

# Description of Process Skills of Students with Dyscalculia in Understanding the Concept of Counting Operations Through Ethnomathematics

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## ABSTRACT

Mathematics is fundamental in daily life and education, yet students with dyscalculia face significant challenges in mastering basic arithmetic operations. This study investigates how the ethnomathematics approach can develop process skills among students with dyscalculia. Using a qualitative descriptive method, two grade-six students with different levels of dyscalculia were studied through observations, tests, and interviews. Results indicate that students with moderate dyscalculia (S1) demonstrated progress in classification and calculation with minimal guidance, while those with severe dyscalculia (S2) required intensive support and showed limited progress. This suggests that ethnomathematics, which integrates cultural and contextual learning, is effective for students with learning disabilities but requires adaptation based on severity levels. Findings highlight the potential of culturally relevant methods in enhancing mathematical skills.

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## 1. INTRODUCTION

Mathematics is one of the subjects taught from elementary school to university. Mathematics is considered a field of study that supports the development of science and technology and supports social and cultural sciences. This is because mathematics is based on concepts and processes that are logical, systematic, and loaded in everyday life. However, sometimes mathematics becomes a scourge for some students because of the inability and difficulties students have in understanding abstract mathematical concepts [1].

Success in learning mathematics can be obtained if students can master concepts. Concept understanding is an ability that is concerned with understanding mathematical ideas that are comprehensive and functional. Understanding concepts is more important

than memorizing them [2]. Concept understanding is a fundamental and important stage in mathematics learning [3]. Understanding basic concepts will help students develop more effective problem-solving skills, increase self-confidence, and reduce confusion when facing difficult math problems. The ability to understand the basic concepts of arithmetic operations at the elementary school level is an important mathematics material because the material focuses on understanding counting skills related to basic arithmetic operations such as addition, subtraction, multiplication, and division [4].

Understanding and mastering math materials requires consistent practice through process skills. Process skills are skills in learning activities that focus on student activeness and creativity in developing specific skills [5]. Process skills involve various skills, namely cognitive or knowledge, manual, and social skills [6]. The process skills approach is student-centred, where students are asked to develop their skills [7].

The purpose of process skills is to develop students' creativity in learning so that students can actively develop and apply their abilities [8]. Unfortunately, some students still experience learning difficulties and disorders that affect their understanding and success in mathematics lessons [9]. Students with learning disorders usually face difficulties in the learning process, such as losing concentration, forgetting quickly, and having difficulty reading, writing, and counting [10]. One of the students who have difficulty in the learning process is students with dyscalculia. Dyscalculia is a learning disability with one of its characteristics, namely chaos in counting [11].

Based on observations made at one of the State Special Schools (SLBN) in Jambi City, some students had difficulty reading, counting, and combining both. Initial observation data showed that two grade 6 SLBN students experienced dyscalculia disorder. Difficulty calculating and applying a basic math formula is one of the obstacles to these students' learning outcomes, which are not under those of other students. With the right approach, these students with dyscalculia should overcome their difficulties and succeed in learning mathematics.

One way that can be done is by using an ethnomathematics approach. Applying ethnomathematics is expected to improve students' ability to learn mathematics to a maximum [12]. This is because there is a link to everyday culture in the learning process. This statement aligns with other researchers who say that ethnomathematics is a collection of knowledge from the mathematical thinking of a community group environment [13]. The results of previous research also show a positive effect of ethnomathematics on students' mathematical understanding in terms of better identifying, translating, and interpreting mathematical symbols [12]. Previous research shows that applying the ethnomathematics approach provides a holistic solution to math learning difficulties, helping students with disabilities understand mathematical concepts and apply this knowledge practically in various situations [11].

One way to utilize ethnomathematics knowledge in schools is to make knowledge about ethnomathematics a reference material in making learning media under students' cultural backgrounds [14]. Ethnomathematics serves to express the relationship between culture and mathematics. Thus, ethnomathematics is a science used to understand how

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mathematics is adapted from a culture [15]. Ethnomathematics integrated into traditional games can have a significant positive impact on student learning.

One of the traditional games that is suitable for ethnomathematics learning is congklak [16]. The congklak game is a game that has a very high cultural value, especially in Indonesia, and can develop aspects within students, can teach counting, make strategies while playing, and help children recognize numbers and simple math introductions that exist in everyday life [17].

The difference between this research and previous research is its more specific focus, namely on analyzing patterns of mathematics learning difficulties in understanding the concept of arithmetic operations in special elementary school students with learning difficulties, especially dyscalculia. This research not only identifies students who experience dyscalculia but also uses samples that are appropriately matched to the problems found so that the results are more relevant and accurate. In addition, this study provides a more in-depth analysis of the patterns of mathematics learning difficulties in students with dyscalculia by utilizing an ethnomathematics-based process skills approach. This approach pays attention to academic aspects and considers the local cultural context, which can help students understand the basic concepts of arithmetic operations. Thus, this research seeks to make a more in-depth and practical contribution to improving mathematics understanding for students with dyscalculia by integrating ethnomathematics and process skills in learning. Based on this statement, the researcher researched "Description of Process Skills of Dyscalculia Students in Understanding the Concept of Calculation Operations through Ethnomathematics."

## **2. METHOD**

This study employed a qualitative descriptive method to explore the process skills of students with dyscalculia in understanding arithmetic operations through an ethnomathematics approach. The research was conducted at SLBN Prof. Dr. Sri Soedewi Masjchun Sofwan, Jambi, during the odd 2024/2025 academic year semester. This research focuses on observation, test questions, interviews, and analysis of student interactions during the learning process to get a comprehensive picture of how ethnomathematics can help students with disabilities understand the concept of counting operations. This research is also supported by systematic data analysis techniques and qualitative research methods, which are carried out by categorizing, interpreting, and confirming findings based on data obtained in the field.

### **Research Instruments**

The instruments used in this research are the main instrument and supporting instruments. The main instrument is data from words and actions obtained through the subjects observed and researched. Supporting instruments in this study are test questions and interviews with research subjects.

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### Research Subject

Two sixth-grade students diagnosed with dyscalculia participated as research subjects. The severity of their dyscalculia was determined through teacher recommendations and initial assessments based on their performance in basic arithmetic tasks.

### Data Collection Technique

The data collection techniques used in this study are observation, test questions, and interviews, which are as follows:

1. Observation. Researchers observed the students during three specific learning sessions involving arithmetic tasks integrated with cultural contexts (e.g., congklak games). Observations focused on interactions, task participation, and the use of tools.
2. Tests. Students were given three arithmetic problems (addition, subtraction, multiplication) to assess their process skills, including observation, classification, and interpretation.
3. Interviews. Semi-structured interviews were conducted alongside the test sessions to understand students' thought processes and problem-solving difficulties. Questions included "How do you interpret this problem?" and "What steps did you use to solve it?"

### Data Analysis

Data were analyzed using the Miles and Huberman framework, including data reduction, display, and conclusion drawing. Observational data, test results, and interview transcripts were categorized into themes related to process skills indicators, such as observation, classification, and prediction.

### Data Validation

In this study, technical triangulation is used, which involves checking data from the same source using different techniques [18]. Triangulation was applied by comparing findings from observations, tests, and interviews. This ensured consistency and reliability in the interpretation of students' abilities.

### Research Procedure

The research procedure in this study went through three stages, namely:

1. The pre-field stage starts with identifying students who meet the criteria as research subjects, submitting a research proposal, submitting a request for permission to conduct research, compiling research instruments, and submitting a research permit to the school;
  2. The implementation stage starts with making observations by providing arithmetic operation material that integrates ethnomathematics, analyzing all data collected, and testing data credibility;
  3. The data analysis starts with reducing data from observations, tests, and interviews, presenting the data, and finally drawing conclusions.
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### 3. RESULTS

#### 3.1. First Meeting Specific Learning

Observations, tests, and interviews were conducted, with the results obtained show that the first subject, who will be called S1, showed good observational ability in understanding changes in the number of congklak seeds, was able to classify congklak seeds for addition well and showed appropriate classification skills in addition operations. S1 also showed a good ability to follow instructions by adjusting the number of congklak seeds according to the given problem. S1 was able to collect and analyze data from the problem correctly. S1 can also interpret simple example problems without assistance. S1 also understood the relationship between addition and congklak seeds well. S1 showed good results in each indicator. The statement aligns with the interview data conducted with S1, which shows that S1 can understand the given problem. One of the interview excerpts with S1 is presented as follows:


*P : Now try to mention what to look for in this problem!*

*S1 : Count the number of marbles collected by Dimas for two days and the number of marbles collected by Tono for two days, and calculate the total marbles collected by Dimas and Tono.*

*P : Is there any part of the question that you still do not understand?*

*S1 : No, ma'am, I understand everything.*

The same activity was carried out with the second subject, which will be called S2, but the results obtained were the opposite. S2 experienced problems at each stage given, ranging from difficulties in the observation process, errors made in interpretation, errors in checking the results of observations to difficulties in explaining the results of the summation obtained. S2 requires much direction and guidance from researchers during the research process. The following is one of the test results conducted by S2, which can be seen in Figure 1. namely:



Penyelesaian:

$$17 + 15 = 34$$
$$8 + 10 = 20$$
$$34 + 20 = 54$$

Figure 1. Results of S2 Answers at the Stage of Carrying out Research

Based on Figure 1. above and on the data obtained in the field, it is known that the addition process carried out by S2 shows an error. Although there are several correct questions, S2 experiences doubts about adding data accurately, so these errors occur. After being given direction and guidance by researchers, S2 could finally communicate the results of his calculations, explaining the information obtained in the problem, although there was a slight delay.

### 3.2. Second Meeting Specific Learning

Observations, tests, and interviews were conducted, with results showing that the first subject, who will be called S1, showed good observational skills in understanding changes in the number of congklak seeds. S1 can also fulfil each indicator well, and it is just that students have difficulty when the number given is significant on the indicator of making predictions. S1 could classify and solve the problems given during the test and interview, although it took longer. S1 is also quite thorough in solving the given problem. As for one of the interview excerpts with S1, who conveyed the information he obtained based on the subtraction problem is as follows:

*P : How do you convert the information in the problem into calculation form? Can you explain the steps?*

*S1 : First, I wrote down the 15 candies bought, then subtracted the same candy given to his sister: five candies.*

*P : Nice! Let us take a closer look now. How many candies did Kemal buy at the beginning?*

*S1 : 15 candies ma'am*

*P : Now, how many candies did Kemal give to his sister?*

*S1 : He gave me five candies. Mom*

The same activity was carried out with the second subject, which will be called S2, but the results obtained were the opposite. Based on the data obtained in the field, S2 seemed hesitant to distinguish the group of reduced seeds from the rest. S2 also had difficulty in fulfilling the indicators assessed. So, it was concluded that at this second day's stage, S2 still needed more guidance in solving the problems given. One of the results of S2's answers in doing the test can be seen in Figure 2. following:

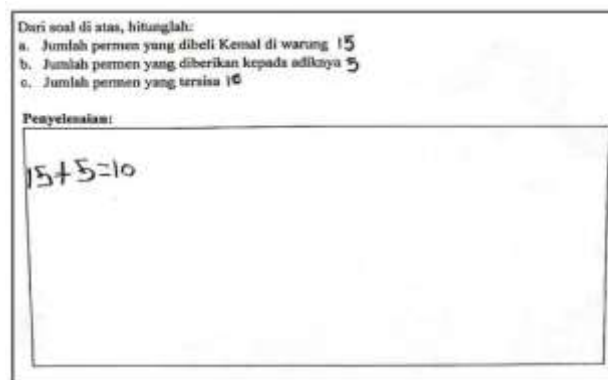


Figure 2. Results of S2 Answers at the Stage of Carrying out Research

Based on Figure 2. above, it can be seen that S2 is wrong in performing the subtraction process, where the results given are correct, but the steps and symbols contained in the solution steps are wrong. This statement made the researcher conclude that S2 needs more intense guidance in the learning process.

### 3.3. Third Meeting Specific Learning

Observations, tests, and interviews with the results obtained show that the first subject, who will be called S1, can interpret and even work on multiplication problems. However, S1 has experienced confusion several times in solving problems and needs help and direction from researchers, but overall, S1 is said to be able to fulfil the research indicators. This statement can be proven through the thoroughness carried out by S1 during the research process, as well as the results of S1's test, which can be seen in Figure 3. as follows:

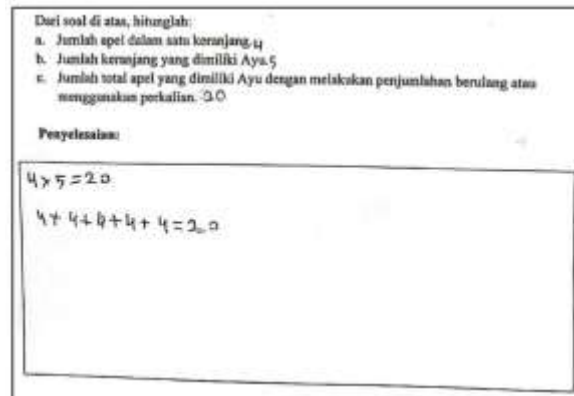


Figure 3. Results of S1 Answers at the Stage of Carrying out Research

Based on Figure 3. above, it can be seen that S1 can describe the problem given. The subject S1 also affixes two steps to solve: direct multiplication and explanation by utilizing the addition operation.

The same activity was carried out with the second subject, which will be called S2, but the results obtained were the opposite. Based on the data obtained in the field, S2, on the third day, still showed the same difficulties in problem-solving. S2 had difficulty in each indicator, including the grouping indicator, determining relationships, and other indicators. S2 also had difficulty communicating the multiplication results obtained verbally; S2 could only mention the final result without being able to explain the repetition or grouping process that had been done. Therefore, the researcher concluded that S2 needed further guidance regarding his problems. One of the interview excerpts with S2, who was unable to explain the steps used, is as follows:

*P* : Now, how do you convert the information in the problem into calculations? Can you explain the steps?

*S1* : Do not know mom

*P* : You already know the information in the problem, and from there, how do you make calculations from the problem so that it can be calculated?

*S1* : Oh, write it down, ma'am.

From the results of the data obtained by these two subjects, low and high dyscalculia categories were obtained. High dyscalculia in this study is a student who has a math learning disorder where students still have difficulty or are mistaken in recognizing numbers, are still difficult and often incorrect in calculating addition, subtraction, and

multiplication operations, and take longer to calculate and understand the problem. Low dyscalculia in this study is a student who has a math learning disorder where students can recognize numbers and the results of addition, subtraction, and multiplication calculations, and they take faster time to understand the problem than high dyscalculia.

## **4. DISCUSSION**

### **4.1. Indicators of Observing and Classifying Process Skills in Identifying and Making Examples and Non-Examples**

Based on the data that has been presented, S1 and S2 undergo the process of observing skills. Students with dyscalculia disorders often have difficulty understanding problem instructions due to difficulties translating words into appropriate mathematical operations [19]. This condition is seen in S1 and S2, which shows that both need direct guidance to overcome confusion in understanding basic information from the problem. Students with learning difficulties can hone their observation skills gradually through consistent guidance [7].

Classification skills in students with dyscalculia require more intensive support from teachers to help them logically understand the basics of classification and group information. This statement is supported by the research results, which state that process skills focus on results and learning through assistance that supports student activeness and involvement [5]. This also confirms the importance of an appropriate teaching approach for students with dyscalculia. A process skills approach that focuses on direct experience and consistent support in the learning process [7].

### **4.2. Indicators of Process Skills: Ability to Collect and Analyze Data and Ability to Interpret Data in Translating and Interpreting the Meaning of Symbols, Tables, Diagrams, Figures, Graphs, and Mathematical Sentences**

The ability to collect and analyze data is a basic skill that includes collecting and presenting information in a form that is easy to understand [20]. In students with dyscalculia, these skills often experience obstacles, mainly due to difficulties in identifying, categorizing, and interpreting mathematical information. S1 could follow instructions in essential data collection with help from the teacher. Students with dyscalculia often have difficulty translating verbal instructions or information into appropriate mathematical symbols, as seen in S1 when dealing with more complex data [19]. S1 tends to make minor errors in interpreting symbols and operations, while S2 is often confused in identifying important, relevant information and tends to be wrong when translating data into mathematical symbols or operations. The learning process should involve assistance and guidance to gradually help students acquire cognitive skills [21].

S1 can interpret simple data but needs help for more complex problems. This shows limitations in mathematical understanding, which is important so that students can apply concepts in various situations [22]. Meanwhile, S2 with high-level dyscalculia relies heavily on teacher guidance to understand data, even basic problems. Students with dyscalculia need a more targeted approach to understanding abstract concepts [11].

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### ***4.3. Indicators of Process Skills Determining Relationships, Measuring, and Counting in Understanding and Applying Mathematical Ideas***

S1 can understand basic relationships in addition and subtraction but needs guidance in more complex problems. Process skills help students gradually understand concept relationships [23]. Meanwhile, S2, who has a high level of dyscalculia, has difficulty understanding simple relationships between numbers and relies heavily on guidance. Dyscalculia is often characterized by weaknesses in basic operations that hinder understanding of number relationships [24].

S1 can understand basic measurements in simple operations such as addition and subtraction. However, when faced with more complex measurement contexts, he needs time and guidance to understand the relationship between mathematical measures and values. In contrast, S2, with high levels of dyscalculia, had more significant difficulties in measuring and identifying relationships between numbers, even in basic operations. A process skills approach that focuses on direct and gradual learning is advantageous in overcoming the barriers of students with dyscalculia so that they can more easily understand basic concepts in measurement [7].

S1 can show good accuracy in calculations, although he sometimes needs to repeat the calculations to ensure the answer is correct. S1's ability to use tools such as congklak seeds as number representations allows him to be more independent and consistent in basic operations. S2, with high-level dyscalculia, had great difficulty recognizing numbers and performing simple calculations. S2 often makes repeated errors and requires intensive direction from the teacher. Ethnomathematics allows students to understand mathematics in a context more relevant to their culture, such as using congklak seeds in traditional games that enrich their understanding of number operations and basic math concepts [12].

### ***4.4. Indicators of Process Skills: Making Predictions (Forecasts), Carrying out Research (Experiments), and Communicating Results in Making an Exploration (Estimate)***

S1 showed a good ability to make predictions, especially on small numbers, using tools such as congklak seeds to verify the results. While S2 often hesitates and guesses the results without understanding the initial data. Students with dyscalculia often struggle to understand numbers and basic math operations [11]. Students with dyscalculia need adaptive strategies [25]. Thus, S1's prediction skills are more developed than S2's, which indicates the importance of a contextual-based approach to help students with dyscalculia understand mathematical concepts in depth.

The difference in S1 and S2 abilities shows the importance of learning approaches that are tailored to the level of student needs. A hands-on, experience-based approach, such as the game of congklak, was effective in helping S1 apply concepts and communicate experimental results. Direct experience and interaction with tools can improve student understanding [7]. However, S2 requires more targeted and intensive learning strategies to help them overcome difficulties, such as repetition of simple steps and more personalized guidance. This supports the importance of an ethnomathematics-based approach, which

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connects mathematical concepts with contextual tools to make learning more relevant and meaningful [12].

S1 showed a good ability to communicate the experiment results, while S2, who belongs to the high dyscalculia category, showed significant difficulties communicating the results. This difference emphasizes the importance of adaptive learning approaches, such as using tools and hands-on experiences [7]. Tools such as the congklak helped S1 understand and explain the results systematically. However, S2 needs intensive guidance to improve his communication skills. Thus, a process skills-based approach can help students develop better communication skills according to their level of need.

## 5. CONCLUSION

Based on the research results on two students with dyscalculia, significant differences were found in the difficulty each student experienced in understanding mathematical concepts. The first subject (S1), who has a moderate level of dyscalculia, shows a better ability to understand the relationship between mathematical concepts, especially in terms of observing, calculating, and measuring. The second subject (S2), which had a high level of dyscalculia, had more significant difficulties understanding basic math operations.

The process skills analysis showed that both students met the indicators of mathematical process skills. The first subject (S1) showed better progress and was more independent in problem-solving, while the second subject (S2) required greater support in each step of the learning process. The process skills possessed by both students serve as indicators in determining the success of mathematics learning, which suggests that despite the different levels of dyscalculia, an adaptive approach can help the mathematical skills of students with dyscalculia.

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