

STUDENT'S LEARNING DIFFICULTIES ON MATHEMATICAL UNDERSTANDING OF A NUMBER PATTERN

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Abstract

Number patterns are a fundamental aspect of mathematics, often serving as a bridge between arithmetic and algebra. Number patterns often require students to think abstractly, identifying relationships and rules that govern the sequence of numbers. For some people, this transition from concrete to abstract thinking can be difficult. Encouraging students to visualize patterns using concrete objects or images can help bridge this gap, making abstract concepts more real. The aim of this study was to investigate the students' difficulties and how grade 9 students' mathematics approaches to number pattern problems. 32 students from a junior high schools in Tangerang participated in this case study. Purposive sampling technique is used in this study. The stages of the preliminary study involve interviewing the mathematics teacher regarding learning, administering preliminary exams, and evaluating the outcomes of the preliminary exams. Research data was collected through tests and interviews. These interviews took place post the analysis of initial test (a diagnostic tests). The result showed that the difficulty in discerning the regularity of the numerical arrangement: 1) In calculating the formula for the n th term in a number pattern, modeling is used; 2) Students frequently employ the direct proportion method to generalize patterns without taking into account the overall arrangement of numbers; 3) Observing the arrangement of numbers causes uncertainty in seeing order; 4) In generalizing number patterns, damage occurs; 5) illustrating that number patterns always have regularities, and these regularities are not always in the form of numerical differences.

Keywords: Learning difficulties; learning outcomes; mathematical understanding; number pattern.

Abstrak

Pola bilangan adalah aspek mendasar dari ilmu matematika dan sering kali dianggap sebagai jembatan antara aritmatika dan aljabar. Pola bilangan mengharuskan siswa untuk berpikir abstrak, mengidentifikasi hubungan dan aturan yang mengatur barisan bilangan. Bagi sebagian orang, transisi dari pemikiran konkrit ke abstrak bisa jadi sulit. Mendorong siswa untuk memvisualisasikan pola menggunakan objek atau gambar konkret dapat membantu menjembatani kesenjangan ini, menjadikan konsep abstrak menjadi lebih nyata. Tujuan dari penelitian ini adalah untuk menyelidiki kesulitan siswa terhadap masalah pola bilangan pada siswa kelas 9. Adapun subjek dalam penelitian studi kasus ini adalah 32 orang siswa SMP di Tangerang. Teknik pengambilan sampel adalah dengan menggunakan teknik purposive sampling. Tahapan studi pendahuluan meliputi wawancara kepada guru matematika mengenai pembelajaran, pelaksanaan tes awal, dan evaluasi hasil ujian. Data penelitian dikumpulkan melalui tes dan wawancara. Wawancara ini dilakukan pasca analisis tes awal (tes diagnostik). Hasil penelitian menunjukkan bahwa kesulitan dalam membedakan keteraturan susunan bilangan: 1) Menggunakan pemodelan dalam menghitung rumus suku ke- n suatu pola bilangan; 2) Siswa sering menggunakan metode perbandingan langsung untuk menggeneralisasi pola tanpa memperhitungkan susunan bilangan secara keseluruhan; 3) Mengamati susunan bilangan menimbulkan ketidakpastian dalam melihat keteraturan; 4) Dalam menggeneralisasi pola bilangan, terjadi ketidaksesuaian; 5) menggambarkan bahwa pola bilangan selalu mempunyai keteraturan, dan keteraturan tersebut tidak selalu berupa perbedaan angka.

Kata kunci: Hasil belajar; kesulitan belajar; pemahaman matematis; pola bilangan.



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INTRODUCTION

Difficulties in Mathematics experienced by individuals even to adulthood, have a negative impact on decision making by individuals in everyday life (Salihu & Räsänen, 2018). There exist numerous categories of learning difficulties, each necessitating a distinct diagnosis or set of identifying features. Student's difficulties in mathematics include difficulty comprehending explanations and question intent, struggling to understand mathematical concepts and symbols, and problems performing calculations (Febriyanti, Mustadi, & Jerussalem, 2021).

Students with mathematics learning difficulties frequently difficulty with basic mathematics processes taught in the classroom, such as establishing retrieval-based techniques (Hopkins, 2016). On the contrary, Mathematics is a discipline that deals with theoretical concepts. Due to its inherent abstract nature, numerous pupils encounter challenges when comprehending mathematical content, thereby necessitating educators to possess the ability to effectively communicate mathematical concepts while adhering to the unique attributes of students. A mathematical word problem can be defined as a written statement or assertion that introduces a scenario for which a solution is not immediately apparent (Alvi & Nausheen, 2019). Algebra is one of very important in mathematics (Hadi & Faradillah, 2019); (Malihatuddarojah & Prahmana, 2019). The discipline of Algebra, which encompasses a range of mathematical concepts and principles, is imparted to students from their formative years in primary school all the way up to higher education establishments, where they are exposed to more advanced topics

such as Analytic Geometry, Calculus, Statistics, Trigonometry, and Topology (Jupri, Drijvers, & Heuvel-Panhuizen, Difficulties in initial algebra learning in Indonesia, 2014). However, numerous studies have indicated that algebra presents difficulties even to the most exceptional students (Moru & Mathunya, 2022). Number patterns play a significant role in the development of mathematical concepts, as mathematics is regarded as a discipline focused on patterns and relationships, and it is crucial to acquire mathematical knowledge through generalization. The introduction of pattern concepts into the middle school mathematics curriculum has posed certain challenges in terms of generalization. Number patterns are a precursor to algebraic concepts, as they involve understanding relationships and expressing them symbolically.

Comprehending number patterns holds significant importance in fostering the development of algebraic reasoning and advanced cognitive skills within the realm of mathematics. A multitude of studies have converged to affirm that engaging with number patterns facilitates the establishment of crucial connections between arithmetic and algebraic concepts (Jupri, Usdiyana, & Sispiyati, 2020). For instance, (Jupri, Usdiyana, & Sispiyati, 2020) crafted a comprehensive learning sequence centered on number patterns, drawing from the principles of Realistic Mathematics Education, to effectively nurture students' grasp of algebraic thinking. On the other hand, (Risdiyanti & Prahmana, 2020) employed local contexts as a pedagogical approach to facilitate the acquisition of number pattern, yielding a heightened degree of comprehension among students. This approach proved to be efficacious as it imbued the process of learning with an element of amusement for the students, and subsequently,

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engendered an enhanced level of engagement with the subject matter.

An advanced comprehension of numerical patterns not only has fundamental significance, but also acts as a catalyst for the development of a multitude of higher-level cognitive abilities, including problem-solving, critical thinking, and innovative ideation (Ghifari, 2021); (Pasnak, et al., 2016) The pedagogical blueprint set forth by (Ghifari, 2021) elucidates effective methods to design instructional frameworks that seamlessly cultivate students' higher-order cognitive capacities through the avenue of number patterns. Building upon this premise, (Pasnak, et al., 2016) established a noteworthy correlation between the mastery of number sequences among first-grade students and the sophistication of their broader mathematical conceptualization, thereby underscoring the role of number patterns in fortifying elevated cognitive faculties within the domain of mathematics.

Research indicates that students face many hurdles when trying to understand the intricacies of number patterns. Based upon the findings of the research, a subset of pupils encountered challenges with ascertaining the sequence or the algebraic formula for the n th term in the numerical progression (Sari, Subanji, & Hidayanto, 2018); (Fatahillah, Alfiyantiningsih, & Dafik, 2021) the individual in question encountered challenges in identifying the principal notion of the predicament and transforming it into a theoretical generalization. Likewise, (Rusmawati, 2021) highlights the struggles of students with limited independence, who face difficulties both in conceptual understanding and in building relationships between concepts and principles.

Educators within NCTM are urged to engage in various methods such as diagnosing student reasoning strategies, identifying patterns of errors and misconceptions, and recognizing areas of unmastered material or a lack of prerequisites. This approach allows for the continuous adaptation of instruction to support students in their pursuit of conceptual understanding. (Zhang, Yi Ding, Soo Lee, & Chen, 2017) have emphasized the importance of this pedagogical approach. Educators, too, confront their share of obstacles when instructing students about number patterns.

The primary objective of this research endeavor was to scrutinize the various obstacles encountered by students while engaging with mathematical concepts, especially with regards to number pattern problems, and to explore the approaches adopted by grade 9 learners in tackling these challenges. In this study, indicators of learning difficulties used are indicators of learning difficulties according to Cooney (Rusmawati, 2021) where difficulties are categorized into 3 types, namely: a) Difficulty in learning the concept (difficulty in learning the concept of a material); b) Difficulty in applying principles (difficulty in applying concepts where students find it difficult to associate concepts with a material); c) Difficulty in solving verbal problems (difficulty in solving problems related to verbal problems or story problems).

METHOD

This study is founded upon a case study. The individuals under scrutiny in this investigation were pupils belonging to the ninth grade with 32 students at SMP Dharma Siswa, Tangerang, during the academic year 2023/2024.

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Purposive sampling technique is used in this study. During the academic year, students who have engaged in the study of numerical patterns at the junior high school level. The class observation data that is the focus of this research is class IX-E because the class students have already received the subject matter of number patterns and the input of the class IX mathematics teacher. The researcher conducted an initial test (diagnostic test) in the form of six number pattern problems. From the results of the initial (diagnostic) test, the researcher determined the research subjects, namely students who had learning difficulties.

The preliminary study stage and the implementation stage of this research were both completed. The stages of the preliminary study involve interviewing the mathematics teacher regarding learning, administering preliminary exams, and evaluating the outcomes of the preliminary exams. The initial test, analysis of the test's results, selection of the research topic, and interviews were all done during the implementation stage.

The information that will be gathered for this study will take the form of narrative sentences and describe the reasoning challenges that students when learning to solve number pattern problems. Daily test results for number pattern material, student answer sheets from the researcher's initial test (a diagnostic test), and interview recordings of study subjects after finishing the assignment sheet were among the data collected. As for the instruments used to obtain data in this study, namely the researcher as the main instrument, the task sheet instrument and the interview guide. Research data was collected through tests and interviews. The interview,

meanwhile, was carried out in a focused manner, lasting sixty minutes. These interviews took place post the analysis of initial test (a diagnostic tests). A diagnostic test consist of 6 questions. In questions 1 and 2 it states that concepts in number pattern material, questions number 3 and 4 state about applying principles in number pattern material, questions number 5 and 6 state about solving verbal problem in number pattern material.

RESULTS AND DISCUSSION

In the process of acquiring knowledge in mathematics, it is imperative to meticulously align it with the fundamental principles of the subject matter and the intellectual growth of the students. It is of utmost importance to establish a strong correlation between the educational experiences of the students and the specific concepts that are to be imparted. A lack of basic arithmetic is one of the key causes of pupils' difficulties with number patterns. The comprehension of intricate patterns is a formidable task in the absence of rudimentary knowledge in arithmetic operations such as addition, subtraction, multiplication, and division. Prior to delving into numerical patterns, it is imperative that educators and learners alike confirm the sound establishment of fundamental arithmetic proficiencies. The discernment of numerical patterns oftentimes mandates that students engage in abstract reasoning to discern interconnections and principles that govern the sequence of digits. This transition from concrete to abstract thinking can be challenging for some people. Encouraging pupils to envision patterns with physical items or drawings can assist in bridging this gap and making abstract concepts more tangible.

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From indicators of learning difficulties in this study revealed from 32 students, the student with difficulty in learning the concept (difficulty in learning the concept of a material) is 30 students. Students with difficulty in applying principles (difficulty in applying concepts where students find it difficult to associate concepts with a material) is 15 students. And students with difficulty in solving verbal problems (difficulty in solving problems related to verbal problems or story problems) is 22 students. The results of learning difficulties on mathematics understanding were presented in Figure 1.

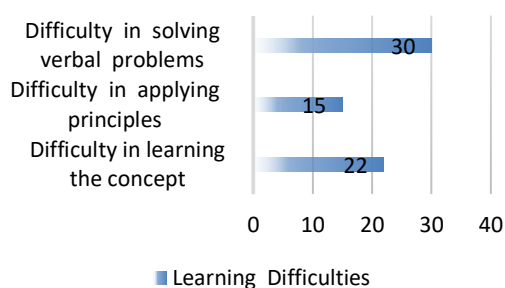


Figure 1. Students' Learning Difficulties on Mathematics Understanding

Based on Figure 1, difficulty in learning the concept is the biggest difficulties for students. Difficulty Understanding the concept of a number pattern will help the students to solve the problems in mathematics. It is an indicator that the junior high school students are in learning development. Understanding the process of knowledge change is a major goal in the development of learning and education (Cai & Ding, 2017). An examination of conceptual understanding as a comprehension of mathematical ideas, activities, and connections is vital in assisting students. By means of

conceptual comprehension, students will not only comprehend the necessary actions, but also rationalize the rationale behind them. The process of attaining conceptual understanding can be achieved through the construction of novel understandings that are founded upon pre-existing knowledge. The degree to which a student comprehends the concept of a formal definition of a function can be articulated with reference to their prior understanding of the fundamental principles of a function.

From the results of the diagnostic tests that have been carried out, it is known that there are students who have difficulties study. These difficulties can be known based on the results of tests and interviews that have been conducted. Obtained data based on the results of tests and interviews experienced difficulties in detecting regularity from the arrangement of numbers and regularity of images, difficulty in generalizing the pattern of numbers and difficulty in seeing order through observing the arrangement of numbers.

The following are the question indicators given in the diagnostic test questions: 1) Identify the object configuration sequence pattern; 2) Computational expertise: Fundamental competencies in mathematical operations encompassing addition, subtraction, multiplication, and division, within the context of ordered numerical sequences; 3) Ability to interpret data: Ability to understand and analyze data, such as graphs and tables; 4) The capacity to recognize and resolve mathematical issues that arise in day-to-day scenarios associated with numerical sequence patterns is referred to as problem-solving ability; and 5) The competency to assess information and

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formulate informed judgements grounded in the accessible data and facts is commonly referred to as critical thinking skills.

Question number 1 and number 2 pertains to the configuration of objects. It states that learning the concept (difficulty in learning the concept of a material). Students are cordially requested to discern the ensuing pattern from the arrangement of images that have been furnished. Additionally, students are encouraged to articulate their viewpoints concerning the answers they have proffered. Recognizing patterns in the configuration of objects poses a formidable challenge to students. The ability to discern patterns in pictures is a task that proves to be arduous for students. Figure 1 shows the result of students' answers in solving object configuration questions in number pattern material.

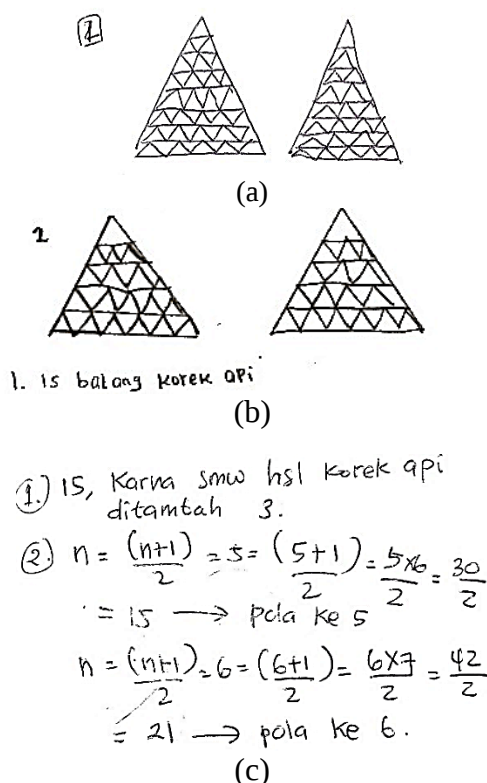


Figure 2. The Result of Student Answer Number 1 and 2

Based on the results of student answers in Figure 2 (a), students can only describe the next pattern without answering questions and explaining how the pattern was obtained. Meanwhile on Fig. 2 (b) and (c) students demonstrate proficiency in providing correct responses to questions, however, they exhibit inadequacy in articulating the methodology or approach employed in arriving at the aforementioned answers. Students only focus on the number of rows of numbers from the pictures in question without looking at what patterns can be formed from the pictures that have been given. To confirm these answers, during the interview, they were confused about making patterns in the form of pictures even though the answers given were correct. They are more interested in solving by using number pattern formulas (Fig. 2b) compared to looking at figure and making what patterns are formed. In a general sense, it is evident that when it comes to inquiries pertaining to object configuration, the majority of students possess the ability to perform calculations. However, the methodology behind this process is at times disregarded, leading to an inability to explicate the significance of the resulting pattern.

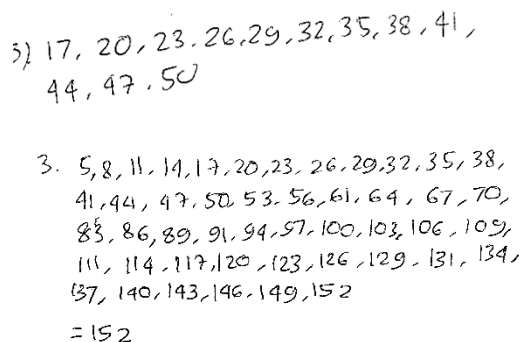


Figure 3. The Result of Student Answer Number 3

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Based on the findings of the student responses illustrated in Figure 3, question number 3 states applying principles (difficulty in applying concepts where students find it difficult to associate concepts with a material), it can be inferred that the vast majority of students were able to accurately and proficiently respond to the posed inquiries. However, it was noted that none of the students provided an explanation regarding the methodology employed in arriving at their respective answers. Regrettably, the students merely cited the ultimate outcome without any mention of the process involved.

4. Informasi yg didapat dr grafik diatas adl bukan tingkat pend. masyr. Indo pd th 2023 lebih blyk tamat SD dg jumlah persentase 23,4% dibanding dg masyr. yg melakukan pend. S3 dg persentase 0,02%. Masyr. dg tingkat pend. tamat SD lebih banyak dibanding dg masyr. yang melakukan S1, S2, S3 sangat memperhatikan.

Figure 4. The Result of Student Answer Number 4

In item 4 of the questionnaire, question number 4 states applying principles (difficulty in applying concepts where students find it difficult to associate concepts with a material), pupils are tasked with delineating the Graph of Indonesian Society's Level of Education. The students aptly expatiated upon the information gleaned from the graph and expounded upon the pattern discernible in the Chart of Indonesian Society's Education Level. The ensuing excerpts are from interviews conducted with students.

From the students' answers during the interview, it was found that number pattern questions related to everyday life were easier for students to understand than questions that had nothing to do with everyday life. From

the students' answers during the interviews, it was found that some patterned questions related to daily life were easier for students to understand compared to questions that had nothing to do with everyday life. Students may fail to see how number patterns apply in semi-abstract images but Patterns can be demonstrated in a variety of contexts, including nature, art, and even teacher financial calculations. Students' interest and motivation in learning can be increased by associating a number of patterns with practical applications.

5. Dikulan ke 3 pasangan kelinci dapat memproduksi 2 kelinci muda & pada bulan ke 10 populasi kelinci ada 20 kelinci
cara $10 \times 2 = 20$

(a)

5. Jumlah kelinci pada bulan ke-10 ialah pasangan kelinci dewasa memiliki anak

(b)

Figure 5. The Result of Student Answer Number 5

Question no 5 state that solving verbal problems (difficulty in solving problems related to verbal problems or story problems). Based on the response provided in answer number 5, it can be inferred that merely 2 pupils from class IX attempted to answer question number 5, both of whom unfortunately provided incorrect responses. Notably, question number 5 pertains to everyday quandaries, thereby differing from question number 4. In light of this, it can be generally surmised that not all numerical pattern inquiries concerning daily life are necessarily conducive to facilitating students' comprehension of the given queries.

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From the results of the interview excerpts it was found that students who studied mathematics had more difficulty understanding questions in the form of story questions and there were no numbers, this was because students were not used to working on non-routine questions. Difficulty encountered by students is often manifested in the form of technical errors. Additionally, students may employ inadequate terminology or fail to properly display or remove symbols. Further, the problem may be logically contradictory or may lack sufficient information for effective debugging. Due to its departure from the realm of mathematics, such a problem cannot be classified as a mathematical problem.

Fakta dari pertumbuhan covid-19 tahun 2020-2021

tanggal, bulan	jumlah
2 - 28 maret	3000
6 - 9 mei	5000
14 - 20 juni	16000
4 - 21 juli	18000
17 - 23 oktober	35000
7 - 28 november	26000

(a)

15. Jan 2021 = 6000 lebih kasus covid
25. Des = 6000 kasus covid
28. nov = 10000 kasus covid
23. Okt = 3000 lebih kasus covid
26. Sept = 4000 kasus covid
11. Sept = 2000 kasus covid
21. Agustus = 2000 kasus covid

(b)

Dari grafik diatas, Fakta yang dapat kita ambil adalah dari tanggal 1-7 Mar 2020 sampai dengan 9-15 Jan 2021, kasus covid di Indonesia sangat melonjak dari tahun 2020-2021

(c)

Figure 6. The Result of Student Answer Number 6

Based on students' answers to question no 6 it was found that students could answer the question but could not

explain the intent of the graph in question no 6. Question no 6 state that solving verbal problems (difficulty in solving problems related to verbal problems or story problems). Recognizing patterns is an important skill in mathematics, yet some pupils struggle to recognize patterns within numerical sequences. Teachers can help children by introducing them to a range of patterns and encouraging them to look for similarities and differences between sequences. Additionally, certain studies have demonstrated a lack of noteworthy linear correlation between the procedural and conceptual knowledge of mathematics teachers (Chirove & Ogbonnaya, 2021). Regular pattern recognition practice can help to improve this talent over time. It might be difficult to deduce the underlying laws or formulas that govern a numerical pattern. Students frequently come into patterns that appear random or lack clear principles. Educators might emphasize the need of patience and endurance in such circumstances. Analyzing longer segments of the sequence and testing other possibilities can finally lead to the discovery of the pattern's rule.

In summary, as a response to our research question "what activities can we witness among children when given these tasks?", students can answer object configuration questions (Figure 2a and 2b) regarding the next pattern that has been made, on the question students should be asked to make the next pattern by describing what kind of pattern is made, but they only make patterns using numbers, not using pictures, apart from that, students have difficulty describing the reasons for the answers already made, the cause of these difficulties is because students do not master the number pattern material

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and most students also tend to forget the material that has been taught previously. When given questions about number patterns in the form of numbers (evidence exemplified in Figure 3), most students easily answered the questions given well, but none of the students could describe the results of their answers. For the next question, students are asked to draw and describe the graph in the question (Figure 4), it was found that some patterned questions related to daily life were easier for students to understand compared to questions that had nothing to do with everyday life. But in contrast to the next story questions, students had difficulty answering the questions given. Of the 32 students, only 2 students answered question number 5 (Figure 5) and only 3 people answered question number 6 (Figure 6). When interviews were conducted regarding their difficulties, these students felt that math problems in the form of stories were very difficult to do if there were no numbers, and they were very difficult. modeling the problem in its mathematical form.

Difficulties in mathematical understanding among the students have been thoroughly examined in prior research (Jupri, Drijvers, & Heuvel-Panhuizen, 2014); (Sartika, Sujana, & Fitriyani, 2022) From indicators of learning difficulties in this study revealed from 32 students, the student with difficulty in learning the concept (difficulty in learning the concept of a material) is biggest than the others. Number patterns are a forerunner to algebraic notions since they involve comprehending relationships and symbolically expressing them. Tasks involving number patterns are problems that revolve around a sequence of numbers. The act of identifying number

patterns, in relation to the act of problem-solving within this study, requires the act of searching for numbers within a given sequence and establishing a pattern. Furthermore, the students primarily verified their formulas and rectified them subsequent to their identification of errors. They encountered no obstacles in ascertaining the overarching formula of the patterns in a general context. This could potentially be attributed to the nature of the questions, which revolve around linear patterns, and the consistent discrepancies between the quantities of the patterns. This pattern then enables the problem solver to create a general solution that can be utilized in any given situation. According to (Sartika, Sujana, & Fitriyani, 2022) types of student difficulties in solving the subject matter of number patterns namely on the concepts, principles and skills. Teachers can help students make this transition by emphasizing the relationships between patterns and algebraic expressions, as well as demonstrating how patterns can be represented using variables and equations. It is essential for teacher to furnish multiple non-routine predicaments that bear resemblance to real-life scenarios, thereby honing the students' proficiency to inquire into the underlying causes and mechanisms (Ghifari, 2021).

Conceptual understanding of number patterns involving missing numbers necessitates a deep understanding of the fundamental properties of number patterns, such as the sequential arrangement or order of numbers, the magnitude or difference between consecutive numbers within the sequence, as well as the various mathematical operations involved. On the other hand, procedural proficiency

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in dealing with number patterns containing missing numbers requires the ability to effortlessly arrange numbers in either ascending or descending order, as well as the capability to correctly identify the missing number(s) by employing precise and efficient strategies. These strategies involve the determination of the magnitude or difference between two consecutive numbers in the sequence, the appropriate application of mathematical operations to obtain the missing number(s), and the accurate placement of the missing number(s) within the given sequence (Tesfaye, Arefayne, & Micael, 2020). It is crucial for students to possess a thorough comprehension of the material on number patterns. Consequently, it is imperative to conduct an inquiry, ascertain, and present a comprehensive outline of students' conceptual comprehension. In turn, this serves as the foundation for undertaking an endeavor to enhance students' mathematical abilities.

Many students employ inadequate techniques when attempting to solve number patterns problems. Oftentimes, students encounter difficulty in recognizing the presence of number patterns within these problems due to their lack of understanding of the relevant mathematical principles. Describing students of mathematical understanding and reasoning allows for the identification of deficiencies in their grasp of mathematical concepts and inaccuracies in their problem-solving strategies. Moreover, it facilitates an appreciation for the manner in which they develop and consolidate their understanding.

The presence of Math anxiety and the accompanying fear of committing errors can potentially impede a student's inclination to engage with numerical

patterns. It is therefore imperative to establish a classroom environment that is amenable and non-critical. Educators can underscore the fact that errors are an inherent aspect of the learning process and furnish pupils with opportunities to collaborate, deliberate, and learn from their mistakes. Students may encounter difficulties when attempting to discern the practical relevance of numerical patterns in everyday life. In this regard, it is possible for teachers to demonstrate how these patterns manifest in a variety of contexts, including nature, art, and even financial calculations. By linking numerical patterns to pragmatic applications, there exists the potential to augment the learners' curiosity and drive to assimilate knowledge.

CONCLUSION AND SUGGESTION

From this study's indicators of learning difficulties among 32 students, 30 students experienced difficulty understanding concepts, 15 students struggled with applying principles (connecting concepts to materials), and 22 students had trouble solving verbal or story problems. Recognizing patterns is a key skill in mathematics, and some students struggle to identify patterns within sequences of numbers. Teachers can guide students by exposing them to a variety of patterns, encouraging them to find similarities and differences among sequences. Regular practice with pattern recognition exercises can enhance this skill over time. Like any skill, mastering number patterns requires consistent practice. Some students might not engage with enough practice problems or variety of patterns. Educators should assign regular practice assignments, offering a mix of straightforward and challenging patterns to cater to different skill levels.

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The study contributes by 9th grade students and concentrated at number patterns. The map of mathematical understanding should be examined at different topics with more and different grade students. The relationship between students' mathematical achievement and understanding also can be investigated. In this article, the focus was on student's learning difficulties on mathematical understanding of a number pattern. Future studies may focus on the development of mathematical understanding in number patterns. Students' retention of subject matter can be enhanced through the acquisition of a mathematical and conceptual understanding. This understanding serves to prevent the material from being easily forgotten. Additionally, it is crucial to recognize that the concepts within mathematics are interconnected, thereby necessitating a comprehensive grasp of these concepts for effective learning.

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