

Preconception Profile of Children Aged 5-6 Years in

Understanding the Concept of Pattern Recognition

Wizaroh Putri¹, Ifa Aristia Sandra Ekayati²

^{1,2,3} Universitas PGRI Ronggolawe, Tuban, Indonesia

e-mail: *¹wizarohp@gmail.com, ²sandrachemistry86@gmail.com

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ABSTRACT

The ability to recognize patterns is a crucial aspect of early childhood cognitive development, as it plays a role in building logical thinking skills, problem-solving abilities, and mathematics learning readiness for the subsequent stages. However, children's initial capability to understand the concept of pattern recognition still exhibits variations, thereby requiring the identification of children's preconceptions before providing a more targeted learning stimulation. This study aims to describe the preconception profile of children aged 5–6 years in understanding the concept of pattern recognition. This study utilizes a quantitative approach with a descriptive quantitative research design. The research subjects consisted of 18 children aged 5–6 years at TK Retno Asih, who were selected using a total sampling technique so that all children in group B were included as research samples. Data collection was conducted through a checklist observation sheet that had been validated by two expert lecturers. The results showed that the preconception profile of children aged 5–6 years regarding the concept of pattern recognition is still at the early

developmental stage. The indicator for the ability to verbally state pattern sequences showed the highest achievement, while the ability to create patterns independently obtained the lowest achievement. These findings indicate that children's initial ability to understand the concept of pattern recognition still requires learning stimulation that is concrete, structured, and aligned with the cognitive developmental characteristics of early childhood.

Introduction

Early childhood is an individual in the age range of 0-6 years (Saputra Aidil, 2022) or 0-8 years (Malelak & Gea, 2023) where at this age the growth and development process is at a very high percentage, reaching 95% (Rahayu & Rahmawati, 2020). This is called the golden age (Novriyanti & Zetira, 2025). During this period, all aspects of development, both aspects of religious and moral values, physical, motor, social-emotional, and cognitive need to be stimulated appropriately in order to develop optimally (Nurpitayani et al., 2025). In addition, providing stimulation from an early age also plays an important role in building the foundation of early mathematical skills, including logical thinking, reasoning, and problem-solving skills that will develop at the next level of education (Mera et al., 2022).

At the age range of 5-6 years, children begin to show more complex development in various aspects, one of which is the cognitive aspect (Qur & Muchtar, 2025). The cognitive aspect is one of the aspects of development that has an important role because it is related to the

ability to think and understand something (Farras et al., 2025). In line with that, Fauzia (2023) stated that cognitive is also related to children's ability to acquire, process, and use information through thinking, remembering, understanding, problem-solving, and making simple decisions. At this stage, children begin to show simple logical thinking skills which are characterized by the ability to sort and group objects, connect cause and effect, and recognize patterns (Sabuna, 2024). The ability to recognize patterns is one of the important aspects of cognitive development because it is the basis for mathematical thinking skills, logical reasoning, and problem solving at the next stage of development (Harini et al., 2025). The ability to recognize patterns is one of the foundations for the development of algebraic thinking from an early age because it helps children understand order, make predictions, and build relationships between mathematical concepts gradually (Acosta et al., 2022).

Clements and Sarama in their work *Learning and Teaching Early Math: The Learning Trajectories Approach* (2009) emphasized that pattern recognition is an important foundation in the development of children's mathematical thinking. Children not only recognize repetitive patterns, but are also able to expand, continue, and start creating patterns simply. This shows that the ability to recognize patterns is an important part of children's learning readiness before entering the primary education level. Recent research has also shown that learning activities that focus on pattern recognition can help children aged 3–5 years develop

mathematical thinking skills through observing, expanding, and creating patterns gradually (Gripton, 2023). According to Piaget (in Ardiati, 2021), children aged 5-6 years are in the pre-operational stage. Where in this phase, children should already have the skills to distinguish objects, classify objects, understand patterns, and understand the relationship between cause and effect. These abilities not only help children to understand basic mathematical concepts, but also support the development of systematic thinking and problem-solving skills. Therefore, pattern recognition stimulation needs to be given appropriately by paying attention to the initial abilities that each child has.

However, the facts in the field show that the ability to recognize patterns in early childhood is still very diverse. Based on the results of initial observations on children aged 5-6 years at Retno Asih Kindergarten, it was found that out of 18 children, only 8 children were able to complete the sequence of patterns based on color, while the other 10 had not succeeded. And out of 18 children, only 6 children are able to pattern. This condition indicates variations in children's initial understanding or preconceptions regarding the concept of pattern recognition. Such variations in ability are commonly found in preschool-aged children because a child's success rate in completing pattern recognition tasks is influenced by the complexity of the patterns given and their prior learning experiences (Diago et al., 2022). These differences in initial understanding demonstrate that each child enters

the learning environment with prior knowledge (preconceptions) formed from previous experiences. Therefore, identifying children's preconceptions is an important step so that teachers can design learning experiences that match the needs and developmental levels of the children (Kambouri,M,2016).

Preconception is the understanding or knowledge possessed by an individual before receiving further instruction (Padalarang et al., 2025). In the context of early childhood education, understanding preconceptions becomes highly crucial because it can assist educators in understanding children's learning readiness and determining learning strategies that fit the children's developmental needs.

Several previous studies show that the study of pattern recognition abilities in early childhood has focused more on the development of media and learning models. Ayuni et al. (2022) aimed to develop a guidebook on pattern concepts to improve the logical thinking skills of children aged 5–6 years and obtained results showing that the developed media was effectively used in learning. Kurnia (2021) examined the effectiveness of learning models on the ability to recognize patterns and showed an increase in children's abilities after being given treatment. Harini et al. (2025) developed nature-based learning, which was proven capable of stimulating children's logical thinking skills. Novriyanti and Zetira (2025) found that the use of geometry media could improve the cognitive abilities of early childhood children. Meanwhile, Nurpitayani et al. (2025) proved that traditional

games are also capable of improving early childhood children's thinking skills. However, these studies still focus on the effectiveness of media or learning models after the learning process takes place. Not many studies have described the profile of children's preconceptions before they receive instruction on the concept of pattern recognition.

This condition indicates a research gap, namely the unavailability of information regarding children's initial abilities as a basis for formulating learning strategies that align with the developmental characteristics of the students. Therefore, this study possesses novelty in the form of describing the preconception profile of children aged 5–6 years before receiving instruction on the concept of pattern recognition. The results of this study are expected to serve as a baseline for teachers in designing learning experiences that suit the initial ability of each child. Based on the explanation of the problems and the research gap presented above, a study on early childhood preconceptions regarding the concept of pattern recognition is highly important to conduct as an effort to understand children's learning readiness before receiving further learning stimulation. Therefore, this study aims to describe the preconception profile of children aged 5–6 years in understanding the concept of pattern recognition. The results of this study are expected to provide theoretical contributions to the development of early childhood education studies, particularly on the cognitive development aspect, as well as serve as an empirical foundation for educators in designing learning strategies that align with children's developmental needs.

Method

This study utilizes a quantitative approach with a descriptive quantitative research design (Sulistyawati et al., 2022). This approach was selected because the study aims to objectively describe the preconception profile of children aged 5-6 years in understanding pattern recognition concepts, based on numerical data obtained through initial observation (pretest).

This research was conducted in Group B at Retno Asih Kindergarten with 18 children aged 5-6 years as research subjects. The sampling technique used was total sampling, meaning that all children in Group B were included as research samples because the population size was relatively small and all members of the population met the research criteria. The use of the total sampling technique is considered appropriate when the population size is relatively limited, allowing all population members to be used as research samples to obtain a more representative picture of the characteristics of the subjects under study (Etikan & Bala, 2017). Research data collection was carried out in April 2026 through initial observation activities on children's ability to understand pattern recognition concepts before receiving further learning.

The instrument used in this study was a checklist-shaped observation sheet (Sufrika et al., 2025) designed to identify the preconception profile of children aged 5-6 years in understanding pattern concepts. This observation instrument contains several

indicators of the ability to recognize patterns, which include the ability to mention pattern sequences, complete patterns, extend patterns based on shape and color, and create patterns independently. Prior to use, the instrument was validated by two expert lecturers (expert judgment) (Anuli, 2020) to ensure the suitability of indicators, clarity of the measured aspects, and the feasibility of the instrument. Assessment on the observation sheet used a score scale of 1-4, namely Not Yet Developing (BB), Starting to Develop (MB), Developing as Expected (BSH), and Developing Very Well (BSB)."

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Initial observation data (pretest) were analyzed using descriptive quantitative analysis techniques to obtain an overview of the

preconception profile of children aged 5-6 years in understanding pattern recognition concepts. The data obtained from the pretest activities were processed by calculating the total achievement score for each pattern recognition indicator, then analyzed using descriptive statistics in the form of mean values, percentages, and categorization of child development levels. Furthermore, the results were analyzed and interpreted to describe the characteristics of children's initial understanding of pattern recognition concepts based on ability indicators, which include mentioning, completing, extending, and creating patterns.

Results and Discussion

The preconception profile of children aged 5-6 years in understanding pattern recognition concepts was analyzed based on pretest results obtained through observations of the children's initial abilities in each pattern recognition indicator. The achievement results of the children's initial abilities toward pattern recognition concepts are presented in Table 1.

Tabel 1. Pretest Results

No	Childr	Indicator	Total
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	en's Names	Children are able to correctly state the sequence of a 4-serialization pattern orally	The child is able to complete a 4- item serialization pattern with 2 repetitions.	The child is able to continue a 4- item serialization pattern based on color	The child is able to continue a 4- item serialization pattern based on shape."	The child is able to create their own pattern	
1.	Ns	3	2	3	3	2	14
2.	Rr	3	2	3	3	1	12
3.	Ft	2	1	1	1	1	6
4.	Rs	2	2	3	3	2	12
5.	Inr	3	2	3	3	1	12
6.	Sy	1	1	1	1	1	5
7.	Am	2	2	1	1	1	7
8.	Ri	2	1	1	1	1	6
9.	Syi	2	2	3	3	1	11
10.	Sbl	2	2	1	1	1	7
11.	Nj	2	2	3	1	1	9
12.	Gh	2	2	1	1	1	7
13.	Ih	2	2	3	2	1	7
14.	Me	2	2	1	1	1	7
15.	Ul	1	1	1	1	1	5
16.	Fr	1	1	1	1	1	5
17.	Gn	2	2	3	3	1	11
18.	Hb	2	2	1	1	1	7
Total							150

Based on Table 1, it is known that the pretest results of the pattern recognition ability of children aged 5-6 years showed a total score of 150 out of a maximum score of 360, with a class average of 8.3. These results

indicate that the preconception profile of children in understanding the concept of pattern recognition in general is in the 'starting to develop' (MB) category. This finding indicates that most children already have an initial understanding of simple patterns, but have not yet demonstrated optimal mastery of the concept across all indicators. This result is in line with research by Ayuni et al. (2022), which shows that children's ability to recognize patterns still requires systematic stimulation in order to develop optimally.

In the pretest results data, variations in initial ability among children in understanding the concept of pattern recognition were found. These variations in ability show that each child has a different preconception, as also found by Harini et al. (2025) that children's logical thinking abilities develop gradually according to the learning experiences obtained. This finding is also supported by research from Larkin, Resnick, and Lowrie (2024), which shows that preschool-aged children are generally already able to copy, extend, and complete simple patterns, but the ability to create patterns independently is still developing gradually and requires continuous stimulation through meaningful learning experiences. Some children showed relatively better achievements, while some others were still at a low initial ability level. These variations indicate that children's preconceptions of the concept of pattern recognition have not developed evenly, so further identification is required for each ability indicator to obtain a more comprehensive overview of the form of children's initial understanding.

To obtain a deeper overview regarding the preconception profile of children aged 5-6 years in understanding the concept of pattern recognition, an analysis was conducted on the achievement of each indicator. This analysis aims to identify the form of children's initial understanding in each aspect of pattern recognition so that the ability indicators that have developed as well as those that still require further stimulation can be identified. The results of the preconception profile analysis based on the pattern recognition indicators are presented in Table 2.

Tabel 2. Children's Preconception Profile Based on Pattern Recognition

Indicators

No	Indicator	Total Score	Mean	Category
1.	The child is able to correctly verbalize a four-item seriation pattern	36	2	MB
2.	"The child is able to complete a four-item seriation pattern with two repetitions	31	1,7	BB
3.	The child is able to continue a 4-series pattern based on color	34	1,8	MB
4.	The child is able to continue a 4-series pattern based on shape	31	1,7	BB
5.	The child is able to create their own pattern.	20	1,1	BB

Based on the table above, the preconception profile of children aged 5–6 years in understanding the concept of pattern recognition shows variations in achievement across each indicator. The indicator for the ability to verbally state the sequence of a 4-series pattern achieved the highest result, with a mean value of 2.00, placing it in the Starting to Develop (MB) category. These findings indicate that the majority of children already possess an initial understanding of recognizing simple pattern regularity through verbal sequencing. This finding supports the research by Clements and Sarama (2009), which states that the ability to recognize pattern sequences is the foundation for early childhood mathematical thinking development. This ability demonstrates that children find it relatively easier to understand patterns that are concrete and can be observed directly.

Meanwhile, the indicator for continuing patterns based on color obtained an average score of 1.89, falling into the Starting to Develop (MB) category. This result indicates that children are beginning to be able to recognize the regularity of simple visual patterns, although their understanding has not yet developed consistently. This finding is in line with Novriyanti and Zetira (2025), who found that visual media helps children recognize cognitive concepts more easily compared to abstract concepts. Conversely, the indicators for completing patterns with repetition and continuing patterns based on shape showed lower achievements, with average scores of 1.72 each, placing them in the Not Yet Developing (BB) category. This condition demonstrates that some

children still experience difficulties in understanding pattern repetition rules and identifying regularity based on shape characteristics. This result aligns with research by Kurnia (2021), which shows that the ability to recognize patterns based on shape requires gradual stimulation through structured learning activities.

Meanwhile, the indicator for creating patterns independently obtained the lowest achievement with an average score of 1.11, placing it in the Not Yet Developing (BB) category. This finding is consistent with research by Harini et al. (2025), which explains that the ability to create patterns is a higher-order thinking skill that requires repeated learning experiences. The ability to create patterns requires a more complex thinking process, such as recognizing regularities, understanding relationships between objects, and generalizing previously understood patterns. Thus, the results of this study indicate that children's preconceptions of the concept of pattern recognition are still in the early developmental stages and have not yet developed optimally. Overall, the findings of this study reinforce the research results of Ayuni et al. (2022), Harini et al. (2025), and Kurnia (2021), all of which demonstrate that the development of pattern recognition abilities requires systematic, concrete stimulation that aligns with the cognitive development stage of early childhood.

Conclusion

Based on the results of the research that has been conducted, it can be concluded that the preconception profile of children aged 5–6 years

in understanding the concept of pattern recognition is still in the early stages of development. The pretest results show that the children's initial ability regarding the concept of pattern recognition has not yet developed optimally across all observed indicators. Nevertheless, some children have shown an initial understanding of simple patterns, particularly in the ability to mention pattern sequences verbally and recognize visual-based patterns, specifically colors. These findings indicate that children tend to more easily understand patterns that are concrete, easily observed, and can be recognized through direct visual experience. These results also show that visual representation provides stronger support for early childhood thinking processes compared to more abstract presentations. The use of real objects, colors, and shapes that are easily observed helps children recognize regularities and build relationships between elements in a pattern. On the other hand, children's abilities in completing patterns with repetition, recognizing patterns based on shape, and creating patterns independently still show relatively low achievements. Future research is suggested to develop learning interventions that focus on improving the ability to create patterns independently and involve a wider number of subjects so that the research results have greater generalizability.

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