Arif Muchyidin

32. 13791-Muchyidin-Turnitin.docx

Universitas Negeri Semarang - iTh

Document Details

Submission ID
trn:oid:::3618:72592692

Submission Date
Nov 29, 2024, 10:02 AM GMT+7

Download Date
Nov 29, 2024, 10:05 AM GMT+7

File Name
32. 13791-Muchyidin-Turnitin.docx

File Size
4.5 MB

11 Pages

4,483 Words

28,216 Characters

2% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

Filtered from the Report

- Bibliography

Match Groups

6 Not Cited or Quoted 1%
Matches with neither in-text citation nor quotation marks

4 Missing Quotations 1%
Matches that are still very similar to source material

0 Missing Citation 0%
Matches that have quotation marks, but no in-text citation

0 Cited and Quoted 0%
Matches with in-text citation present, but no quotation marks

Top Sources

1% Internet sources
1% Publications
0% Submitted works (Student Papers)

Integrity Flags

0 Integrity Flags for Review

No suspicious text manipulations found.

Our system's algorithms look deeply at a document for any inconsistencies that would set it apart from a normal submission. If we notice something strange, we flag it for you to review.

A Flag is not necessarily an indicator of a problem. However, we'd recommend you focus your attention there for further review.

Match Groups

- **6** Not Cited or Quoted 1%
  Matches with neither in-text citation nor quotation marks
- **4** Missing Quotations 1%
  Matches that are still very similar to source material
- **0** Missing Citation 0%
  Matches that have quotation marks, but no in-text citation
- **0** Cited and Quoted 0%
  Matches with in-text citation present, but no quotation marks

Top Sources

1% Internet sources
1% Publications
0% Submitted works (Student Papers)

Top Sources

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	Internet	
ummaspul.e-journal.id		1%
2	Publication	
Emily C. Bouck, Rajiv Satsangi, Holly Long, Larissa Jakubow, Carrie O'Reilly. "A Virt...		0%
3	Publication	
DePrimo, Adam R.. "The epistemè of the Normal Bell Curve in Post-Secondary Tra...		0%
4	Internet	
pakistan.accaglobal.com		0%
5	Publication	
Harfin Lanya, Halimatus Zahroh, Moh Zayyadi, Devie Reztia Anjarani. "Mathemati...		0%
6	Internet	
ejournal.undiksha.ac.id		0%
7	Internet	
www.coursehero.com		0%

Exploration of Mathematical Communication Skills of Students with Mild Intellectual Disability Through Manipulative Activities Using Bowls and Marbles

Abstract

This study identified students' mathematical understanding and communication deficiencies, especially in dividing numbers. Although bowls and marbles have been used to support mathematical conceptual understanding, there are limitations in understanding how students communicate effectively about division and numbers in practical contexts. This study explores students' mathematical communication skills in dividing and counting and how using bowls and marbles influences this. The research method used is a case study with a qualitative approach involving direct observation and video recording. The study subjects comprised four students with mild intellectual disabilities and different characteristics in communicating and understanding mathematical concepts. The instruments used included observation notes and video recordings of learning. Data were collected through observation of the learning process and video analysis to assess communication skills and conceptual understanding. The results showed that students 1 and 2 had better mathematical communication skills and a strong understanding of division, although with some initial errors. Students 3 and 4 highly depended on teacher direction and were less active in verbal communication. This study concludes that using bowls and marbles can improve understanding of division, but the success of mathematical communication is greatly influenced by active student involvement and teacher direction. This study implies the need to develop more interactive learning strategies and additional support for students with difficulties in mathematical communication. Applying teaching techniques emphasizing active student involvement and effective use of bowls and marbles can improve understanding of mathematical concepts and communication skills.

Keywords: communication skills, division, use of bowls and marbles, mathematical concepts

Abstrak

Penelitian ini mengidentifikasi kekurangan dalam pemahaman dan komunikasi matematis siswa, terutama dalam konteks pembagian bilangan. Meskipun bowls and marbles telah digunakan untuk mendukung pemahaman konsep matematis, terdapat keterbatasan dalam memahami bagaimana siswa berkomunikasi secara efektif mengenai pembagian dan membilang dalam konteks praktis. Penelitian ini bertujuan untuk mengeksplorasi kemampuan komunikasi matematis siswa dalam konteks pembagian dan membilang serta bagaimana hal ini dipengaruhi oleh penggunaan mangkok dan kelereng. Metode penelitian yang digunakan adalah studi kasus dengan pendekatan kualitatif, melibatkan observasi langsung dan rekaman video. Subjek penelitian terdiri dari empat siswa tunagrahita ringan dengan karakteristik berbeda dalam berkomunikasi dan memahami konsep matematika. Instrumen yang digunakan meliputi catatan observasi dan rekaman video pembelajaran. Data dikumpulkan melalui observasi proses pembelajaran dan analisis video untuk menilai kemampuan komunikasi dan pemahaman konsep. Hasil penelitian menunjukkan bahwa siswa 1 dan siswa 2 memiliki kemampuan komunikasi matematis yang lebih baik dan pemahaman yang kuat mengenai pembagian, meskipun dengan beberapa kesalahan awal. Siswa 3 dan siswa 4 menunjukkan ketergantungan yang tinggi pada arahan guru dan kurang aktif dalam komunikasi verbal. Kesimpulan dari penelitian ini adalah bahwa media manipulatif dapat meningkatkan pemahaman pembagian, namun keberhasilan komunikasi matematis sangat dipengaruhi oleh keterlibatan aktif siswa dan arahan guru. Implikasi dari penelitian ini adalah perlunya pengembangan strategi pembelajaran yang lebih interaktif dan dukungan tambahan bagi siswa yang menunjukkan kesulitan dalam komunikasi matematis. Penerapan teknik pengajaran yang menekankan pada keterlibatan siswa secara aktif dan penggunaan media manipulatif yang efektif dapat meningkatkan pemahaman konsep matematis dan keterampilan komunikasi.

INTRODUCTION

Mathematics is essential to everyday life, crucial in decision-making, problem-solving, and developing critical thinking skills. Its relevance extends beyond the academic space, manifesting in activities such as managing budgets, shopping, or planning activities, which require a basic understanding of mathematical concepts (Marasabessy, 2021). This practical application of mathematics supports financial

literacy and improves an individual's ability to solve problems systematically (Angraini et al., 2023).

In education, the importance of mathematics is often illustrated through an approach that connects abstract concepts with real contexts. One effective approach is Realistic Mathematics Education (RME), which has been shown to increase student engagement by linking mathematical problems to everyday experiences (Rahayu et al., 2021). This approach confirms that mathematics is an abstract discipline and a practical tool for life (Hendrayanto et al., 2022). One way that can be used to bridge the abstract of mathematics is with manipulative activities.

Manipulative activities, defined as using concrete or virtual objects to aid students in understanding and solving abstract mathematical concepts, are particularly beneficial for students with disabilities, including those with intellectual disabilities. These manipulatives are essential tools that facilitate the transition from concrete experiences to abstract reasoning in mathematics. Research indicates that manipulatives can significantly enhance students' engagement and comprehension in mathematical tasks by providing tangible representations of abstract concepts (Carbonneau et al., 2013; Peltier et al., 2020; Spooner et al., 2019). For instance, Spooner et al.(2019) highlight that manipulatives can help students with moderate to severe developmental disabilities grasp complex mathematical ideas more effectively.

A critical aspect of this process is mathematical communication, which bridges abstract mathematical concepts and practical applications. As the educational landscape evolves, the emphasis on communication skills has become increasingly pronounced, reflecting the need for students to articulate their mathematical reasoning effectively. Mathematical communication is a core skill that helps students connect mathematical concepts with practical applications. This communication includes conveying, interpreting, and reasoning about mathematical ideas through verbal, written, or visual forms (Aladwan et al., 2023; Ambarwati & Darmawel, 2020). Good mathematical communication skills indicate the ability to compose logical explanations, interpret mathematical information accurately, and convey ideas coherently. These skills deepen students' understanding and increase collaboration and engagement in learning(Sholihah et al., 2022).

For students with intellectual disabilities, mathematical communication is a challenge and an important need (Muchyidin & Priatna, 2022). Their main obstacle often involves difficulty understanding and expressing mathematical concepts due to cognitive and language limitations (Dalilan et al., 2021). This challenge is exacerbated by cognitive inertia, which is difficulty changing mindsets when faced with new concepts and semantic barriers, such as understanding abstract mathematical terms (Agheana, 2023; Root et al., 2017). Therefore, customized teaching strategies are indispensable to support student understanding and communication.

Instructional approaches such as Virtual–Representational–Abstract (VRA) and Concrete–Representational–Abstract (CRA) have proven effective in supporting mathematics learning for students with intellectual disabilities. The VRA model helps students understand abstract concepts through cascading stages, from visual manipulation of concrete representation to symbolic abstraction (Bouck et al., 2018; Bouck & Bone, 2018). Meanwhile, the CRA model integrates physical manip-

ulation, visual representation, and mathematical symbols to build a deep understanding of the concept (Bouck et al., 2020; N. M. Sari et al., 2020). This approach also provides opportunities for students to practice mathematical communication skills through various forms of expression.

This research focuses on how students with intellectual disabilities communicate their understanding of division. Division is a fundamental arithmetic operation that improves computational skills and encourages critical thinking and problem-solving skills. For students with intellectual disabilities, understanding the concept of division becomes an essential skill to support daily functions, such as dividing goods or allocating resources equitably.

Through direct observation, this study aims to uncover the strategies used by students in understanding and conveying the concept of division, as well as how they overcome communication challenges in the learning process. By studying emerging indicators of mathematical communication skills, this research is expected to provide new insights that can be used to develop inclusive and effective learning strategies for students with intellectual disabilities.

METHOD

The qualitative research method (Creswell, 2014) focuses on understanding how students with mild intellectual disabilities communicate their comprehension of mathematics, specifically the concept of division. The study subjects were four students with mild intellectual disabilities, selected based on the research criteria. The research was conducted using observational methods, with the material taught being division concepts using bowls and marbles as concrete aids. This approach was chosen to support students in visualizing and articulating their understanding of division.

The role of the researcher as an observer began with a collaborative discussion with the classroom teacher to determine the roles and materials to be delivered to the students. Classroom teachers were assigned to teach as usual to minimize adaptation needs, ensuring that communication between students and the teacher remained optimal. By keeping the teaching consistent, the researcher could focus on observing how students verbally communicated their understanding of division without the added variable of new instructional methods.

The researcher observed every moment in the classroom during the learning process, recording how students interacted with the materials and responded to instructions. This direct observation allowed the researcher to gather real-time insights into how students expressed their comprehension of division. Additionally, the researcher guided students who had difficulty understanding the teacher's instructions, ensuring that students could still actively participate in the learning process.

The study's primary objective—to explore how students communicate their understanding of division—was supported by having the teacher demonstrate the division process, followed by students independently performing the task. This structure allowed the researcher to observe how students verbally articulated their process and challenges, providing valuable data on their communicative and cognitive approaches to understanding division.

Participants

The subjects in this study are four students with mild intellectual disabilities from a private school in Bandung. The subjects of this study were selected based on inclusion criteria, namely students with mild intellectual disabilities. From nine students in class X at SLB, a selection was made to determine students who met this criterion so that the research subject was relevant to the study's focus. The school is near a traditional market, influencing the students' daily environment and community interactions. The socioeconomic conditions of the students' families are generally from economically disadvantaged backgrounds, which affects their access to educational resources and support. The student's learning habits and needs are shaped by their circumstances and the resources available at their school, providing a unique context for this study.

Instruments

The primary instruments used in this study include observation notes and educational materials specifically designed for teaching division. The educational materials consist of bowls and marbles, which serve as concrete aids to help students visualize and understand the concept of division. The observation notes are structured with specific categories to systematically document the students' verbal explanations and actions during the division activities. These categories include students' accuracy in following instructions, verbalizing the division process, and using the materials to demonstrate understanding. Such a design ensures that the notes capture detailed and organized information about how students understand and engage with mathematical concepts.

Data Collection

Data collection is conducted through structured observations of the students as they engage with the division tasks. The process begins with the teacher demonstrating simple division using bowls and marbles to illustrate the concept. After this demonstration, the students are asked to perform similar division tasks independently. The researcher observes and records the students' verbal explanations and actions during these tasks. Observations were conducted over four sessions spread across two weeks, each lasting 60 minutes. To enhance the credibility of the data and minimize potential observer bias, triangulation was applied by cross-referencing observations with video recordings and field notes. Additionally, periodic discussions with the classroom teacher were conducted to validate interpretations of the students' responses and actions. This combination of methods ensured a comprehensive and objective documentation of the students' communication and problem-solving processes.

Data Analysis

Data analysis involves thematic analysis of the collected observation notes and recordings. The researcher reviews the recorded data to identify recurring patterns and critical themes in how students understand and explain division. Data is coded based on categories such as division strategies (e.g., grouping, repeated subtraction), levels of understanding (e.g., concrete, representational, abstract), and verbal communication of mathematical concepts (e.g., accuracy in explaining steps and use of mathematical terms). Potential themes include "effective use of concrete aids," "common errors in division processes," and "barriers to verbalizing mathematical ideas." This process also includes identifying specific difficulties faced by the students, such as

misunderstanding the concept of equal groups, and effective teaching strategies observed during the sessions. The thematic analysis aims to provide a comprehensive understanding of the student's cognitive and communicative processes in the learning division, contributing to developing more effective instructional methods for students with intellectual disabilities.

RESULTS AND DISCUSSION

Results

In this study, the learning process focused on understanding the concept of division through manipulative activities using concrete objects, namely stars, that must be divided into several bowls. This learning process involves the active role of students with intensive guidance from teachers, especially in counting, sharing, and verbal and non-verbal communication. The following are the details of the stages carried out in the learning process:

Teacher Instruction. The teacher begins the learning by giving clear instructions regarding the division tasks that must be done. These instructions are often delivered verbally and are accompanied by non-verbal cues, such as pointing at a bowl or exemplifying how to do a portion. In some cases, such as in student 3, the teacher must actively point to the correct bowl so that the student can carry out the task appropriately.

Selection of Number of Objects (Stars). The teacher determines the number of stars to be divided, and students are asked to count the number of stars aloud. This process aims to train students' numeracy skills from numbers 1 to 12. Students who are already more fluent, such as student 1, can count well, while other students, such as student two or student 3, are more likely to use non-verbal gestures, such as counting with their fingers.

Division process. Each student was asked to divide the stars into several bowls based on the instructions given. In divisions such as six divided by 2 or 9 divided by 3, students divide by placing stars individually into the available bowl. Mistakes often occur due to a lack of concentration or understanding of how an even distribution should be made. For example, student one mistakenly placed a star on the wrong bowl because he lost focus, and student 4 refused to participate in the division.

Repetition and Correction. After each student divides, the teacher will check to ensure the correctness of the results. If there is an error, such as an uneven division, students are asked to recount the number of stars or redivide. This repetition aims to strengthen students' understanding of the concept of division and to improve their consistency in completing tasks.

Table 1. Students' ability profiles in the Learning Division

Indicator	Student 1	Student 2	Student 3	Student 4
Mathematical Communication Skills	**Verbal:** Able to count from one to ten, but sometimes makes mistakes in counting.	**Verbal:** Counting in a loud and clear voice, providing the correct answer when asked for clarification.	**Verbal:** Quiet, not talking much, has difficulty without the teacher's instructions.	**Verbal:** Uses a clear voice to count and confirm results.
	Non-Verbal: Shows confusion and hesitation when dividing stars.	**Non-Verbal:** Actively corrects mistakes but more often uses non-verbal communication.	**Non-Verbal:** Follows teacher's instructions well, lacks initiative.	**Non-Verbal:** Actively helps and corrects other students but is less active in speaking.
Counting Ability (1-12)	Able to count from one to ten, makes mistakes with numbers above ten.	Able to count from one to twelve well without significant difficulty.	Able to count from one to twelve according to instructions.	Able to count from one to twelve well.
Ability in a division	is often confused and makes mistakes in distributing stars evenly, which needs correction.	Understands division well and can correct mistakes made by other students.	Able to divide stars as instructed, struggles without direct guidance from the teacher.	Understands division well and can confirm correct results.
Ability to Express Opinions	Less active in expressing opinions verbally, more focused on practical activities.	Active in expressing opinions and giving corrections, although more often using non-verbal communication.	Rarely expresses opinions and relies on the teacher's instructions to complete tasks.	Tends not to be active in verbal expression but provides clarification when asked.

Clarification and Discussion. Teachers also often ask other students, such as student two or student 4, to verify the results of the division done by student 1. This is a way for teachers to ensure that other students pay attention to and understand the ongoing process. It also provides opportunities for students to express their opinions and practice mathematical communication verbally and through gestures.

Student Reflection and Awareness. In some cases, students realize their mistake, such as when student 1 realizes that his star is lacking in one of the divisions and shows a reaction such as patting his head or laughing. This awareness is crucial because it shows that students are learning from their mistakes and are starting to understand the concept of division better.

Independent Practice. Apart from the intensive guidance of the teacher, students are also allowed to complete the task independently, as seen when students one and student 2 take the initiative to recalculate the stars or divide the stars according to the instructions given. Although some still need correction, this process supports independence and initiative in learning.

All student and teacher activities are recorded for further analysis during the learning process. The recording results obtained important information related to interaction and learning dynamics. Analysis of the recordings showed how students responded to the teacher's instructions, both verbally and non-verbally, and how they performed the assignment tasks. Mistakes made by students in counting or dividing stars became one of the focuses of the analysis, where some students were seen having difficulty in dividing appropriately, while others were able to correct the mistakes after getting directions from the teacher. This recording also shows teachers' communication strategies in providing guidance, both

Table 2. Student's ability profile in dividing

Student	Six divided by 2	Six divided by 3	Nine divided by 3	Ten divided by 2	Ten divided by 5	12 divided by 2
Student 1	Able to divide stars with some initial confusion but completed it with the teacher's help.	Able to divide with some mistakes in star placement was corrected after guidance.	Made an error in the second round but finished with the teacher's help.	Able to divide but made a mistake in the final count. Realised the error after being guided.	Hesitated in placing stars in the third bowl but succeeded after help from Student 2 and the teacher.	Used the incorrect number of bowls but finished correctly after being directed.
Student 2	Able to count and divide stars correctly, though relied primarily on non-verbal gestures.	Able to divide correctly but is more comfortable with non-verbal communication.	Able to count correctly, though remained silent during the process.	Able to recount correctly, demonstrating good counting skills.	Provided accurate corrections to Student 1's mistakes, showing a good understanding despite speaking very little.	Able to divide stars correctly, though primarily using non-verbal gestures.
Student 3	Able to divide when given explicit instructions from the teacher.	Able to divide with guidance, tend to be passive without instructions.	Required guidance in dividing and waited for the teacher's instructions.	Needed full direction from the teacher but was able to finish after being guided.	Still highly dependent on direct instructions from the teacher, lacks confidence in division.	Able to divide after direct guidance from the teacher, needed assistance to complete.
Student 4	Able to divide but preferred to confirm results from other students rather than actively participate.	Passive in dividing, prefers to confirm existing results.	Correctly confirmed results but was reluctant to participate in the division process actively.	Understands division but is unwilling to take an active role; only confirms results internally.	Able to count and understand division but remains passive and reluctant to engage directly.	More passive, though, can count well. This student avoids active involvement and only confirms results.

with words and gestures, which help students understand the concept of division. This analysis shows that students need repetition and clarification in several stages but gradually improve concept understanding and numeracy skills.

Table 1 provides an overview of each student's strengths and areas for improvement based on mathematical communication, arithmetic, division, and expressing opinions.

Table 2 above summarises each student's abilities in various divisions, showing how they interact with the teacher and assignments and how they carry out the division.

Discussion

Key Findings and Analysis

Table 1 shows a significant variation in mathematical communication skills between the four students. Student 1 has limited verbal communication skills, often makes mistakes in counting up to ten, and shows confusion when asked to divide non-verbally. This condition is reflected in Table 2, where Student 1 often makes mistakes in the assignment assignment, such as misplacing stars or bowls, and needs the guidance of teachers and other students to complete the assignment. This indicates that limited verbal and non-verbal communication skills impact the difficulty of independently understanding and implementing the concept of division.

In contrast, Student 2 displayed good verbal communication skills, although they used non-verbal communication more often. This student can explain the answer clearly when asked, show accuracy in counting up to the twelfth number, and be able to give corrections to other students. In the division task (Table 2), Student 2 showed high accuracy in dividing the stars, although they tended to use non-verbal gestures during the process. This shows that although Student 2 prefers non-verbal communication, his mathematical understanding is quite strong, allowing him to assist other students in completing assignments.

Student 3, on the other hand, showed a high dependence on the teacher's direction in verbal and non-verbal communication. Although they can count up to twelve according to instructions, these students rarely express opinions and are more passive in-class activities. In the division task (Table 2), Student 3 needs explicit guidance for each step. This dependency indicates that a lack of initiative and confidence affects students' ability to communicate mathematical understanding, especially when dealing with independent tasks.

Student 4 also exhibits a unique communication pattern. Despite having enough verbal ability to count up to twelve correctly, these students prefer to validate the results of other students rather than actively participate. This is reflected in the assignment (Table 2), where Student 4 rarely takes an active role, more often confirming the outcome than directly completing the assignment. A preference for passive validation indicates that these students understand the concept of division but may experience barriers to motivation or confidence in actively participating.

From both tables, the ability to calculate directly affects the performance of the division. Student 1, with the limitation of counting above the number of ten, had difficulty distributing the stars evenly. Meanwhile, Student 2, who had good numeracy skills, showed more stable performance in division tasks, although they tended to use non-verbal communication. Students 3 and 4 showed adequate numeracy skills, but their dependence on teachers (Student 3) and lack of initiative

(Student 4) limited their effectiveness in completing division tasks independently.

The ability variation between students emphasizes the importance of an individualized approach to mathematics learning for students with mild intellectual disabilities. Student 1 needs more intensive support, such as strengthening verbal communication skills and dividing tasks into small steps to reduce confusion. For Student 2, strategies that encourage verbal expression more often can help improve the balance between verbal and non-verbal communication. Student 3 will benefit from independence training through step-by-step instruction designed to reduce reliance on teachers. Student 4, on the other hand, needs additional motivation to increase active participation, such as positive reinforcement or giving a role in a group activity.

Comparison with Prior Research

The findings of this study align with previous research on non-verbal communication in mathematics learning in students with mild intellectual disabilities (Huscroft-D'Angelo et al., 2014). For example, Silviana and Hadi (2019) emphasized that visual-verbal communication skills play a vital role in mathematical problem-solving, with high-achieving students demonstrating better communication skills. This suggests that non-verbal communication, such as visual aids (e.g., pictures or symbols), can help students with disabilities understand complex mathematical concepts more effectively. Additionally, research by Sari (2023) highlighted that weak memory and understanding of symbols are major obstacles for children with disabilities in mathematics, further supporting the importance of integrating non-verbal communication into mathematics instruction.

The study also observed how manipulatives, such as the bowls and marbles used in this research, contributed to the student's ability to perform division. This hands-on learning approach allowed students to interact directly with the learning material, clarifying their understanding of mathematical concepts. As seen in the case of Student 2, those who were more confident and communicative could use the manipulatives effectively to complete the division task. On the other hand, students like Student 3 and Student 4, who were less active, relied more on teacher instructions and showed less initiative in using the bowl and marbles, indicating the significant role that active engagement plays in learning.

Research on teaching aids in mathematics learning shows that teaching aids can significantly improve students' mathematical understanding and communication, including students with disabilities. Teaching aids reduce the abstraction level of mathematical concepts, which is often an obstacle for students with special needs. For example, research by Resqueta and Mutianingsih shows that using props in non-standard weight measurement in primary schools can improve students' math learning outcomes (Resqueta & Mutianingsih, 2022). In addition, research by Khotimah and Risan emphasized that teaching aids help students understand abstract mathematical concepts, especially in space-building materials (Khotimah & Risan, 2019).

Furthermore, research by Simarmata et al. (2022) shows that using learning media suitable for the characteristics of students with disabilities can improve their understanding of mathematical concepts. This is in line with the findings of Rokhim et al. (2023), which state that the right learning media can help students with disabilities understand difficult materials, such as science and mathematics.

Thus, teaching aids serve as a learning medium and a bridge to improve mathematical communication among students with special needs so that they can more actively participate in the learning process. Using a realistic approach to learning, as proposed by Kurniati, students can more easily understand the mathematical concepts taught (Kurniati, 2022). Therefore, teaching aids in mathematics learning, especially for students with disabilities, have improved their mathematical understanding and communication.

Implications for Teaching Strategies

The study also supports the idea that hands-on learning effectively improves students' mathematical communication skills with mild intellectual disabilities. According to Widodo et al. (2021), hands-on learning, as seen in the Discovery Learning model, effectively enhances students' mathematical communication skills. This was also echoed in research by Sholihah et al. (2022), which emphasized that positive learning experiences increase students' confidence, improving their ability to communicate mathematically. Moreover, Istimuryani et al. (2023) found that inquiry-based learning, which often includes hands-on elements, helps improve mathematical communication skills.

However, it is also important to consider the potential drawbacks of hands-on learning. Research by Siburian and Saija (2019) pointed out that some students may struggle to connect hands-on experiences with abstract mathematical concepts, which can hinder their ability to communicate mathematical ideas effectively. Similarly, Lubis and Dewi (2023) noted that while hands-on learning may increase student engagement, not all students can articulate their understanding clearly after engaging in practical activities. This is particularly true for students with mild disabilities who may face challenges linking their hands-on experiences with verbal explanations. Therefore, educators should be mindful of these challenges and ensure students are supported in relating their hands-on experiences to broader mathematical concepts (Lisnawati et al., 2024).

Implication of Research

The implication of research from the above information is related to several important aspects that can affect the learning approach of students with intellectual disabilities, especially in understanding the concept of division. Here are some of the implications:

(a) The Role of Communication in Learning: Verbal and non-verbal communication skills are crucial in helping students with intellectual disabilities understand mathematical concepts. Teachers should pay more attention to clear verbal instructions and support them with non-verbal cues such as pointing or directing gestures to assist students in completing division tasks.

(b) Structured Learning Approach: This research implies the importance of a structured approach in teaching the concept of division to students with special needs. Teachers must give instructions gradually, using visual sharing strategies such as bowls and stars, and provide immediate corrections when students make mistakes. This can improve students' understanding and engagement in learning.

(c) Differentiation of Learning Based on Student Needs: Each student demonstrates different abilities in sharing and communicating. This shows that a different approach is needed for each student. Teachers can tailor each student's learning strategies by understanding the differences in numeracy, communication, and concept comprehension, making

learning more inclusive and effective.

(d) Student Confidence Enhancement: Students who received more support, both verbally and through physical guidance, showed improvement in completing division tasks. This implies that building students' confidence through effective communication and direct support will improve their ability to complete math tasks independently in the future.

Limitation

This study has several limitations, including a small sample size of only four students with varying characteristics. This limits the generalizability of the findings, as each student exhibited different levels of understanding and responses to the concept of division. Additionally, the study was conducted in a single school with a homogeneous socioeconomic background, where the students came from economically disadvantaged families. In this context, parents were often occupied with work to meet their families' basic needs, resulting in minimal interaction between students and their parents. This lack of parental involvement likely influenced the level of support students received for their learning at home, potentially affecting their mathematical communication skills and comprehension.

The study did not explicitly measure external factors influencing students' communication skills and mathematical understanding, such as parental involvement, access to additional learning resources, or home learning environments. The homogeneity in socioeconomic conditions and the absence of external variable measurements may have limited the interpretation of the findings. Future research should expand the sample by including students from schools with more diverse socioeconomic backgrounds. Additionally, measuring external factors such as parental engagement, time available for home study, and support from the learning environment is essential. Such an approach is expected to provide a more comprehensive understanding of the factors affecting students' mathematical communication skills and comprehension.

CONCLUSION

The conclusion of this study shows that mathematical communication skills, both verbal and non-verbal, play an important role in understanding and implementing the concept of division in students with mild intellectual disabilities. The difference in students' ability to calculate, communicate, and actively participate in learning emphasizes the need for a structured learning approach tailored to individual needs. Learning methods that utilize manipulatives, such as bowls and marbles, effectively improve students' understanding of division, although some students still need intensive guidance to associate practical experience with abstract explanations. This study also emphasizes the importance of providing verbal support and clear non-verbal cues to strengthen students' involvement in learning and encourage their confidence in completing tasks independently. With adaptive and student-based teaching strategies, mathematics learning can become more inclusive and effective for students with mild intellectual disabilities.