MATHEMATICS PROBLEM SOLVING THROUGH MAKE-A-DRAWING STRATEGY FOR ELEMENTARY SCHOOL STUDENTS WITH MILD INTELLECTUAL DISABILITY

PEMECAHAN MASALAH MATEMATIKA MELALUI STRATEGI MAKE-A-DRAWING UNTUK SISWA MILD INTELLECTUAL DISABILITY DI SEKOLAH DASAR

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Abstract

Mild intellectual disability are children who have below-average IQ. This study aims to describe the ability of a student with mild intellectual disability to solve mathematics problems using the make-a-drawing strategy. The method used in this research was qualitative research. The subject was a student with special needs who was in grade IV but had a grade-1 level of ability. The data collection process was carried out using an interview and a test. The data validity test conducted in this study involved the triangulation technique. The qualitative data analysis stage consisted of four steps: data collection, data reduction, data presentation, and the last stage involved drawing conclusions and verification. The results showed that the make-a-drawing strategy could facilitate mild intellectual disability students to develop mathematical problem-solving skills, strengthen their understanding of concepts, and increase their confidence in dealing with various daily mathematical situations.

Keywords: Mathematics Problem Solving, Make-a-Drawing Strategy, Mild intellectual disability

1. Introduction

Inclusive education in Indonesia has a big impact. The principle of education inclusion is to ensure that every individual, without looking at the background behind or need specifically, has the right to get equal and quality education (Mujiafiat & Yoenanto, 2023; Zamista, 2022). By entering students with special needs into an environment of inclusive learning, we give them a chance to develop potency fully. Inclusive education also plays a role in building a more inclusive and tolerant society. Interaction between students with special needs education and others can increase understanding, tolerance, and acceptance of diversity, creating a base for a diverse society. Apart from that, inclusive education creates an environment in which students can study and work with individuals who need education specifically, preparing them to live and participate in an increasingly diverse society. By understanding and appreciating diversity within a class, Indonesian students who experience education are also more inclusive and ready to face global challenges in the future.

Inclusive education in Indonesia has a base strong jurisdiction for ensuring access to equal education for all students, including those who have special needs. The 1945 Constitution of the Republic of Indonesia guarantees the right of every citizen to get an education. Constitution Number 20 of 2003 concerning The National Education System provides a base law for inclusive education, and Law Number 8 of 2016 concerning Incumbent Disability forbids discrimination in access to education and guarantees inclusive education for disabled persons. Regulation Government Number 19 of 2017 specially arranged inclusive education, affirming the right of every participant to be educated without discrimination (Pala, Rahman, & Kadir, 2020; Septantiningtyas & Hasanah, 2022). In addition, the Convention on the Rights of the Child stipulates the right of every child to get a quality education and pay attention to children with special needs, including children with disability.

One of the challenges faced in this context is providing effective learning for students with mild intellectual disability. Students with mild intellectual disability often face difficulty in understanding the draft of mathematics and methods of conventional learning, which are not adequate for fulfilling their needs. Mild intellectual disability is a term used to describe the level of difficulty in functioning in a more intellectual light compared to the level of more difficulty critical in disturbance development intellectual (Sherawat & Punia, 2022). Children with mild intellectual disability have intellectual limitations that can influence their abilities in a matter of understanding, learning, and adapting to the environment around them.

Some factors often hamper the ability to solve mathematics problems in students with mild intellectual disability. Students struggle to understand draft mathematical nature abstracts, like formulas or connection complex mathematics (Trichas, 2022). A limited understanding of instructions and mathematics complexes also becomes a constraint in elaborating problems and formulating solutions. Apart from that, there are limitations in processing information that can challenge mild intellectual disability students to recognise patterns, relationships, or the steps involved in solving mathematics problems (Hord, 2023). Challenge addition appears in understanding context problems, which can make it difficult for students to hook knowledge of mathematics with real-world situations. Besides that, a limitation in metacognitive abilities, like awareness about the thought process, strategic planning, and evaluation solution, also possibly influences the ability to solve mathematics problems for mild intellectual disability students (Heward, Sheila, & Alber-Morgan, 2017). Although so, it is necessary to remember that

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every student is a unique individual, and the identification of strengths as well as individual needs can open the road for more effective learning strategies. An inclusive approach that takes into account differences and adjustments to the appropriate curriculum can help create an environment supportive of learning development of solving problem mathematics ability in students with mild intellectual disability.

Based on the previous study results, there were indicative findings of low ability to solve mathematics problems in students with mild intellectual disability. The research tends to show a number of challenges specifically faced by students with mild intellectual disability in the mathematics domain (Prabavathy, Sivarajani, & Alex, 2023). A number of studies highlight the difficulty of students with mild intellectual disability in understanding draft mathematics basics, like operation arithmetic, measurement, and geometry. Limitations in stringing information and difficulties in transferring knowledge of mathematics to real-world situations also become primary attention (Schnepel & Aunio, 2022). A number of researches also show low ability metacognition in students with mild intellectual disability, which includes difficulty in planning a solution strategy problems, monitoring thought processes, and evaluating the resulting solution (Wojcik & King, 2022).

This research supports the understanding that students with mild intellectual disability often need more approaches to intensive learning and focus on their individual needs. Additionally, the results of the study emphasize the importance of developing learning strategies that can facilitate understanding draft mathematics more concretely and contextually for students with mild intellectual disability (Andriani & Kusumastuti, 2022). With existing awareness of low-ability solution problem mathematics in students with mild intellectual disability, this research can become a base for the development of more effective learning strategies and adaptable curriculum use to increase achievement students’ mathematics with mild intellectual disability (Heward, Sheila, & Alber-Morgan, 2017). In the context of inclusion, efforts to create a supportive environment and encourage learning progress in mathematics for students with mild intellectual disability become more important to ensure accessibility and academic success. One potential strategy to help students with mild intellectual disability understand and solve problem mathematics is through the make-a-drawing strategy or picture strategy. Images can become an effective visual tool for clarifying draft mathematics, stimulating understanding, and helping students overcome obstacles and cognitive possibilities they face.

Children with mild intellectual disability tend to have strength in visual understanding, and the make-a-drawing strategy provides the ideal container for describing concepts of mathematics through pictures or diagrams. By using the make-a-drawing strategy, complex draft mathematics can be sorted to become more simple parts, making it possible for children to understand the steps of solving problems in a more detailed way (Andriani & Kusumastuti, 2022). Apart from that, you can also make a drawing strategy to stimulate the involvement child in learning mathematics, giving elements creative and fun that can increase their motivation to study. The pictures make it possible for children to be more involved in solving problems, which in turn can awaken the study spirit (Lithner, 2017). The make-a-drawing strategy increases the communication skills of children with mild intellectual disability. They may convey an understanding of draft mathematics with more clarity and effectiveness.

By designing representative images to solve math problems, children can stimulate their cognitive skills, like observation, analysis, and synthesis. This approach
also supports the individual learning style of students with mild intellectual disability because it gives them flexibility in expressing their ideas visually. Overall, the integration of the make-a-drawing strategy in learning mathematics can give more access to concepts of mathematics, strengthen problem-solving ability, and improve the study experience for children with mild intellectual disability.

This research helps to develop inclusive teaching strategies, enabling students with mild intellectual disabilities to more easily understand and solve mathematics problems, thus ensuring that all students have equal opportunities for quality education. In addition, by finding effective ways to teach mathematics to students with mild intellectual disabilities, this research contributes to developing essential basic life skills, which can improve their independence and quality of life. Furthermore, this research provides new insights into how visual strategies such as creating pictures can aid the understanding of mathematical concepts, helping teachers develop more effective and adaptive teaching methods to suit the needs of students with varying ability levels.

Although a number of studies have explored learning strategies for students with special needs, there is still a lack of in-depth research about the use of the make-a-drawing strategy in the context of students with mild intellectual disability, especially in problem-solving mathematics. Besides, it is necessary to notice that every student with mild intellectual disability has different needs and potential, so it is important to identify possible learning strategies adapted individually. Understanding the make-a-drawing strategy can help students with mild intellectual disability solve problems in mathematics, giving a new outlook for developing learning methods that are more inclusive, effective, and possibly customised to the needs of each student. This study is expected to make a significant contribution to understanding learning mathematics for students with mild intellectual disability. Therefore, this research aims to: (1) describe the cognitive ability of students with mild intellectual disability (subject research), (2) describe the use of the make-a-drawing strategy to increase the problem-solving ability of mathematics in students with mild intellectual disability, (3) describe the problem-solving ability of a student in answering questions.

2. Research Method

In this research, the researcher applied a qualitative research approach. A qualitative approach is carried out in a field location with the aim of describing an understanding, symptom, or description of a particular phenomenon that is presented narratively (Creswell, 2014). This research was carried out at SDN Ganadaria Utara 03, South Jakarta. The subject of this research was one student with mild intellectual disability with initial DAR who was in grade 4 but had an ability level equivalent to grade 1. The research instruments were a test and interview sheet. Problem-solving ability test is presented in the following table 1:

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the shop, one box of pencils contains ten pencils. If four boxes of pencils are on the shelf. How much is the total number on the shelf?</td>
</tr>
<tr>
<td>2</td>
<td>Mr. Ahmad bought 5 litres of milk. After drinking 2 litres, how many litres of milk remain there?</td>
</tr>
</tbody>
</table>

Table 1. Solving-Problem Capability Test
The data validity test carried out in this research involved technical triangulation. According to Sugiyono (2016), triangulation is a combination of various data collection techniques and available data sources. In the context of this research, qualitative descriptive data analysis techniques were applied to gain an understanding of students' abilities in solving mathematical problems. Technical triangulation refers to testing the credibility of data by examining data from the same source but using different techniques. The qualitative data analysis stage consists of four steps, starting with data collection, data reduction, data presentation, and the final stage involves drawing conclusions and verification. This approach ensures the accuracy and reliability of the data by confirming information obtained from different but relevant sources in the context of this research.

3. Results and Discussion
3.1 Results
3.1.1 Condition of the Research Subject
DAR is a nine-year-five-month-old student of class 4 at SDN Gandaria Utara 03 who has uniqueness in cognitive and verbal trends. In assessing cognitive ability, DAR has been diagnosed with mild intellectual disability by a psychologist, who indicated a challenge in finishing mathematics problem-solving and other cognitive aspects.

With a general level of intelligence of 55, verbal intelligence of 60, and performance intelligence of 58, DAR faces challenges in processing information, especially in verbal contexts and tasks performed. Every individual's potential uniqueness and diversity can become a source of strength. Although she/he faces difficulty in cognitive and verbal abilities, DAR has extraordinary courage and perseverance. The learning process possibly needs more approach, specials, and support from the environment, school, or family. Understanding can become essential for developing its potential in a supportive and fulfilling environment.

In supporting DAR, it is essential to understand individual uniqueness and needs. Through a holistic approach and the proper support, DAR has the potency to develop and explore various talents and interests. Giving opportunities and an inclusive environment can contribute positively to its development.

3.1.2 Mathematical Problem-Solving through the Make-a-Drawing Strategy
Before teaching a child with a mild intellectual disability at school, the homeroom teacher did a learning preparation plan. The purpose of planning is to clearly describe the steps that will be taken to carry out the learning process. The teacher used a lesson plan, and it was necessary to note that there were special programs, such as individual learning programs, prepared specially for children with mild intellectual disability. However, the teacher added information related to children in the class, describing ability first, then in
activity learning, there were special activities used or done for DAR. The teacher made adjustments in its implementation. Adjustment covered subtraction material and declined difficult-level material. With this, the teacher tried to accommodate the needs of children with mild intellectual disability in the learning process. As seen in the results of the interview with the teacher:

“Evaluation is formative and done periodically to monitor the development of students. It is vital to give bait to come back optimistic and plan appropriate improvement strategies. The challenge I am facing is providing support in addition to my needs. Collaboration with team support and open communication with parents is essential. However, with good cooperation, we can overcome various challenges and focus on the development of a cheerful child”. (Teacher_FFR)

The teacher started planning learning with an evaluation that was comprehensive to the needs and abilities of the child. Through collaboration between parents and psychologists, the teacher tried to understand the deep needs of children to create an appropriate learning environment. After identification, the need was specific; the next step was to adapt the curriculum with detailed achievement, learning process, and material to be appropriate to the child's level of understanding. In the assessment process, the teacher periodically used a formative evaluation and adjusted the assessment method to suit the child’s needs.

3.1.3 Mathematical Problem-Solving Ability of Children with Mild Intellectual Disability

Figure 1. Results of Using the Make-A-Drawing Strategy on Question Number 1

From the results of figure 1, DAR visualisation using images and interviews, we could understand that there was one box containing ten pencils and four boxes of pencils on the shelf for the identification problem. In determining the solution strategy problem, DAR created a picture or visual representation of the situation problem. DAR made picture box pencils and showed the amount of pencils in each box. This helped DAR to visualize the total number of pencils on the shelf. Throughout the interview, she/he showed that she/he could count the pencils and add them to get the total number of pencils on the shelf. In terms of this, every box had ten pencils, and because there were four boxes, DAR multiplied ten by 4 to find an answer. In stages of reflection and checking
the return answer, DAR verified the return solution with the picture already made and confirmed that the answer was by the description problem.

Figure 2. Results of Using the Make-A-Drawing Strategy in Question No. 2

The results of figure 2 showed that DAR visualization overcame mathematics problems by following the Polya steps and using image strategies. First, DAR understood the problem by carefully reading the question and knowing Mr. Ahmad had 5 litres of milk. After drinking 2 litres, DAR determined how many litres of milk were left. Next, after understanding the problem, DAR planned the solution. This step could be followed by a picture depicting a milk container with a volume of 5 litres, which showed a 2-litre reduction in total. Making pictures can help students with mild intellectual disabilities visualize and draft mathematics more suitably. After the plan solution, DAR carried out the plan with operation reduction: 5 litres of milk - 2 litres of milk. This process, shown in figure 2, helped visually understand the subtraction steps. After the calculations were finished, DAR evaluated the result. In terms of this, she/he must ensure that the answer was 3 litres of milk, as appropriate with a question.

Figure 3. Results of Using the Make-A-Drawing Strategy on Question Number 3

From figure 3, DAR understood the problems by carefully reading this; DAR understood that there were three groups of birds in the park, and every group contained six birds. After understanding the problem, DAR planned a solution using Polya steps. The first step was identifying what was known and should be searched for. DAR said the number of group birds (3) and the quantity of birds in every group (6). The total number of birds in the park was necessary to search for. DAR made a picture or a visual representation showing every bird group and the number of birds in it. Next, implementation planning added up the birds in every group. The operation mathematics involved was multiplication: 3 groups x 6 birds/group = total number of birds in the park.
In stages of reflection and rechecking the answer, DAR did not answer the question from the teacher.

Figure 4. Results of Using the Make-A-Drawing Strategy on Question Number 4

In figure 4, DAR understood the problem that Tono initially had 18 candies and gave two candies to his sister each day. DAR needed to find the amount. Today, Tono gave candy to his sister without remainder. After understanding the problem, DAR planned the solution. The first step was identifying what was known and should be searched for. It was known that Tono had 18 candies and gave two candies every day. Searching for how many Tono gave candy today without remainder was necessary. DAR made representative images of candy beginning and candy given every day. The next step was to carry out the plan using operation mathematics. DAR used distribution: 18 candies/2 candies/day = total day. DAR described the steps in the picture to help understand them.

Figure 5. Results of Using Make-A-Drawing Strategy on Question Number 5

Figure 5 shows that DAR understood the problem that in the field, there were four groups of children playing ball, and every group contained eight children. DAR searched for the number of children playing football on the field. After understanding the problem, DAR planned the solution. The first step was identifying what was known and should be searched for. DAR conveyed that there were four children, and every group contained
eight children. The total number of children playing football on the field was necessary to search for. DAR made a representative image of the group and the number of children in it. The next step was to carry out the plan using operation mathematics. In terms of this, DAR used Multiplication: 4 groups x 8 children/group = total number of children. DAR described the steps in the picture to help understand them. After calculating, DAR evaluated the result. You were looking for the following result: the total number of children playing football on the field.

3.2 Discussion

The results of this research presented the profile of DAR, a child aged 9 years 5 months with unique cognitive and verbal tendencies. Diagnozed with mild intellectual disability (MID), she/he showed that in facing challenges in solving mathematical problems and other cognitive aspects, she/he still needed special help. Students with mild intellectual disability need direction to be able to determine what strategy or method to use in solving the given problem. Apart from that, students are also unable to develop these strategies to solve problems (Suryadinata & Farida, 2016). However, this profile emphasizes that each individual has her/his potential and uniqueness, and this diversity can be a source of strengths. DAR also showed extraordinary courage and perseverance in her/his learning process.

The homeroom teacher of DAR adopted a holistic approach to planning lessons to support her/his special needs. Even though there is a special learning plan, such as an individual learning program, the teacher made adjustments to implement regular lesson plans. These adjustments included reducing material and decreasing the difficulty level of material. The teacher also engaged in formative assessments periodically to monitor student's progress, provide positive feedback, and plan appropriate improvement strategies. Thus, DAR was able to participate in mathematics learning and was able to solve problems even though it still required special strategies and material adapted to the abilities of students with mild intellectual disabilities, in line with the findings of Yuniarti & Subasno (2020), variations in learning needed to be made so that boredom did not occur when students with mild intellectual disabilities carry out the learning process.

The make-a-drawing strategy, or making a picture in solving mathematical problems, has proven to be effective for DAR. Through visualization and visual representation, DAR was able to understand mathematical problems better. Polya's steps, namely understanding the problem, planning a solution, implementing the plan, and evaluating the results, were followed well by DAR. The examples in the figures showed that DAR used the make-a-drawing strategy to solve various types of mathematical problems, such as calculations, basic mathematical operations, and understanding mathematical concepts (Gersten, Chard, Jayanthi, Baker, Morphy, & Flojo, 2009; Sambathrani, 2023; Trichas, 2022).

The results of this research highlighted the importance of an inclusive learning approach and curriculum adjustments to support the development of children with mild intellectual disability. Collaboration between teachers, parents, and support teams is key to providing an appropriate learning environment. The make-a-drawing strategy can also be an effective approach in helping children with mild intellectual disabilities understand mathematical concepts better.
4. Conclusion

The make-a-drawing strategy became a helpful visual tool for mild intellectual disability students to visualize drafts of mathematics. By combining Polya steps and pictures, students can systematically overcome problem mathematics and understand better mathematics concepts. This strategy can help students with mild intellectual disabilities develop skills in problem-solving mathematics, strengthen their understanding of concepts, and improve their trust in various situations in mathematics daily.

References


