Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Profile of Number Pattern Problem Solving Abilities Based on Learning Style of Grade VIII Students at Budi Utomo SMP Negeri 14 Palu

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ARTICLE INFO

Article history:

Received: 18 April 2026
Accepted: 29 June 2026
Available Online: 05 July 2026

Keywords:

Problem-Solving Skills,
Learning Styles,
Number Pattern

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Article Doi:

https://doi.org/10.31258/jes.10.7.p.505-520

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A B S T R A C T

Problem-solving is an essential mathematical competency influenced by students' different learning styles. This study aimed to describe the mathematical problem-solving profiles of eighth-grade students at SMP Negeri 14 Palu on number pattern material based on visual, auditory, and kinesthetic learning styles. A descriptive qualitative approach was employed. Three students were selected as research subjects, each representing one learning style identified through a learning style questionnaire. Data were collected using questionnaires, written problem-solving tests, and semi-structured interviews. The analysis was based on Polya's four stages of problem-solving: understanding the problem, devising a plan, carrying out the plan, and looking back. Data were analyzed through data condensation, data display, and conclusion drawing. The findings revealed that students with visual and auditory learning styles successfully completed all four problem-solving stages. In contrast, the kinesthetic learner completed the first three stages effectively but encountered difficulties in the final stage of reviewing the solution. These findings suggest that learning styles influence students' approaches to mathematical problem-solving. Therefore, teachers should implement varied instructional strategies that accommodate different learning styles and provide structured guidance, particularly for kinesthetic learners, to strengthen their ability to evaluate and verify their solutions independently.

1. Introduction

Within the educational system, mathematics serves as a foundational discipline that is systematically taught from the primary level up to higher education (Zahratunnisa et al., 2026). Given its significance in daily life, it is regarded as an essential foundation for everyone, particularly students (Aisyah et al., 2018). In the learning process, mathematics functions as a bridge between various fields, connecting a

number of sciences and technologies, such as physics, chemistry, biology, medicine, economics, pharmacology, and information technology (Imamuddin et al., 2019). According to Setiyana et al. (2026), mathematics represents a primary discipline that plays a strategic role in developing logical and systematic thinking. Beyond content knowledge, mathematical instruction equips students with logical, critical, analytical, and systematic thinking skills, alongside crucial collaborative abilities (Saputra, 2019). Among the various competencies required in mathematics, problem-solving is paramount. Roebyanto & Harmini (2017) argue that problem-solving is a crucial and inseparable part of the mathematics learning process. Furthermore, the Indonesian government, through the 2013 curriculum, explicitly recognizes the importance of problem-solving skills (Rohmah et al., 2024). In line with this, the *National Council of Teachers of Mathematics* (NCTM) emphasized that there are five essential process standards students must achieve in their mathematical development, one of which is the ability to solve problems (Maulyda, 2019).

Problem-solving, according to Setiyanik et al (2020), represents the methods used by students to solve mathematical problems based on known information. Students are considered capable of problem-solving when they thoroughly understand the issue select an appropriate to reach a solution (Agsya et al., 2019). Furthermore, Nurhasanah & Luritawaty (2021) state that these skills foster students' analytical development and their ability to apply logic in various situations. To achieve an accurate solution, students must follow precise and efficient stages during the problem-solving process (Hairani et al., 2023). Consequently, this study adopts Polya's framework to analyze the problem-solving stages. According to Polya (1957), there are four fundamental stages of problem-solving: understanding the problem, devising a plan, carrying out the plan, and looking back to verify the steps and results, thereby ensuring the final answer aligns with the problem's requirements. Nevertheless, Yusri (2018) reveals that mathematical problem-solving remains one of the most challenging activities in education. Despite its importance, many students continue to struggle throughout the problem-solving process. Previous studies have also documented similar indicators of weak mathematical problem-solving skills specifically among junior high school students (Suraji et al., 2020).

This systemic issue is clearly reflected at the local level. Based on interviews with a mathematics teacher at SMP Negeri 14 Palu, it was revealed that students' ability to solve number pattern problems remains relatively low. Student frequently encounter difficulties, leading to errors such as inaccuracy formulas, and mistakes in the execution of solutions due to a lack of conceptual mastery. For instance, they struggle when presented with problems that differ slightly from the examples provided in class. The situation aligns with Anggraini & Hendroanto (2021), who argue that students' weaknesses in analyzing problems, observing the solving process, an evaluating results directly diminish the quality of their problem-solving skills. Among the topic in mathematics, number patterns are essential as they require robust problem-solving abilities and provide students with the logical foundation needed to face real-life challenges (Agustina & Munandar, 2022). Tharob et al. (2024) identified low problem-solving ability as a primary cause of

learning difficulties, particularly in number patterns. Consequently, it is imperative for students to sharpen their problem-solving skills, specifically within this topic.

The ability of students to solve problems regarding number patterns is not only influenced by cognitive aspects, but is also closely related to differences in student characteristics when absorbing material during lessons. Students commonly experience challenges in processing information in a way that is perceived as inconsistent with their learning preferences. Every student has unique learning needs, acquires knowledge differently, and processes information in distinct ways (Setiyadi, 2020). According to (Mursari, 2019), each student has their own way of learning that helps them understand the material better, so that they can solve problems more effectively during studying. According to Setiyanik et al. (2020) the difference in characteristics that students have, is called learning style.

Learning style is defined as the method used by students to receive and assimilate the information (Mufarihah et al., 2019). Damanik (2015) further states that learning style is a strategy that a person implements in a way that they believe best suits themselves and helps them learn effectively according to their learning needs. One of the benefits that students can get when they understand their own learning style is that it will help them become reliable problem solvers (Inastuti et al., 2021). According to DePorter & Hernacki (1992), there are three categories in learning, namely visual, auditory, and kinesthetic. Elaborating on these traits, visual individuals absorb information more efficiently through graphic illustrations and symbolic representations, whereas auditory learners gain a deeper understanding from spoken instructions, and kinesthetic students benefit most from physical engagement and hands-on activities (Waryani, 2021; Nurfadila, 2023, as cited in Nurhidayah et al., 2026).

Learning designed according to students' learning styles not only improves academic outcomes but also enhances mathematical problem-solving skills. Previous research by Purwaningsih & Ardani (2020), found that students utilize unique abilities when solving mathematical problems, as each possesses distinct learning style characteristics. Furthermore, Febrianti & Pujiastuti (2020) revealed that differences in problem-solving are significantly influenced by these styles. While this study aligns with previous research focuses exclusively on learning style variations using number pattern problems. Consequently, it is expected to provide a comprehensive profile of problem-solving abilities and serve as a reference for teachers to develop appropriate, efficient instructional methods. Based on the background and urgency presented, this study aims to describe the mathematical problem-solving profiles of eighth-grade students regarding number patterns, analyzed through their learning styles.

2. Methodology

This study employs a descriptive qualitative approach and was conducted at SMP Negeri 14 Palu. The research subjects were three grade VIII students, comprising one student from each learning style category: visual, auditory, and kinesthetic. The

research instruments included the researcher as the primary instrument, supported by learning style questionnaires, problem-solving test items, and interview guides. Data were collected through the administration of learning style questionnaires, written tests, and interviews. The learning style questionnaire used in this study was adapted from Yaumi (2013), to categorize subjects based on their dominant learning styles. It consists of 10 items, each offering three alternative answers representing visual, auditory, and kinesthetic styles. The dominant learning style is determined by identifying the category with the highest score. The written test, consisting of one validated essay question on number patterns, was administered to describe the problem-solving profiles of students across these learning styles. Additionally, semi-structured interviews were conducted to clarify information and uncover details that may not have been revealed during the written test. The data from both tests and interviews were analyzed based on Polya's (1957) framework, as presented in Table 1.

Table 1. Problem-solving Indicators

Polya Troubleshooting	Indicator
Understanding the Problem	The subject identifies the given information (data) and the unknown (question). This includes assessing whether the information provided is sufficient, identifying necessary conditions, and restating the problem in an operational or solvable form.
Devising a Plan	The subject can remember or try to find a problem that has been solved that has a similarity to the problem to be solved. This involves identifying patterns or rules and developing a systematic procedure for the solution based on the gathered information.
Carrying the Plan	The subject executes the previously developed procedures and steps precisely to arrive at a solution.
Looking Back	• The subject verifies the applied procedures and checks the accuracy of the results. • The subject gives a conclusion from the answers obtained

Data analysis in this study was conducted using the qualitative framework proposed by Miles et al. (2014), which consists of three concurrent flows of activity: (1) data condensation (2) data display, and (3) conclusion drawing and verification. To ensure the trustworthiness and scientific rigor of the findings, a data validity check was performed. Specifically, data validity was established through member checking. This process was carried out to determine the compatibility and alignment between the data obtained by the researcher and the actual perspectives provided by the research subjects.

3. Results and Discussion

This study aims to describe the mathematical problem-solving profiles of students in class VIII Budi Utomo at SMP Negeri 14 Palu regarding number patterns, analyzed through their learning styles. The analysis of the learning style questionnaire indicated that these students possessed diverse learning preferences. The questionnaire, which was administered to the entire class, was meticulously

analyzed to categorize each individual into a visual, auditory, or kinesthetic profile. The percentage of each learning preference was computed based on the students' overall scores from the validated instrument. This baseline data served as a crucial reference for selecting representative research subjects for the subsequent stages of the study. Through this initial mapping, variations in how students absorb mathematical content were observed measurably and objectively. The comprehensive results of this classification and the frequency distribution of the students' learning styles are systematically presented in Table 2 below.

Table 2. Results of Learning Style Questionnaire

Learning Style	Visual	Auditory	Kinesthetic	Quantity
Many Students	6	7	13	26

Table 2 indicates that the kinesthetic learning style is the most dominant among the students of class VIII Budi Utomo, accounting for 13 individuals. Conversely, the visual learning style is the least prevalent, being represented by only six students. This disparity demonstrates that students within this classroom possess diverse modalities for comprehending mathematical lessons. Consequently, these questionnaire results served as a baseline reference for the researcher to conduct a purposive selection of subjects. This approach ensured that each learning style category could be investigated thoroughly and equitably during the resolution of number pattern tasks. Based on these considerations, the researcher ultimately selected three primary subjects, each representatively manifesting a distinct learning style preference, as detailed in Table 3 below.

Table 3. Research Subjects

Subject Initials	Learning Style	Subject Code
RSS	Visual	SV
DEW	Auditory	SA
MFP	Kinesthetic	SK

Table 3 presents the profiles of the three research subjects selected to represent each specific learning style category. These individuals are identified using standardized codes: SV for the visual learner, SA for the auditory learner, and SK for the kinesthetic learner. The selection of these subjects was highly purposive rather than random; they were chosen because they achieved the highest scores in their respective questionnaire categories, a selection fully supported by recommendations from the class VIII Budi Utomo mathematics teacher. Beyond these academic parameters, essential research ethics specifically the students' willingness and comfort to participate actively served as crucial considerations in this selection process. Once the three subjects were finalized, the researcher administered a series of follow-up instruments, including written tests on number patterns and semi-structured interviews, to deeply explore their cognitive workflows. Based on the systematic implementation of all data collection stages, the analysis of each subject's problem-solving profile is comprehensively detailed in the subsequent sections.

Data Analysis of Subject SV in Solving Number Pattern Problems

The results of the written test and interviews analysis of subjects SV in solving number pattern problems, based on the Polya's problem-solving indicators, are presented in Figure 1 below.

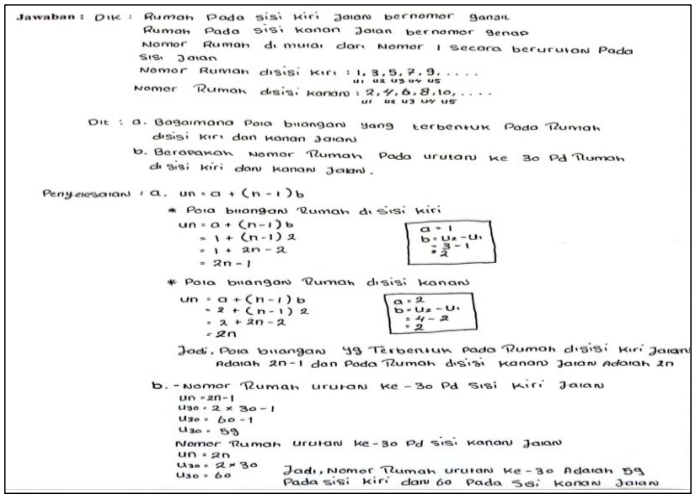

Figure 1. Written Test Answers Sheet of Subject SV

To further investigate subject SV ability to solve number patter problems, interview transcript is presented in Table 4.

Table 4. Transcript Interview Subject SV in Solving number pattern problems

Indicator		Interview Transcript
Understanding the problem	P-03	Ok, is there anything you don't understand about the problem?
	SV-03	Not at all
	P-04	How did you manage to understand the problem?
	SV-04	I read it several times
	P-05	Okay, based on the problem you've worked on, could you identify the given information and what is being asked, and what are the questions you need to solve?
	SV-05	It is known that every house on the left side of the road has an odd number, while the houses on the right have even numbers. The house number starts from the number one on the left side of the road. So, the sequence on the left is 1, 3, 5, 7, 9 and so on, and the sequence on the right is 2, 4, 6, 8, 10.
	SV-06	Part A ask for the number pattern formed by houses on the left side of the road and the house on the right side of the road. Part B ask for the houses in the 30th position for both sides of the road.
Devising a Plan	P-07	After understanding the problem, what steps did you take to solve it?
	SV-07	I looked for a formula that matched the question, then I substituted all the information from the problem into that formula
	P-08	Which formula did you use, and how did you decide it was the right one?
	SV-08	I used the Arithmetic number pattern formula.

		$U_n = a + (n-1)b$, I chose it because I noticed *a* constant difference between each term.
	P-09	How did you know if the difference is constant? Could you explain?
	SV-09	I calculated it, so for the house number on the left side it is (1, 3, 5, 7, 9, …), the common difference (*b*) is 2. Similarly, for the house numbers on the right side (2, 4, 6, 8, 10, …), the common difference (*b*) is also 2
Carrying the Plan	P-10	Okay after that, what is the next step?
	SV-10	Well, we already know for the common difference for the left side 2, and for the right side, it also 2. the first term (*a*) the left side 1 and the house on the right side 2. So, I just plugged them into the formula, $U_n = a + (n-1)b$, For the house on the left side, it becomes $1 + (n-1)\,2$, which simplifies $1+2n-2$, resulting in $U_n = 2n - 1$. For the right side, I used the same formula, $U_n = 2 + (n-1)\,2$, the result is $U_n = 2n$
	P-11	Okay, now, how about part b?
	SV-11	For part b, I just put it in the formula obtained in part a, to find 30th houses number on the left side I used $U_{30} = 2(30) - 1$, the result is 59. Then for the of the 30th house number on the right side of, it's $2(30)$, it is 60
Looking Back	P-14	Are you sure that the answer is correct?
	SV-14	Yes, I'm sure you'll agree with me, but I have double-checked my work and re-read the question to make sure
	P-15	Okay, then what is the conclusion?
	SV-15	For part A the number pattern formed is 2 on the house on the left side, which is $U_n = 2n - 1$, while for the house on the right, it is $U_n = 2n$. Then for part B, the 30th house number on the left side of the road the result is 59 and on the right side of the road the result is 60

Figure 1 and Table 4 demonstrate that subject SV possesses robust mathematical competencies that strictly align with Polya's problem-solving framework. At the "understanding the problem" stage, SV accurately identified both the given parameters and the primary question. The interview data further confirmed that the subject could re-explain the problem context clearly in their own words. During the "devising a plan" stage, the subject successfully determined the appropriate mathematical formula required for the solution. Subsequently, in the "carrying out the plan" stage, this formula was applied effectively, yielding an orderly and structured mathematical layout. Finally, during the "looking back" stage, both the written test and interview transcripts indicated that SV demonstrated a high level of certainty regarding the validity of the results and had systematically re-verified the calculations to draw accurate final conclusions. These findings align with Rahmatika et al. (2022), who noted that visual learners tend to systematically organize information, act as effective planners, and meticulously re-examine their computational outcomes.

Data Analysis of Subject SA in Solving Number Pattern Problems

The results of the written test and interviews analysis of subjects SA in solving number pattern problems, based on the Polya's problem-solving indicators, are presented in Figure 2.

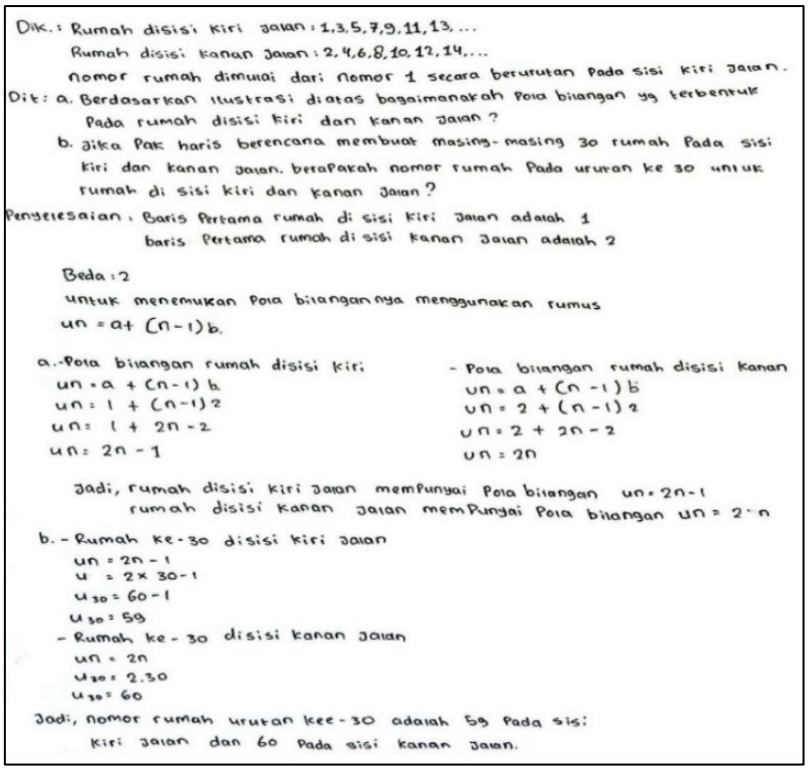
Dik.: Rumah disisi kiri jalan : 1,3,5,7,9,11,13,...
Rumah disisi kanan jalan : 2,4,6,8,10,12,14,...
nomor rumah dimulai dari nomor 1 secara berurutan pada sisi kiri jalan.
Dit: a. Berdasarkan ilustrasi diatas bagaimanakah pola bilangan yg terbentuk pada rumah disisi kiri dan kanan jalan ?
b. Jika Pak haris berencana membuat masing-masing 30 rumah pada sisi kiri dan kanan jalan. berapakah nomor rumah pada urutan ke 30 untuk rumah di sisi kiri dan kanan jalan ?
Penyelesaian : Baris pertama rumah di sisi kiri jalan adalah 1
baris pertama rumah di sisi kanan jalan adalah 2
Beda : 2
untuk menemukan pola bilangannya menggunakan rumus
$un = a + (n-1)b$.
a. Pola bilangan rumah disisi kiri:
$un = a + (n-1)b$
$un = 1 + (n-1)2$
$un = 1 + 2n - 2$
$un = 2n - 1$
- Pola bilangan rumah disisi kanan
$un = a + (n-1)b$
$un = 2 + (n-1)2$
$un = 2 + 2n - 2$
$un = 2n$
Jadi, rumah disisi kiri jalan mempunyai pola bilangan $un = 2n-1$
rumah disisi kanan jalan mempunyai pola bilangan $un = 2 \cdot n$
b. - Rumah ke-30 disisi kiri jalan
$un = 2n - 1$
$u = 2 \times 30 - 1$
$u_{30} = 60 - 1$
$u_{30} = 59$
- Rumah ke-30 disisi kanan jalan
$un = 2n$
$u_{30} = 2.30$
$u_{30} = 60$
Jadi, nomor rumah urutan kee-30 adalah 59 pada sisi kiri jalan dan 60 pada sisi kanan jalan.

Figure 2. Written Test Answers Sheet of Subject SA

To further investigate subject SA ability to solve number patter problems, interview transcript is presented in 5 below:

Table 5. Transcript Interview Subject SA in Solving number pattern problems

Indicator		Interview Transcript
Understanding the problem	P-02	Have you ever seen or worked on a problem like this before?
	SA-02	Yes, I have, but not with this specific story or context.
	P-03	Okay, is there anything you don't understand about the problem?
	SA-03	No, i think i understand everything
	P-04	How do you understand this problem?
	SA-04	I read it a out loud and repeated it several time until I fully understood it
	P-05	Can you tell us what information is known and what is asked in the question?
	SA-05	It is known that every house on the left side of the road has an odd number, while the house on the right side of the road has an even number. The house number starts sequentially from the number one on the left side of the road. So, the sequence on the left is 1,3,5,7,9 and on the right 2,4,6,8,10. Asked: there are two, part A number pattern formed on the house on the left side of the road and the house on the right side of the road. Then the part

		Bis the number of houses in the 30th position for both the left and right sides of the road
Devising a Plan	P-06	After understanding the problem, how do you plan to solve the problem?
	SA-06	I'm trying to find a formula that fits your question, keep putting all the information in the question in the formula.
	P-07	What is the formula?
	SA-07	The Arithmetic sequence formula $U_n = a + (n-1)\,b$
	P-08	How did you decide to use this formula?
	SA-08	That's it, because the difference each term is still 2. that's why I used the arithmetic formula.
	P-09	How do you know if the common difference is still 2? Try to explain!
	SA-09	As far as I know, to find the common difference, you subtract the terms, so for the house number on the left side $U_1 = 1 U_2 = 3.$ $b = U_2 - U_1 = 3 - 1 = 2$ Likewise, same for the house number on the right side $U_1 = 4 U_2 = 2$ $b = U_2 - U_1 = 4 - 2 = 2$
Carrying the Plan	P-10	Okay, after you know the plan you will do, how do you solve the problem?
	SA-10	For part A we known the common difference fixed at 2. So, I substituted all the information into the formula $U_n = a + (n-1)\,b$ the result. Then, for the house number on the left side, result $U_n = 2n - 1$, and for the right side, the result $U_n = 2n$
	P-11	Okay, so how about part B?
	SA-11	Part B, I used the formula that I obtained in part A. To find 30^{th} house number on the left side, the result is 59. Then for the house number of the order of 30 on the right side of the road it becomes 60
Looking Back	P-14	Are you sure that the answer is correct?
	SA-14	Yes, I am confident that my answer is correct.
	P-15	Did you double-check the answer after getting the final result?
	SA-15	Yes, I made sure to check it out before I get it.
	P-16	How did you check the answer again?
	SA-16	I re-read the questions and reviewed the steps and answers I had written.
	P-17	Okay, can you give me a conclusion?
	SA-17	For part A the number pattern formed on the house on the left side is $U_n = 2n - 1$ and the house on the right side of the road, it is $U_n = 2n$. Then for part the 30^{th} house number one the left side of the road is 59, and on the right side of the road, it is 60.

Based on Figure 2 and Table 5, it can be concluded that subject SA possesses proficient problem-solving capabilities. At the "understanding the problem" stage, SA successfully identified all the parameters provided in the question; during the interview, the subject also demonstrated the ability to clearly re-explain the problem context in their own words. In the "devising a plan" stage, SA selected an appropriate method to address the problem. The interview results further revealed that the subject could effectively leverage prior mathematical knowledge to

formulate a viable completion plan. Furthermore, in the "carrying out the plan" stage, subject SA executed the solution process successfully. The interview transcripts confirmed that the subject consistently carried out the calculations in strict accordance with the previously devised plan to obtain an accurate mathematical solution. Finally, during the "looking back" stage, SA performed repeated verifications on the answers and formulated a precise final conclusion. These findings are in line with research by Willia et al. (2020), which states that auditory learners generally comprehend problems well, formulate effective solution plans, execute calculations correctly, and reliably re-examine their final outcomes by cross-checking their computational steps against the original question text.

Data Analysis of Subject SK in Solving Number Pattern Problems

The results of the written test and interviews analysis of subjects SK in solving number pattern problems, based on the Polya's problem-solving indicators, are presented in Figure 3.

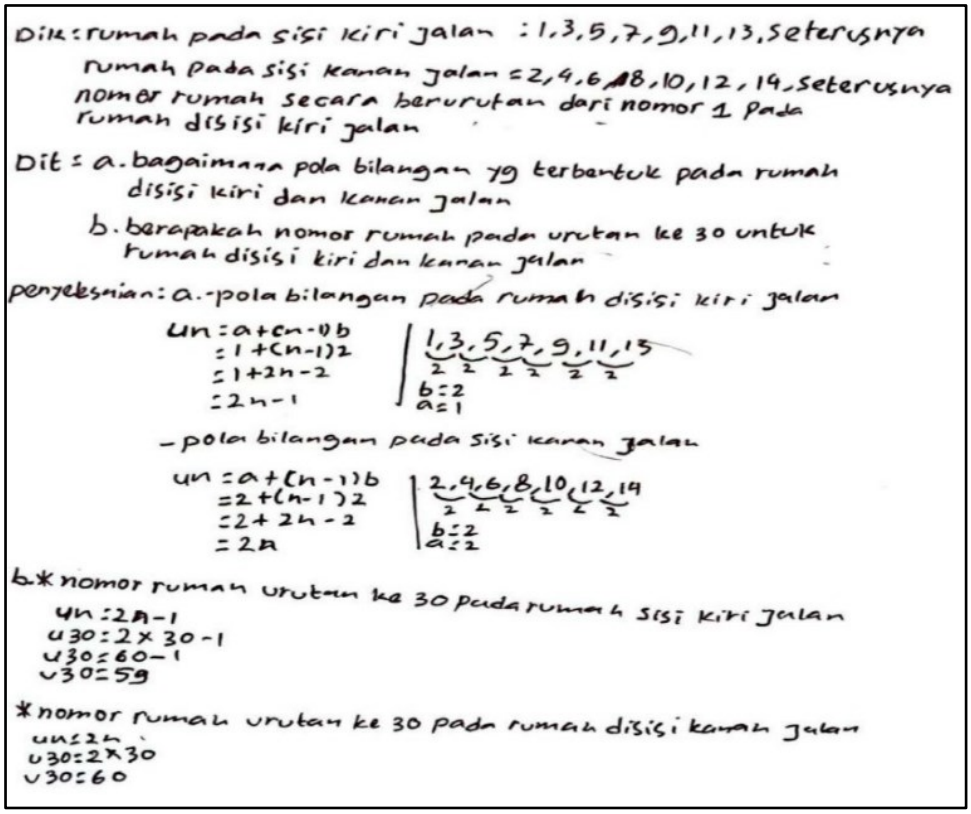

Figure 3. Written Test Answers Sheet of Subject SK

To dig deeper into the problem-solving ability of the number pattern of Subject SK, the following is a transcript of the interview with the SK Subject in Table 6 below.

Table 6. Transcript Interview Subject SK in Solving number pattern problems

Indicator		Interview Transcript
Understanding the problem	P-04	Okay, do you understand the meaning of the problem provided?
	SK-04	I don't really understand it
	P-05	Why make it difficult for you to understand?
	SK-05	It's hard for me to understand because the text is so long, so I had to read it several times to understand it.
	P-06	However, can you identify the given information what is being asked in the question?
	SK-06	Yes, I can. What is known is that the house number on the left side is odd numbered, the house on the right side is even numbered. The number starts sequentially from number one. So, the house number on the left side are 1, 3, 5, 7, 9 etc. continues if on the right side the numbers are 2, 4, 6, 8, 10, etc.
	SK-07	For those who are asked, there are two parts. First, how is the pattern of numbers formed on the house on the left side and on the right side of the road? Then the second is what is the house number in the 30th order for the house on the left and right sides of the road
Devising a Plan	P-08	How did you solve the problem?
	SK-08	The first thing I did was to work on part A. I used the arithmetic sequence formula
	P-09	How is the formula you used?
	SK-09	It is $U_n = a + (n - 1)\, b$.
	P-10	Can you explain what the components of that formula mean?
	SK-10	U_n is the n term, *a* is the first term, and *b* is the common difference
	P-11	Could you explain why you chose to use that specific formula?
	SK-11	It's like this: because the house number on the left side of the road, 1, 3, 5, 7, 9 etc. and while on the right side the numbers are 2, 4, 6, 8, 10, etc. (pointing to the answer sheet), I noticed that the difference between each term is constantly 2. That's way I used that's formula.
Carrying the Plan	P-12	Okay, what about the next step?
	SK-12	Since all the values are known, for the house on the left side of *a* is 1, and *b* is 2. Continues, for the right side *a* is 2, and *b* is 2. So, I just substituted them into the formula. So, for the house number on the left side of the road $U_n = a + (n - 1)\, b$, I replaced *a* with 1 and *b* with 2. after that I calculate the result, $U_n = 2n - 1$. For the right side, I followed the same steps, substituting the values into the formula to get the result, $U_n = 2n$
	P-13	And how did you solve part B?
	SK-13	If part B, is just put it in the formula obtained in part A.
	P-14	How is that? can you explain?
	SK-15	Well, from part A, has been obtained for the house on the left side $U_n = 2n - 1$ while for the house on the right side $U_n = 2n$. So, I just substituted 30 into the formula. For the 30^{th} house on the left, the result is 59, and for 30^{th} house on the right side, the results it is 60

Looking Back	P-17	Are you sure your answers are correct?
	SK-17	Yes, sir.
	P-18	Did you double-check the answer after obtaining the final result?
	SK-18	No, I didn't.
	P-19	Why didn't double-check to confirm the answer?
	SK-19	Time was up, and I was also tired of re-reading everything
	P-20	Can you tell me about the results? What is the conclusion, and did you include one?
	SK-20	What is the conclusion, how do you use it too?
	P-21	Actually, it's better to use conclusions
	SK-21	Ooh my goodness, I didn't do anything wrong, I thought this was the only way to go.
	P-22	Do you know how to draw conclusions?
	SK-22	No, I don't.

Based on Figure 3 and Table 7, although subject SK achieved the correct numerical answer, the subject failed to satisfy all dimensions of Polya's framework. SK successfully understood the problem, devised a plan, and executed the computational steps accurately. However, a critical cognitive breakdown occurred during the "looking back" stage; due to physical restlessness, boredom, and perceived time constraints, the subject skipped the verification process entirely. Instead of cross-checking the calculations, SK hurriedly submitted the work, failing to formulate a final conclusion. This is consistent with research by (In'am, 2014), who notes that students frequently bypass re-examination due to insufficient time, and corroborates DePorter & Hernacki (1992) regarding the susceptibility of kinesthetic learners to lose focus during rigid, paper and pencil mathematical testing environments.

4. Conclusion

Based on the results and discussions presented, it can be concluded that the visual subject (SV) successfully fulfilled all of Polya's problem-solving stages. The subject demonstrated the ability to understand the problem by identifying both the given and unknown elements and reinterpreting the information in their own words. Furthermore, SV effectively devised and implemented a plan, producing systematic and neat written work. Finally, the subject looked back at their results by reviewing the answers and drawing accurate final conclusions. Similarly, the auditory subject (SA) demonstrated the ability to understand the problem by recording all essential information and re-explaining it in their own words. The subject devised an appropriate plan and carried it out consistently as intended. Furthermore, SA effectively looked back by re-examining the answers and drew accurate final conclusions. In contrast to the other two profiles, the kinesthetic subject (SK) was able to understand the problem, devise a plan, and implement the solution. However, the subject failed to perform the final "looking back" stage; due to boredom and time constraints, SK hurriedly submitted the work without re-examining the answers, consequently, the subject could not draw a final conclusion.

This clearly indicates that the kinesthetic subject did not satisfy all of Polya's problem-solving stages.

The findings of this study indicate that differences in learning styles significantly influence students' mathematical problem-solving processes, especially the impediments experienced by kinesthetic learners during the looking-back stage. Consequently, it is essential for educators to formulate and execute adaptive instructional strategies that accommodate diverse learning modalities, namely visual, auditory, and kinesthetic particularly when addressing number pattern concepts. specifically for kinesthetic learners, teachers are advised to provide more intensive guidance through structured worksheets or systematic self-assessment prompts to train and habituate them to re-evaluate their final answers. This study has several limitations, as it exclusively focuses on delineating students' problem-solving profiles based on their learning styles (visual, auditory, and kinesthetic) with a limited sample size of three students in class VIII Budi Utomo at SMP Negeri 14 Palu. Consequently, these findings cannot be generalized to account for other cognitive factors or more complex mathematical topics. For future research, it is highly recommended to expand the number of participants and investigate mathematical problem-solving profiles in number patterns by integrating both learning styles and thinking styles to examine the problem-solving workflow in greater detail.

Acknowledgement

All praise and gratitude be to Allah SWT. for His abundant mercy and blessings, which have enabled the successful completion of this article. The researcher would like to express her sincere appreciation to everyone involved in this academic journey, especially to her beloved parents for their unwavering prayers and endless support. Gratitude is also extended to the supervising lecturers and instrument validators for their invaluable guidance, immense patience, and constructive criticism provided throughout this process. Special thanks are also addressed to the Dean of the Faculty of Teacher Training and Education at Tadulako University, as well as the principal and mathematics teachers of SMP Negeri 14 Palu, for granting the necessary research permissions. Furthermore, the researcher highly appreciates the eighth-grade students of class VIII Budi Utomo for their enthusiastic participation as research subjects. Lastly, a heartfelt appreciation goes to all colleagues and friends for their constant encouragement, solidarity, and motivation.

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How to cite this article:

Rohani., Hadjar, I., Bakri M., & Tawil, A. H. M. (2026). Profile of Number Pattern Problem Solving Abilities Based on Learning Style of Grade VIII Students at Budi Utomo SMP Negeri 14 Palu. *Journal of Educational Sciences*, *10(7)*, 505-520.