:

P : Can you explain other marble arrangements you know, then determine the formula for the nth term of the patterns you made?
SRT : No way, Miss, I can't imagine it.
P : Does that mean we can't determine the 7th term yet?
SRT : Yes, the same thing Miss can't.

At the carrying out plan stage, the results of the CPSE questionnaire in Table 5 show that S2 feels confident and will not give up even though his strategy is different from his friends. S2 also believes that group discussions can help him get new ideas for solving math problems. However, the test results in Figure 4 show that S2 immediately substituted the first term and the difference into the formula without following the correct solution steps. As a result, S2 made a mistake in determining the results for points a, b, and c. This error indicates that S2 has not been able to implement the problem-solving plan properly. The interview results also revealed that S2 had difficulty imagining patterns besides those in the problem, so he made mistakes in determining the formula and calculations in questions b and c. These findings indicate that although S2 has good motivation, he has not been able to implement the solution plan effectively.

Looking back

Looking backstage, the results of the CPSE questionnaire in Table 5 show that S2 has a positive attitude in learning mathematics, such as not being embarrassed to ask questions, being confident in giving arguments, and having a high curiosity. However, the test results in Figure 4 show that S2 did not write a conclusion from his work. The interview revealed that S2 did not have time to check his answers because time ran out, caused by his excessive focus on specific parts without reviewing his entire work. This finding suggests that S2 needs to improve his time management and re-checking skills for the solutions he has created.

The results of this study indicate that, although S2 has high self-confidence and motivation, he has difficulty connecting information in the problem with relevant concepts, planning solutions, and checking his answers. This finding differs from the study of Kusuma et al. (2024), which showed a positive relationship between self-efficacy and problem-solving success because S2 lacks understanding of the problems. In addition, Hung (2018) and Abbott (2010) emphasize the importance of CPSE in encouraging creativity. Still, this study shows that creativity alone is insufficient without a strong conceptual understanding and appropriate problem-solving strategies. This finding supports the results of the studies of Ariza & Sánchez (2015) Samosir et al. (2024), which state that a lack of in-depth understanding hinders applying effective problem-solving strategies.

In the context of problem-solving theory, these results align with Polya (1973) model, which emphasizes four stages: understanding the problem, devising a plan, carrying out plan and looking back. S2 showed high motivation but had difficulty in the early stages, namely in understanding the problem and devising a plan. Although S2 was confident in proposing a new strategy, he had difficulty in developing a relevant pattern, indicating that conceptual understanding was more dominant in the success of problem-solving. In addition, although S2 tried to re-check his answers, applying metacognitive strategies was not optimal. This difficulty indicates the need for scaffolding to improve planning and problem-solving skills (Raslan, 2024; Saputro, 2023; Toh, 2023). Tan et al.

(2014) also showed that creativity, such as arranging number patterns, is closely related to strong conceptual understanding, which is still challenging for S2.

S3 (Subjects with Low CPSE)

Understanding the problem

Based on the test results done by S3, it can be seen that the subject has understood the problem well. This understanding can be seen in Figure 5, which shows S3's answer to understanding the problem. Furthermore, the results of the interview transcript with S3 strengthen these findings.

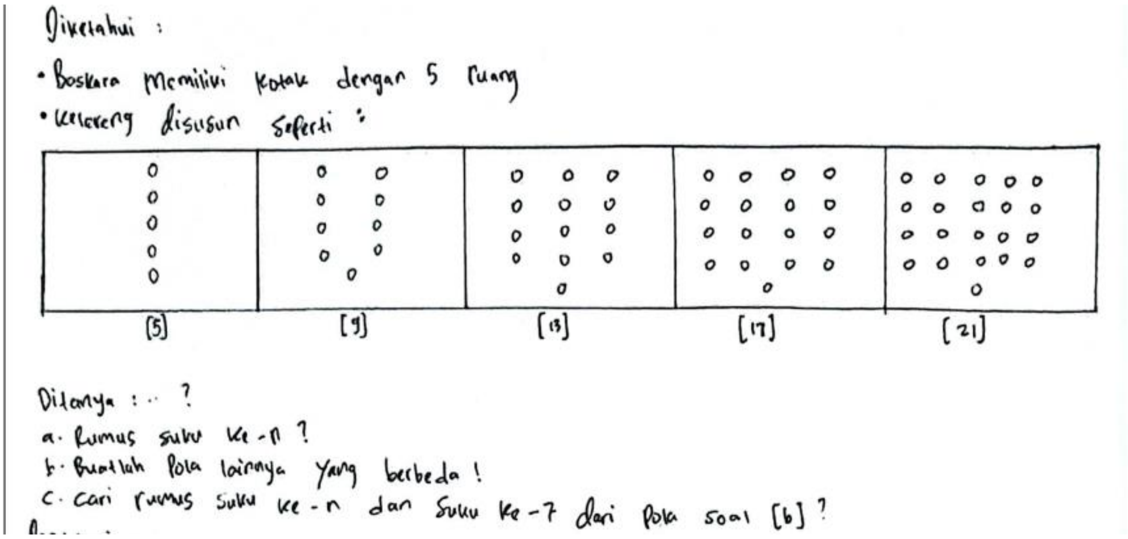


Figure 5. S3's answer to understanding the problem

P	:	*In your opinion, what information is given in the question?*
S3	:	*After I read the question, the information I got was that Baskara has a box with 5 spaces; the arrangement of marbles is 5, 9, 13, 17, 21, meaning the difference is 4, and the first term is 5.*
P	:	*Okay, next, what problem do you have to solve from this question?*
S3	:	*From this question, ma'am, we are asked to find the formula for the nth term of the Baskara pattern, create another pattern that is different from the question, and after that, find the formula for the nth term and find the 7th term of the pattern created in question (b).*

Based on the results of the CPSE questionnaire in Table 5, S3 was able to understand new mathematical concepts well. However, S3 lacked confidence when he did not memorize the formula or got a low test score. The test results in Figure 5 show that S3 was able to write down the information that was known and asked and describe the arrangement of marbles according to the problem. In addition, S3 was able to mention the steps to solve it, such as finding the formula for the Un, creating a new pattern, and determining the U7. The interview results supported this finding because S3 was able to explain the information given in the problem clearly. However, doubt due to lack of confidence was still an obstacle in the process of solving the problem. Overall, S3 had a good ability to understand problems, especially if given enough time and guidance.

Devising a plan

Based on the test results of subject S3, it can be seen that the subject is able to formulate a good devising a plan. This ability is reflected in the systematic steps shown in Figure 6. Furthermore, based on the transcript of the interview with S3 regarding the devising a plan, the following information was obtained:

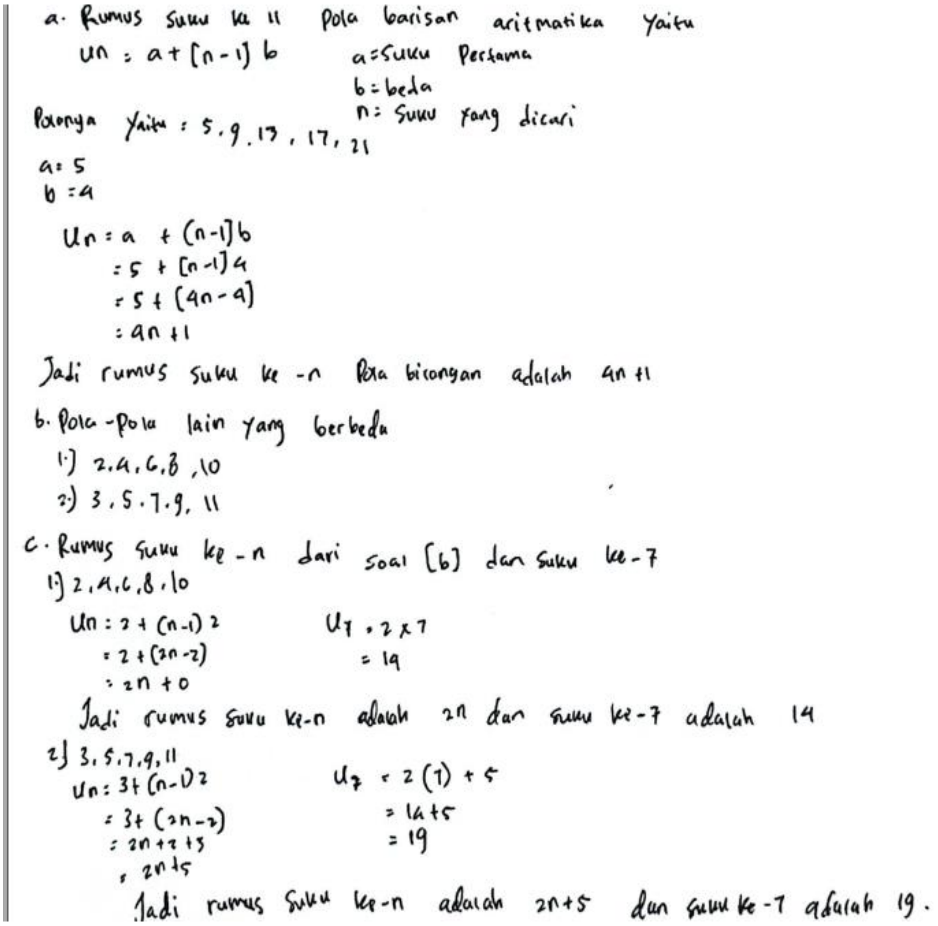


Figure 6. S3's answer in devising a plan

P	:	*From the problems that need to be solved, you said you were asked to find other different patterns; how many patterns can you form?*
S3	:	*We made 2 patterns, Miss.*
P	:	*Where did you get the idea to form the pattern?*
S3	:	*We remember learning about number patterns like that, Miss, so to make it easy to determine the formula for the nth term, we use the even number pattern and the odd number pattern but slightly modify it for the odd number pattern.*
P	:	*In your opinion, is there any other way or pattern other than the one you chose to solve the problem?*
S3	:	*There are other patterns that can be used, Miss.*

At the devising a plan stage, the results of the CPSE questionnaire in Table 5 show that S3 was able to understand new mathematical concepts well. However, S3 felt less confident when his strategy was criticized by his friends and considered himself less creative in learning mathematics. However, the test results in Figure 3 show that S3 succeeded in compiling a good solution plan. S3 was able to determine the Un formula for the given pattern and design a new pattern in question b. In addition, S3 also designed the steps to calculate the number of marbles in the U7 using the Un formula that had been obtained from question b. Based on the interview, S3 revealed that he used his knowledge of odd and even number patterns to find new patterns. Although S3 felt hesitant when conveying new ideas, he was able to use his conceptual understanding to compile a systematic solution plan. This finding shows that with the right support, S3 can compile a good problem-solving plan, although his level of confidence still needs to be improved.

Carrying out plan

Based on the test results, S3 appears to have carried out the plan well, even though there were some errors (see Figure 5). Furthermore, the interview transcript with S3 regarding the carrying out plan shows his thinking process:

P : According to what you wrote, can you explain how you determined the formula for the nth term of the patterns you created?

S3 : So, of course, the first thing we need to do is find the pattern first; after getting the pattern, we look for the formula for the nth term first. So, the formula for U_n = a+(n+1)b for the first pattern, right? 2, 4, 6, 8, and 10. So the first term is 2, and the difference is 2. Next, we just put it into the formula, then 2+(n-1)2. After that, we multiply 2 by the one in the brackets so that it becomes 2+2n-2, and the result is 2n. Because we were also asked to find the 7th term, we substituted n with 7, then 2 times 7, and the result was 14. So the formula for the nth term is 2n, and the 7th term is 14

P : Okay, so that's it for the first pattern you've made. Is the method the same as the other patterns you've made?

S3 : Yes, the same Miss for the second pattern, it's 3, 5, 7, 9, and 11, Miss. So the first term is 3, and the difference is 2. Next, we just enter it into the formula, then 3+(n-1)2. After that, we just calculate as before to get the result, which is 2n+5. Because we were also asked to find the U_7, we substituted n with 7, then 2 times 7 plus 5, and the result was 19. So, the formula for the U_n is 2n+5, and the U_7 = 19.

P : Are you aware or not that there was an error during the calculation process?

S3 : Please wait a minute, Miss, we'll try to look again.

P : Coba kamu lihat di bagian mana?

S3 : Oh yes, Miss, I wasn't careful in the last calculation; it should have been 2n-2+3, not 2n+2+3, so the correct result is 2n+1, and the 7th term becomes 15

P : Okay, so you know what the answer should be, right?

S3 : Yes, Miss, it seems I wasn't careful enough yesterday.

The results of the CPSE questionnaire in Table 5 show that S3 felt doubtful when his strategy was different from that of his friends and gave up easily when faced with difficult material. In addition, S3 felt unsure when he had to explain a new strategy to friends or teachers. He also admitted that he felt less creative in learning mathematics.

However, S3 still believed that he was able to find new things related to mathematics in the real world. However, the test results in Figure 6 show that S3 was able to carry out the solution plan well; S3 started his steps by determining the formula to find the Un of the Baskara marble arrangement. Furthermore, S3 planned the solution patterns for part b of the problem and designed the steps to calculate the number of marbles in the U7 using the Un formula that had been obtained. The interview revealed that S3 was aware of his mistake in the calculation, so he rechecked his answer and found an error. The formula that should be used is $2n - 2 + 3$, not $2n + 2 + 3$. After being corrected, the general formula of the second pattern becomes 2n + 1 so that the U7 = 15. This finding shows that although S3 faces challenges in implementing the solution plan, he has the potential to learn from his mistakes and improve his work results.

Looking back

Based on the test results shown in Figure 6, S3 has written down the conclusion of his calculations. However, when interviewed further, it was found that S3 was not completely thorough in checking his answers. This is revealed in the following interview transcript:

P : Didn't you double check your answers after working on the questions?
S3 : I checked, Miss, but it seems like I wasn't careful enough, so I didn't see the error.

The results of the CPSE questionnaire in Table 5, S3 did not hesitate to ask the teacher if there was a concept that was not yet understood. However, S3 felt hesitant to give arguments in front of the class and lacked the curiosity to continue studying at home when problems at school had not been resolved. The test results in Figure 6 show that S3 was able to find the formula for the Un for both the existing pattern and the new pattern that he found. In addition, S3 also succeeded in calculating the number of marbles in the U7, although there were errors in the answers to questions b and c for the second pattern due to lack of accuracy. In the interview, S3 stated that he had checked his answers again, but errors still occurred due to a lack of accuracy. Based on these findings, although S3 was able to solve problems, higher accuracy and curiosity still need to be developed.

The results of the study showed that S3 had good abilities in understanding problems, developing a solution plan, implementing the plan carefully, and rechecking the results. This happened even though the level of (CPSE) he had was relatively low. This finding contradicts the study of Kusuma et al. (2024), which showed a positive relationship between self-efficacy and problem-solving success. One reason for this difference is that factors such as strong conceptual understanding, effective logical thinking strategies, and relevant learning experiences are more dominant in determining student success than relying solely on CPSE. Hung (2018) and Abbott (2010)state that CPSE plays an important role in encouraging creativity. However, the results of this study show that creativity alone is not enough to achieve success in solving mathematical problems. Although S3 showed creativity in devising a plan, the lack of rigor in the carrying out plan and looking back indicated that conceptual understanding, logical thinking strategies, and learning experiences were more dominant in determining student success (Hendriana et al., 2018; Liljedahl et al., 2016).

In the context of Polya (1973) theory, S3 showed good abilities in all stages of problem-solving: understanding the problem, devising a plan, carrying out plan, and looking back. This suggests that despite S3's low CPSE, success in problem-solving can be achieved through deep conceptual understanding and the application of appropriate logical thinking strategies. The theory of metacognitive strategies is also relevant, as S3 was able to effectively monitor and evaluate his thinking processes, which contributed to his success in solving number pattern problems. This study highlights the importance of guidance and scaffolding to support students with low CPSE to remain confident in exploring problem-solving strategies, as found by Singh (2018) that group discussions can help build social knowledge, improve conceptual understanding, and develop self-confidence. Thus, although CPSE plays a role, success in solving mathematical problems is more determined by a combination of conceptual understanding, logical thinking strategies, and metacognitive skills.

S4 (Low CPSE Subject)

Understanding the problem

Based on the test results of S4, the subject did not understand the problem well. This lack of understanding can be seen from the results displayed in Figure 7. Next, the transcript of the interview with S4 in the section on understanding the problem shows the following:

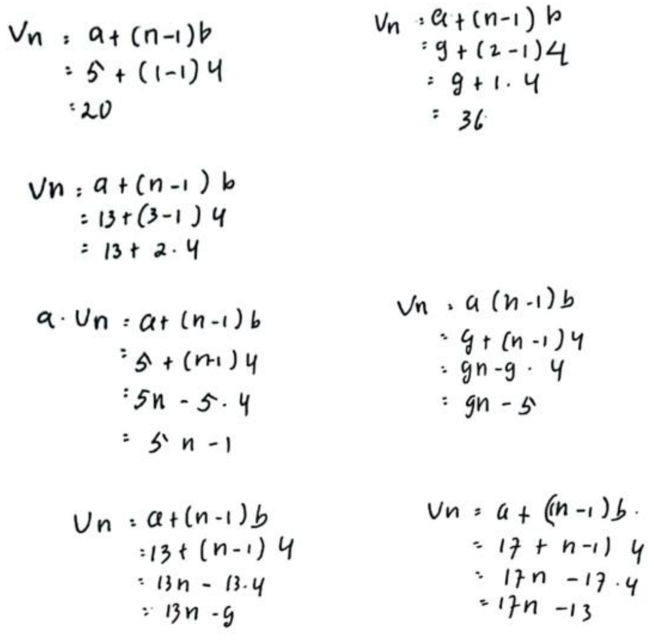


Figure 7. S3's answer to understanding the problem

P : In your opinion, what information is given in the question?
S4 : Remind me of the formulas I have learned, Miss.
P : Yes, what I mean is from the questions given, what do you know?
S4 : The formula for n terms, arrangement of marbles, Miss

P : *Okay, so that's what you understand from the question, right?*
S4 : *Yes, Miss, that's all.*
P : *Now, what problem do you think needs to be solved from this problem?*
S4 : *Looking for the arrangement of marbles, Miss.*

Based on the results of the CPSE questionnaire in Table 5, S4 felt able to understand mathematical concepts. Still, it lacked confidence if he did not memorize the formula or got a bad score, which affected his understanding of the problem. The test results in Figure 7 show that S4 did not understand the problem well, as seen from his inability to record the information known and asked in the problem. S4 also did not re-draw the arrangement of marbles made by Baskara. On the other hand, in the interview, S4 also misidentified the information in the problem by mentioning the nth-term formula as known information, even though the formula was the part that had to be found. These findings indicate that, although S4 felt able to understand mathematical concepts, lack of confidence and understanding of the problem were the main obstacles in solving mathematical problems.

Devising a plan

Based on the test results shown in Figure 7, S4 has not been able to formulate a good problem-solving plan. This is confirmed through the following interview transcript:

P : *Okay, how did you get the structure yesterday, and where did you get the idea to write that answer?*
S4 : *From the U_n formula, Miss.*

The results of the CPSE questionnaire in Table 5 show that S4 felt less confident when his friends criticized his strategy. He was also hesitant to propose new methods and was unsure when explaining the strategy to others. Although S4 was confident that he could find new things related to mathematics, he felt less creative in learning mathematics. The test results in Figure 7 show that S4 knew the formula for the Un. However, when asked to compile a general formula based on the problem pattern, S4 assumed that the first term was the term given in the problem. As a result, S4 produced four general formulas for the Un but did not find the general formula for the Un for U7 =11. S4 also did not find a different pattern in part b of the problem and failed to solve part c of the problem. In the interview, S4 stated that his understanding was in accordance with the answers he gave on the test. This shows that lack of confidence and difficulty in developing new solutions affect the solution of mathematical problems.

Carrying out plan

Based on Figure 7, S4 has not Carrying out plan properly. The following interview transcript reinforces this:

P : *While you were coming up with the idea, did you look at your friends?*
S4 : *I'll do it myself, Miss.*
P : *Can you explain other marble arrangements that you know, then determine the formula for the nth term of the patterns that you made?*
S4 : *Can't Miss, confused until the time is up.*
P : *Does that mean you can't determine the 7th term yet?*
S4 : *No, Miss*

Based on the results of the CPSE questionnaire in Table 5, S4 tends to give up when facing difficult material, especially if the strategy used is different from his friends. In addition, S4 feels less confident in finding new ideas after discussing them in groups. The test results in Figure 7 show that S4 assumes the first term is based on the terms given in the problem. As a result, S4 produces four general formulas for the Un but does not find the general formula for the Un for U3 =11. S4 also does not find a different pattern in part b and fails to solve part c. The interview results reveal that S4 is still confused and unable to find a new pattern to determine the 7th term. These findings indicate that S4 needs to improve his accuracy, self-confidence, and ability to find alternative solutions to solve mathematical problems.

Looking back

Based on the results of the CPSE questionnaire in Table 5, S4 is not ashamed to ask the teacher if there is a mathematical concept that is not yet understood. However, he hesitates to provide logical arguments in front of the class and is not curious enough to continue with unsolved math problems at home. The test results in Figure 6 show that S4 did not write a conclusion from the problems being worked on. In addition, in the interview, he admitted that he only worked on the questions as written on the answer sheet without completing them completely. He also did not have time to recheck his answers because of limited time. Overall, S4 needs to increase his curiosity, accuracy, and confidence in solving math problems. In addition, S4 needs to get used to solving questions more completely and rechecking his answers before the time runs out.

The results of this study indicate that S4 has adequate conceptual understanding based on the results of the CPSE questionnaire. Still, based on the test results, S4 has difficulty in solving mathematical problems at all stages of problem-solving, according to Polya (1973), starting from understanding the problem, devising a plan, carrying out plan, and looking back. This finding is in line with the study of Kusuma et al. (2024), which shows that self-efficacy is positively related to problem-solving success because low CPSE in S4 contributes to difficulties in exploring various solution strategies and facing challenges when solving complex problems. Hung (2018) and Abbott (2010) stated that CPSE is important in creativity. Still, the results of this study show that without adequate self-confidence and precision, creativity alone is not enough to succeed in solving mathematical problems. This finding is also consistent with the research of Szabo et al. (2020)) and Posamentier & Krulik (2015), which emphasize the importance of precision and systematic strategies in problem-solving.

Low CPSE negatively impacts S4's ability to apply logical thinking strategies and solve problems systematically. In addition, low metacognitive skills hinder S4 from monitoring and evaluating his thinking process. This condition is relevant to the theory of metacognitive strategies, which explains the difficulties individuals have in managing their thinking processes. A study by Mahayani et al. (2021) showed that self-confidence has a significant effect on students' ability to apply mathematical concepts. Low self-confidence in S4 is the main inhibiting factor in the problem-solving process faced. In addition, Catarino et al. (2019) revealed that group discussions and cooperative learning environments can significantly increase students' creativity and self-confidence. Based on these findings, guidance that focuses on developing creative strategies, increasing accuracy, and strengthening self-confidence through a collaborative approach has the potential to help S4 overcome obstacles in solving mathematical problems.

The results of this study indicate that Creative Performance Self-Efficacy (CPSE), such as self-confidence, creativity, critical thinking, and accuracy, have a close relationship with mathematical problem-solving. In addition, conceptual understanding has been shown to play an important role in helping students develop more systematic and innovative problem-solving strategies. A strong understanding of basic concepts allows students to connect various ideas and choose the right method to solve problems efficiently.

The findings of this study indicate that although S1 and S2 have high CPSE, their performance in problem-solving is still different. This difference supports previous findings presented by Kerzner (2023) and Luo & Yu (2020), which emphasize that understanding the problem is a crucial step in solving mathematical problems. Deep understanding not only helps students avoid a mechanical approach but also increases efficiency in solving problems (Samosir et al., 2024). Furthermore, McLure et al. (2020) emphasized that self-confidence alone is not enough to guarantee success in problem-solving. Such success requires the application of systematic strategies and strong conceptual understanding so that students can solve problems more effectively.

The results of this study also show that students with low CPSE do not always perform poorly. For example, S3 was able to understand the problem and develop a solution plan even though he was less thorough in implementing the strategy. This finding strengthens the research of Roger & Formella (2016), Silva et al. (2020), and (Liu et al., 2023), which emphasize that creativity in problem-solving can be improved with strong conceptual understanding. However, the case of S4, who had low CPSE and weak performance in all stages of problem-solving, shows that self-confidence and conceptual understanding must go hand in hand. Setiawan et al. (2022) emphasized that self-confidence without good understanding is not enough to guarantee success. Therefore, students with low CPSE need intensive guidance to improve their skills in solving problems effectively.

These findings suggest that students with different levels of CPSE have unique challenges in problem-solving, so learning strategies need to be tailored to their needs. Students with high CPSE often have strong self-confidence, but this can make them rush into solving problems without understanding the problem in depth. In contrast, students with low CPSE tend to be hesitant to try new strategies and lack confidence in solving problems. Therefore, learning approaches should be designed to accommodate these differences so that each student can optimize their potential in solving mathematical problems.

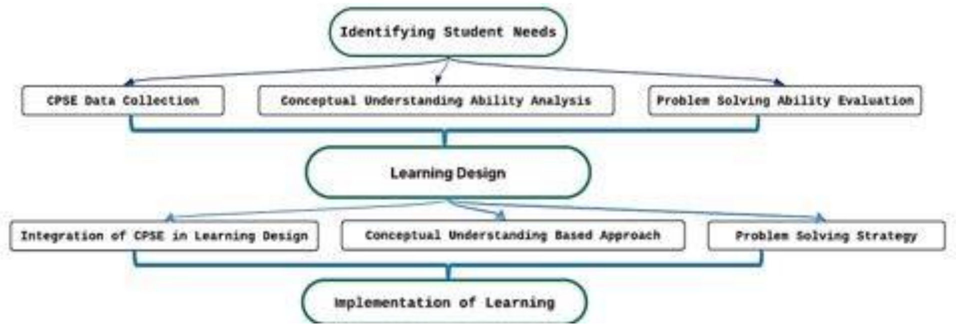
Students with high CPSE need teaching strategies that focus on improving accuracy and reflective thinking. Metacognitive strategies can be applied by asking students to write down the steps of solving problems before working on them to increase their awareness of the thinking process. Error-based learning also helps them identify and analyze common mistakes so that accuracy in problem-solving increases. Reflective discussions encourage students to evaluate solutions and consider various approaches before making a final decision. These strategies help students avoid mistakes due to overconfidence and deepen their conceptual understanding.

Students with low CPSE need an approach that can build their confidence in solving math problems. One approach that can be applied is scaffolding, which is by providing gradual guidance, such as clear initial instructions, concrete examples, and exercises arranged in stages from simple to complex problems. In addition, collaborative learning can also be an effective strategy. In this method, students are grouped into heterogeneous teams so they can work together and learn from more confident peers. With the right support, students with low CPSE will be able to develop a better understanding and show courage in proposing problem-solving strategies.

In order for the strategies implemented to be effective for students with both high and low CPSE, interventions in learning need to be designed with their needs in mind. One approach that can be used is scaffolding, which provides gradual support so that students can complete tasks more confidently and accurately. Teachers can use gradual instructions, visual models, and progressive exercises to build students' understanding systematically. In addition, the Problem-Based Learning (PBL) model can be applied to provide real challenges that encourage students to think creatively and develop more effective problem-solving strategies. Students with high CPSE can be given more complex problems that require in-depth analysis. Meanwhile, students with low CPSE can get initial guidance and additional support through group discussions before solving problems independently.

Considering the diverse needs of students, the application of flexible learning models is very important to support their optimal development. One effective approach is the scaffolding approach with the PBL model, which integrates gradual guidance with real problem-solving so that students are more confident and have a stronger understanding of concepts. In addition, differentiation-based learning allows teachers to adjust challenges and support according to students' CPSE levels; for example, teachers can provide variations of questions that are adjusted to the abilities of each student. A collaborative approach can also be applied by grouping students with high and low CPSE so that they can work together, share strategies, and strengthen their understanding of concepts and problem-solving skills. By implementing the right strategies, mathematics learning can be more effective in developing creative and analytical thinking skills so that all students can reach their best potential.

The design of the mathematics learning process that strengthens the relationship between CPSE, conceptual understanding, and problem-solving can be seen in Figure 8.



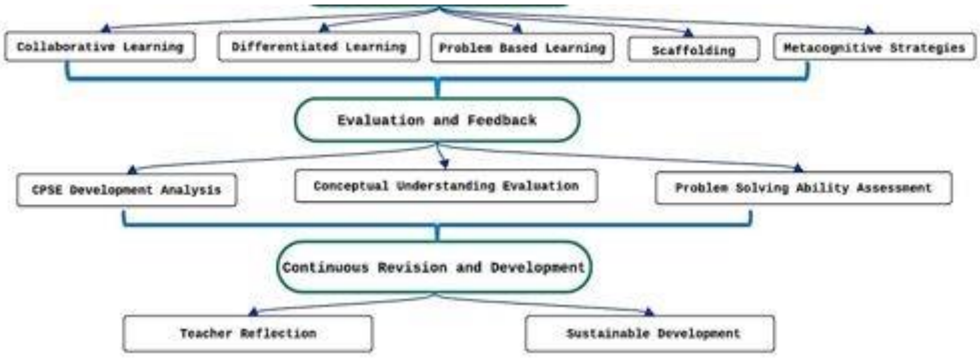


Figure 8. Relationship between CPSE, concept understanding and problem solving in the mathematics learning process

▪ CONCLUSION

This study shows that Creative Performance Self-Efficacy (CPSE) is not always directly proportional to students' mathematical problem-solving abilities. Students with high CPSE, such as S1, show good performance in solving problems, while S2 with high CPSE have difficulty in understanding problems and developing appropriate problem-solving strategies. On the contrary, S3, who have low CPSE, can show more systematic problem-solving despite having lower self-confidence. This finding confirms that in addition to CPSE, other factors such as conceptual understanding, accuracy, and learning experience also influence students' success in solving mathematical problems. Thus, a learning approach that only focuses on improving CPSE without paying attention to conceptual aspects and problem-solving strategies is not effective enough in improving students' mathematical thinking abilities.

This study has important implications for designing more adaptive learning strategies based on individual student needs. The application of scaffolding that is appropriate to student's level of understanding can help them connect mathematical concepts with effective problem-solving strategies. In addition, problem-based learning (PBL) and differentiated instruction can help accommodate differences in students' ability profiles, both in terms of creativity and problem-solving. Metacognitive strategies such as asking students to write down the steps to solve the problem before working on the problem, the application of error-based learning to help students identify errors, and reflective discussions to evaluate solutions are also important to implement. However, this study has several limitations, including the limited number of subjects and the focus on one mathematical topic, namely number patterns. Therefore, further research is needed to explore how CPSE interacts with various other factors in various mathematical topics and how pedagogical interventions can be tailored to improve the balance between creativity and accuracy in mathematical problem-solving.

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