Increasing Mathematical Logical Intelligence Through RME Model Assisted by DIMSMOVE Based on Local Excellence on the North Coast of Java, Indonesia for Students with Intellectual Disabilities

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Abstract

The low logical mathematical intelligence of students with mild intellectual disabilities is caused by several factors: the learning process is still classical with the lecture method; the less than optimal use of learning media and teaching materials based on the surrounding cultural environment; the unavailability of concrete and interactive teaching materials that are adjusted to the cognitive needs of students with mild intellectual disabilities; and the unavailability of Android-based applications that help students learn the material anytime and anywhere, so that they can facilitate their ability to remember and understand the material. This research was conducted at the Sunan Kudus Special Elementary School located on JL Mayor Kusmanto RT 4 RW 3 Pedawang, Bae District, Kudus Regency, Central Java Province, Indonesia. This school was chosen because of the low level of students' logical mathematical intelligence and the lack of use of Android-based learning media.The main objective of this study was to analyze the effectiveness of the Realistic Mathematics Education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording (DIMSMOVE), based on local advantages on the North Coast of Java, Indonesia, in improving the logical mathematical intelligence of students with mild intellectual disabilities. The results of the study showed that the average logical mathematical intelligence score of students using the RME model supported by interactive digital modules based on local excellence exceeded the Minimum Completion Criteria (KKM), and there was a significant increase in their logical mathematical intelligence. The level of effectiveness was categorized as moderate based on the N-Gain test, which showed that the RME model and the digital media developed were effective in supporting the learning and memory of students with mild intellectual disabilities. This study contributes to the field of inclusive education by introducing an innovative learning model that integrates RME with a culturally relevant and voice-supported digital module (DIMSMOVE). The combination of local cultural content and interactive technology offers a contextual, inclusive, and adaptive learning solution for improving cognitive competence in students with intellectual disabilities.

Keywords: Model Realistic Mathematics Education (RME), Digital Mathematics Science Module With Voice Recording (DIMSMOVE), mathematics logical intelligence, mild intellectual disabilities

1. Introduction

The concept of children with special needs has a broader meaning when compared to the concept of children in general. According to the Directorate of Special Education, Children with Special Needs are children who experience physical, mental-intellectual, social and emotional abnormalities or deviations in their development process compared to children their age. Data from the Central Statistics Agency in 2017 recorded that the number of children with special needs in Indonesia was 1.6 million. The classification of children with special needs includes children with visual impairments (Blindly Impaired), children with hearing and speech impairments (Deaf/Speech Impaired), children with intellectual impairments (Impaired), children with limb impairments (Impaired), children with behavioral and emotional disorders (Impaired), children with specific learning disorders, children who are slow learners (*Slow Learner*), ADHD (Mardi Fitri, 2021). In conclusion, understanding the diverse classifications and characteristics of children with special needs is essential for designing inclusive and responsive educational practices. With a significant number of children identified as having special needs in Indonesia, including those with

intellectual, physical, and emotional challenges, educators and policymakers must prioritize equitable access, appropriate interventions, and supportive learning environments to ensure every child reaches their full potential.

Of this large number, children with special needs have the same rights to obtain education. This means that in education there should be no discrimination, education is not only for normal children but is a right for children with special needs (Ardianti et al., 2021; Ardianti & Wanabuliandari, 2021; Wanabuliandari & Purwaningrum, 2018a). This is stated in Law no. 19 of 2011 concerning the Rights of Persons with Disabilities. Apart from that, the rights of children with special needs are also contained in the Minister of State for Women's Empowerment and Child Protection Regulation No. 10 of 2011. These two regulations are the government's efforts to protect the rights of children with special needs.

One of the students with special needs who has the right to receive education is students *intellectual disabilities*. *Intellectual disabilities* or mentally retarded according to *American Asociation on Mental Deficiency* (AAMD) is a disorder that includes below average general intellectual function, namely an IQ of less than 84 based on tests and appears before the age of 16 years.

Intellectual disability (ID) is characterized by significant limitations in both intellectual functioning and adaptive behavior, which covers a range of everyday social and practical skills. This condition originates during the developmental period (Danielsson et al., 2015; Lee et al., 2023). Individuals with intellectual disabilities often exhibit difficulties in memory retention, abstract reasoning, and learning academic content. For example, reduced benefit from long-term item frequency exposure has been shown to contribute to poor short-term memory, which is frequently observed in individuals with developmental disorders (Kimel et al., 2024). Their ability to process, store, and retrieve academic information efficiently is often hindered by limitations in working memory and adaptive cognitive strategies, making contextual and multi-sensory approaches to learning highly necessary (Elshani et al., 2020; Orío-Aparicio et al., 2025; Lee et al., 2023). Therefore, implementing interactive and culturally relevant digital media can help address their learning challenges more effectively.

In students intellectual disabilities grouped into three criteria, namely: (1) mild, (2) moderate, (3) severe. Student mild intellectual disabilities (mild intellectual disabilities) is a student with an IQ ranging from 50-70 who has abilities in academic subjects, social adjustment, able to work, able to be independent in society, able to do simple and semi-skilled work (Widiastuti & Winaya, 2019)(Fisher & Roget, 2014; Kurniastuti et al., 2023; Tass, 2021; Widiastuti & Winaya, 2019). Children's limitations should not be a barrier for parents or educators to provide appropriate education for children, including mathematics education. This is because the application of mathematics is unavoidable in life. As an important subject to study, mathematics plays a very important role in the learning process to form the ability to think logically, systematically, creatively and critically in solving problems.

The most prominent intelligence in learning mathematics and science is mathematics logical intelligence. Mathematics and science have a close relationship, namely the collaboration between experiment and theory. Theories in science are mathematics modeling of various basic principles whose truth still has to be tested by experiments that can provide similar results. Learning basic mathematics and science requires students to carry out thought processes, analysis and algorithmic operations (Ardianti & Wanabuliandari, 2021; Sumaji et al., 2020). Logical-mathematical intelligence plays a crucial role in successful mathematics and science learning because it supports logical thinking, problem-solving, and understanding of scientific concepts, as evidenced in the context of mathematics, chemistry, and technology (Shirawia et al., 2023). The use of learning media such as contextual math comics and meta-analysis-based approaches demonstrate that this intelligence significantly determines student learning outcomes in mathematics and science across various educational levels and regional settings (Johar et al., 2023; Onesimus et al., 2025). Mathematics logical intelligence is part *multiple understanding* which is important to develop at this time. Mathematics logical intelligence is the ability to use numbers well, reason correctly, manage long trains of thought and understand logical or numerical patterns (Morgan, 2021; Sumaji et al., 2025; Warmansyah et al., 2023; Yoga et al., 2020). Logical intelligence is usually associated with the brain and includes several components, namely mathematical calculations, problem solving, inductive considerations (scientific explanations from specific to general), deductive considerations (scientific explanations from general to specific), and clarity of patterns and relationships. Indicators of mathematics logical intelligence are (1) being able to carry out various mathematics operations, (2) understanding patterns and relationships, (3) understanding quantitative concepts, and (4) being able to carry out logical reasoning, as this intelligence enables students to solve mathematical and scientific problems through structured and abstract thinking (Shirawia et al., 2023; Zaiyar et al., 2020). Thus, fostering logical-mathematical intelligence is essential to support students' analytical thinking, especially in interdisciplinary STEM-based education.

Mathematical logical intelligence plays a role in the success of students' learning process (Rahmawati & Ibrahim, 2021). Apart from that, mathematical logical intelligence also influences student learning outcomes because mathematical logical intelligence is closely related to an individual remembering, making perceptions, and retrieving information (Morgan, 2021; Sumaji et al., 2025; Warmansyah et al., 2023; Yoga et al., 2020). Mathematical logical intelligence also influences the level of success in life. Mathematical logical intelligence influences a person's understanding of work, for example reading financial reports, reading mathematical data, taking advantage of opportunities based on mathematical calculations and so on (Milsan & Wewe, 2019). Therefore, mathematical logical intelligence needs to be improved in children with special needs. Seeing the large amount of discrimination against workers with disabilities in the form of not providing employment opportunities, not providing fixed wages, often receiving bullying treatment, and getting fewer working hours (A et al., 2019). Thus, it can be said that mathematical logical intelligence needs to be developed in various ways.

1.1 Background of the Study

Based on the results of observations at the Sunan Kudus Special Elementary School, students' mathematical logical intelligence mild mental retardaion still low. This can be seen in the mathematical logical intelligence test in the preliminary study which obtained per indicator (1) Able to carry out various mathematical operations by 34%; (2) Understanding patterns and relationships at 0%; (3) Understand quantitative concepts by 25%; (4) Able to carry out logical reasoning by 30%. Based on teacher interviews, it was found that the low level of mathematical logical intelligence was caused by, among other things, (1) classical-based learning using the lecture method; (2) lack of optimal use of learning media and teaching materials based on the surrounding cultural environment; (3) the unavailability of teaching materials that help mentally retarded students remember and understand the material repeatedly; (4) the unavailability of an Android-based application that helps mentally retarded students learn material anytime and anywhere, thereby facilitating their ability to remember and understand the material.

Therefore, appropriate problem solving is needed to improve students' mathematical logical intelligence mild intellectual disabilities namely through appropriate learning models and media. In developing learning models we must consider the characteristics of different students. The learning model implemented in the classroom for students with special needs must be varied so that students do not get bored easily. Apart from that, the learning model for students with special needs should provide real experiences for students with special needs because they have difficulty thinking abstractly (Asror et al., 2024; Husnawati et al., 2020; Knijnik, 2002; Salsabila et al., 2022; Schildkamp, 2019; Sumarni et al., 2024; Yunaini, 2021; Zhang & Zhang, 2010). One of the appropriate learning models based on student characteristics is the realistic mathematics education (RME) model. The realistic mathematics education (RME) model is a mathematics learning theory that is oriented towards mathematizing everyday experiences and applying mathematics in everyday life (Hafidah & Rukli, 2022; Listiawati et al., 2023). In summary, enhancing the mathematical logical intelligence of students with mild intellectual disabilities requires carefully selected learning models and media that align with their unique cognitive characteristics. The use of contextual and concrete approaches, such as the Realistic Mathematics Education (RME) model, provides meaningful learning experiences by connecting mathematics to real-life situations thereby supporting understanding, motivation, and long-term retention for students who struggle with abstract thinking.

To support learning steps and indicators of mathematical logical intelligence, appropriate learning media are needed. The learning media applied should be in accordance with the characteristics of students with special needs. One of the learning media that can be used is digital media which is packaged in a fun way to make students with special needs more motivated so that they can easily accept the learning provided (Ardianti & Wanabuliandari, 2021; Kurniasih et al., 2020b; Wanabuliandari; & Ardianti, 2022; Wanabuliandari et al., 2018). One of the appropriate innovations in solving this problem is through the Digital Mathematics Science Module With Voice Recording (DIMSMOVE) innovation based on local advantages on the North Coast of Java, Indonesia. Digital Mathematics Science Module With Voice Recording based on local advantages on the North Coast of Java, Indonesia is a digital module whose interactive nature makes it easy to navigate, allows loading images, audio, video, and is equipped with formative tests, apart from that it also uses local excellence content on the North Coast of Java, Indonesia. Digital Mathematics Science Module With Voice Recording based on local advantages of the North Coast of Java Indonesia was developed taking into account the characteristics of students with mild intellectual disabilities, namely difficulty understanding something abstract, equipped with Local Advantages content of the North Coast of Java Indonesia; difficulty remembering, solving problems and communicating, assisted with mathematics and science content to help increase mathematical logical intelligence and assisted with voice recording to play back material or record sound.

Based on this explanation, the researcher provided a solution tailored to the problem. Therefore, researchers

conducted research related to increasing mathematical logical intelligence through a realistic mathematics education (RME) model assisted by a digital mathematics science module with voice recording based on local excellence on the North Coast of Java, Indonesia among students. Mild Intellectual disabilities.

1.2 Research Questions

The research questions of this study were as follows:

- Is there an increase in students' mathematical logical intelligence using the realistic mathematics education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording (DIMSMOVE) Based on Local Excellence on the North Coast of Java, Indonesia in Students with Mild Intellectual disabilities?

2. Literature Review

Logical-mathematical intelligence is one type of intelligence proposed by Howard Gardner in his theory of multiple intelligences. This intelligence involves the ability to think logically, solve mathematical problems, and understand abstract concepts and patterns (Morgan, 2021). This intelligence is important in mathematics and science subjects, which require critical and analytical thinking skills. Mathematical logical intelligence is part *multiple understanding* which is important to develop at this time. Logical-mathematical intelligence plays a crucial role in successful mathematics and science learning because it supports logical thinking, problem-solving, and understanding of scientific concepts, as evidenced in the context of mathematics, chemistry, and technology (Shirawia et al., 2023). The use of learning media such as contextual math comics and meta-analysis-based approaches demonstrate that this intelligence significantly determines student learning outcomes in mathematics and science across various educational levels and regional settings (Johar et al., 2023; Onesimus et al., 2025). Mathematical logical intelligence is the ability to use numbers well, reason correctly, manage long trains of thought and understand logical or numerical patterns (Susanti, 2018; Warmansyah et al., 2023). Mathematical logical intelligence is usually associated with the brain and includes several components, namely mathematical calculations, problem solving, inductive considerations (scientific explanations from specific to general), deductive considerations (scientific explanations from general to specific), and clarity of patterns and relationships. Indicators of mathematics logical intelligence are (1) being able to carry out various mathematics operations, (2) understanding patterns and relationships, (3) understanding quantitative concepts, and (4) being able to carry out logical reasoning, as this intelligence enables students to solve mathematical and scientific problems through structured and abstract thinking (Shirawia et al., 2023; Zaiyar et al., 2020). In conclusion, logical-mathematical intelligence is a foundational aspect of students' cognitive development that underpins their success in both mathematics and science learning. By fostering this intelligence through appropriate strategies, learning media, and contextual approaches, educators can enhance students' critical thinking, problem-solving abilities, and conceptual understanding ensuring they are well-equipped to navigate complex academic and real-world challenges in the era of interdisciplinary education.

To improve mathematical logical intelligence, appropriate learning models and learning media are required. A learning model is a plan that is used to form a learning plan so that teaching and learning activities become better (Khoerunnisa & Aqwal, 2020). In developing learning models we must consider the characteristics of different students. The learning model implemented in the classroom for students with special needs must be varied so that students do not get bored easily. Apart from that, learning models for students with special needs should provide real experiences for students with special needs because they have difficulty thinking abstractly (Yunaini, 2021). One of the appropriate learning models based on student characteristics is the realistic mathematics education (RME) model. The realistic mathematics education (RME) model is a mathematics learning theory that is oriented towards mathematizing everyday experiences and applying mathematics in everyday life (Freudenthal, 2002; Putranto & Marsigit, 2018; Rusdi et al., 2019; Wardono et al., 2019; Wardono & Mariani, 2019). Wahyudi et al., (2017) said that linking something real with mathematical ideas in learning is very important so that learning is more meaningful and students enjoy it more. The steps of the realistic mathematics education (RME) model are (1) understanding contextual problems, (2) explaining contextual problems, (3) solving contextual problems, (4) comparing and discussing answers, (5) concluding (Hobri, 2009). In conclusion, enhancing students' mathematical logical intelligence, especially for those with special needs, requires the thoughtful selection of learning models and media that align with their cognitive characteristics and learning styles. The Realistic Mathematics Education (RME) model offers a promising approach by contextualizing mathematical concepts in real-life experiences, fostering deeper understanding, and creating a more engaging and meaningful learning environment for all learners.

Apart from that, there is a need for appropriate learning strategies to improve mathematical logical intelligence,

namely through the realistic mathematics education (RME) model. According to Susanti, (2018), there is a need for learning strategies in the mathematics learning process because mathematics is always applied in daily activities and can improve the ability to think logically, accuracy and ability to solve problems. One strategy in approaching mathematics learning that is related to real life is realistic mathematics learning (Elwijaya et al., 2021; Rahmawati et al., 2023; Wanabuliandari & Sekar Dwi Ardianti, 2024). By using a realistic mathematics learning model, learning is more active and encourages students to come up with their own mathematical concepts (Wanabuliandari & Sekar Dwi Ardianti, 2024). In conclusion, integrating realistic mathematics education (RME) as a learning strategy plays a vital role in enhancing students' logical-mathematical intelligence by connecting abstract mathematical ideas to real-life contexts. This approach not only fosters students' logical reasoning and problem-solving skills but also promotes meaningful and active learning experiences that empower learners to construct their own mathematical understanding.

The use of learning media such as animation, comics, and interactive applications has been proven effective in improving logical-mathematical intelligence, as it strengthens students' abilities in performing mathematical operations, understanding patterns and relationships, understanding quantitative concepts, and conducting systematic logical reasoning (Azinar et al., 2020; Laswadi et al., 2022; Sofia et al., 2023). Learning media designed with a contextual and learning style-based approach has also been shown to support students' logical thinking processes and mathematical problem-solving abilities at various levels of education (F.A et al., 2021; Johar et al., 2023; Warmansyah et al., 2023). The use of digital media for children with special needs can help convey information to children with special needs and can increase student motivation (Kurniasih et al., 2020a, 2020b). Through the use of mobile applications (Android) and local cultural content, it will make it easier for teachers and crew members to carry out the learning process (Ardianti et al., 2021; Wanabuliandari, S., & Purwaningrum, 2018). Learning with interactive multimedia which contains audio and visual elements can train children's thinking and memory because it can be accessed anywhere, especially for children with mild intellectual disabilities, using interactive digital modules is the right choice, because the material presented is concrete and unconventional (Maulidiyah, 2020). In conclusion, the integration of various learning media ranging from animations, comics, interactive applications, to culturally-based digital content plays a crucial role in enhancing students' logical-mathematical intelligence, particularly by supporting their reasoning, motivation, and conceptual understanding. Such media not only cater to diverse learning styles and educational levels but are also especially beneficial for children with special needs, providing accessible, engaging, and meaningful learning experiences that promote both cognitive and emotional development.

One of the innovations implemented is the Digital Mathematics Science Module With Voice Recording Based on Local Excellence on the North Coast of Java, Indonesia. Interactive digital modules are learning that contains video, audio, images or animation. Learning using interactive digital modules can improve the quality of learning because the learning material and presentation are very interesting (Maulidiyah, 2020). Digital Mathematics Science Module With Voice Recording based on local advantages on the North Coast of Java, Indonesia, is a digital module whose interactive nature makes it easy to navigate, allows loading images, audio, video, and is equipped with formative tests, apart from that it also uses local excellence content on the North Coast of Java, Indonesia. Digital Mathematics Science Module With Voice Recording based on local advantages of the North Coast of Java Indonesia was developed taking into account the characteristics of students with mild intellectual disabilities, namely difficulty understanding something abstract, equipped with Local Advantages content of the North Coast of Java Indonesia; difficulty remembering, solving problems and communicating, assisted with mathematics and science content to help increase mathematical logical intelligence and assisted with voice recording to play back material or record sound.

The local advantages of the North Coast of Central Java are presented in interactive digital modules to attract students' interest in learning. Learning will be more meaningful if the implementation of learning uses local wisdom from the local area with the aim of students being able to understand the material concretely (Wanabuliandari, S., & Purwaningrum, 2018). Learning that is linked to local cultural elements helps students understand mathematical concepts easily. By connecting with local culture in their area, students gain direct learning experience(Ulya & Rahayu, 2017).

The voice recording feature in learning is the use of technology to record sounds such as providing feedback, instructions, or teaching materials that can support the student learning process (Gibson & McKnow, 2007). Voice recording can support students with mild intellectual disabilities by strengthening memory and understanding of material. Students who used voice-recorded learning materials and listened to them repeatedly showed significant improvements in information retention, especially those with attention or memory difficulties, as the repeated exposure supported deeper processing and understanding (Chen et al., 2024; Paler, 2022; Schiller et al., 2024;

Fiorella, 2021). Listening to audio content not only enhances vocabulary recall and comprehension but also improves fluency, attention, and motivation, making it an effective tool for inclusive and individualized learning (Paler, 2022; Sofia et al., 2023). Voice recording also allows educators to provide more personalized and relevant feedback. Kessler et al., (2009) suggests that audio feedback can communicate tone and intonation that cannot be achieved with written text. This helps students with special needs understand feedback better and apply it for improvement.

Students with special needs who used voice-recording technologies like VoiceThread showed increased engagement, motivation, and academic success, as they were able to access material repeatedly, participate at their own pace, and express understanding through multimodal formats (Brunvand & Byrd, 2011). Research also confirms that such tools are especially beneficial for students with autism or learning difficulties, helping them overcome attention, communication, and processing barriers by offering flexible and accessible learning pathways (Conner et al., 2025; McKeegan & Zanuttini, 2025). In conclusion, the integration of voice-recording technologies into inclusive education settings offers meaningful support for students with special needs by accommodating their unique learning profiles. These tools not only enhance academic achievement and engagement but also empower students to learn independently, communicate effectively, and participate more confidently in the learning process. This research shows that voice recording technology can address the learning challenges faced by students with special needs and provide the additional support they need.

2.1 Theorical Framework

Sunan Kudus Special Elementary School is a school for children with special needs in Kudus Regency, Central Java Province, Indonesia. The low level of mathematical logical intelligence is due to the fact that the learning process at the Sunan Kudus Special Elementary School is still classically based. Teachers still use the lecture method so that the learning process is still centered on the teacher. Apart from that, the Sunan Kudus Special Elementary School also does not use digital-based learning media which helps mentally retarded students to remember and understand the material repeatedly. From the results of the preliminary study, the percentage of students' mathematical logical intelligence was obtained: 1) Able to carry out various mathematical operations of 34%; 2) Understand patterns and relationships at 0%; 3) Understand quantitative concepts by 25%; 4) Able to carry out logical reasoning by 30%. So it can be concluded that students' mathematical logical intelligence is still low. Meanwhile, from the results of teacher interviews, the learning process still uses the lecture method and does not use digital-based learning media. From previous research based on Haryanti's research results in 2016, the RME model was effective in improving the learning achievement of arithmetic operations in mentally retarded children. The results of Maulidyah's research in 2020 showed that the use of interactive multimedia helps teachers deliver material successfully, because it creates a pleasant and motivating atmosphere for mentally retarded children. Therefore, it is necessary to apply the RME model assisted by the Digital Mathematics Science Module With Voice Recording based on the local advantages of the North Coast of Java, Indonesia.

The advantages of the RME Model are that it provides students with an understanding of the relationship between mathematics and everyday life, students can construct their own understanding, students can find their own mathematical concepts, students do not have to solve a single problem when solving problems. Apart from that, the RME model requires Digital Mathematics Science Module With Voice Recording media based on local excellence on the North Coast of Java, Indonesia to support RME learning steps because it is equipped with content that connects daily life to solving contextual problems. The advantages of this media are that it makes it easy to navigate, contains images, audio, video, animation and formative tests, is equipped with local superior content on the North Coast of Central Java, there is local superior content, there is a voice recording feature and can be accessed anytime and anywhere .

After implementing the Realistic Mathematics Education model assisted by an interactive digital module based on local advantages on the North Coast of Central Java, it is hoped that it will increase logical mathematical intelligence and it is hoped that there will be differences in logical mathematical intelligence before and after implementing the Realistic Mathematics Education model assisted by a Digital Mathematics Science Module With Voice Recording based on local advantages on the Coast. North Java Indonesia.

3. Method

3.1 Research Methods and Design

The research was carried out at SDLB Sunan Kudus. The research approach used in this study is quantitative. The design used in the study is *a pre-experimental* design with the design form *of the one group pretest-postest design*.

This design can be used if there is a group that is given treatment in the study, then intends to compare the state before and after being given treatment (Lestari & Yudhanegara, 2015). The design of this study can be seen in Table 1:

Table 1. Research Design

Pretest	Treatment	Postest
O_1	X	$\mathbf{O_2}$

Information:

O_1: *Pretest* students' mathematical logical intelligence

O_2: *Posttest* students' mathematical logical intelligence

X: Learning treatment using the Realistic Mathematic Education (RME) module assisted by an interactive digital module based on local excellence on the North Coast of Central Java

3.2 Sampling

The population in this study consisted of Grade IV students at Sunan Kudus Special Elementary School (SDLB Sunan Kudus). The sampling technique used was non-probability sampling, with data collected through saturated sampling. Saturated sampling is a technique in which all members of a small population are selected as the sample (Lestari & Yudhanegara, 2017). This method is appropriate when the total population is relatively small, typically fewer than 30 individuals (Lestari & Yudhanegara, 2017). Based on this approach, the entire population of 10 students in Grade IV of SDLB Sunan Kudus was included as the sample. All participants were diagnosed with mild intellectual disabilities and had not previously been exposed to Android-based learning media. The use of saturated sampling ensured that the study represented the full characteristics of the target population.

3.3 Data Collection

The data collection technique in the study is using tests. The test is a tool to collect information, when compared to other tools, the test is more official because there are limitations (Arikunto, 2010). The test is used to retrieve data on students' level of mathematical logical intelligence. The tests tested are in the form of pretest and posttest questions. The pretest questions were given before using the Realistic Mathematics Learning Model (PMR) assisted by the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia. while the posttest questions were given after using the Realistic Mathematic Education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia. So that it can be known that the improvement of mathematical logical intelligence before and after using the Realistic Mathematic Education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording is based on local excellence on the North Coast of Java, Indonesia.

3.4 Data Analysis

After the data is collected, the next step is to analyze the data. First, a prerequisite test is carried out, namely a normality test to determine whether the distribution of data is normally distributed or not, Next, a *one sample t test will be carried* out to find out whether learning with the Realistic Mathematics Learning model assisted by Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia achieves learning completeness and *n gain* test to find out whether there was an increase in mathematical logical intelligence before and after the implementation of the Realistic Mathematic Education (RME) model based on the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia.

4. Results

The research results will be discussed in several sections. Starting with a prerequisite test then testing the achievement of mastery in learning to use *uji one sample t test* then test the increase in mathematical logical intelligence before and after implementation *treatment* by using *n-gain.*

4.1 Student Learning Completeness

To test the mastery of learning, researchers conducted a normality test first as a prerequisite test for the results *posttest*. The following are the results of the normality test in Table 2.

Table 2. Normality Test *Posttest*

Class	Lots of Data	Test Shapiro Wilk
Class Experiment	10	0.67

Based on the SPSS testing in Table 2, a significance value of 0.67 > 0.05 was obtained. So H_0 accepted which means value *posttest* declared to be normally distributed.

After that, the mastery of learning will be tested using a test *one sample t test* to analyze data. The research hypothesis carried out is:

$H_0 : \mu \leq 60$, the average mathematical logical intelligence of students using the Realistic Mathematics Education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia is no more than 60.

$H_1 : m > 60$, the average mathematical logical intelligence of students using the Realistic Mathematics Education (RME) Digital Mathematics Science Module With Voice Recording model based on local excellence on the North Coast of Java, Indonesia is more than 60.

The test criteria used are as follows:

- If $P - value > 0{,}05$, for H_0 accepted
- If $P - value < 0{,}05$, for H_0 rejected

The results of calculations using SPSS are in Table 3.

Table 3. Results *Uji One Sample T Test*

Class	Lots of Data	Test One Sample T Test
Class Experiment	10	0.411

Based on data analysis, it was found that P-$value$ = 0.411. Because one party testing is right then $P - value = \frac{1}{2} \times Sig.(2 - tailed)$ or $\frac{1}{2} \times 0{,}411 = 0{,}2055$. As for the testing criteria $\frac{1}{2} \times \alpha$ or $\frac{1}{2} \times 0{,}05 = 0{,}025$. P-value$value$ more than α namely 0.025. Because 0.2055 > 0.025, then H_0 rejected, which means that at the 95% confidence level it can be concluded that $m > 60$, then the average mathematical logical intelligence of students using the Realistic Mathematics Education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia is more than 60 or achieved learning completion.

4.2 Increasing Students' Mathematical Logical Intelligence

To determine the increase in mathematical logical intelligence before and after being given treatment, researchers used a test *n-gain*.

Criteria *n-gain* according to Lestari & Yudhanegara (2015), namely in Table 4.

Table 4. Criteria *N-Gain*

Mark *N-Gain*	**Criteria**
$N - Gain \geq 0.70$	High
$0.30 \leq N - Gain < 0.70$	Currently
$N - Gain < 0.30$	Low

As for the calculation results *n-gain* in Table 5:

Table 5. Test Results *N-Gain*

Student Name	Pretest	Posttest	N-Gain	Information
AWNH	50	81.3	0.63	Currently
AVK	31.25	50.0	0.20	Low
AGPH	31.3	50.0	0.27	Low
RAHPS	56.25	81.3	0.57	Currently
WZPA	31.25	43.8	0.18	Low
KHH	43.75	75.0	0.56	Currently
ZPN	50	68.8	0.38	Currently
SRG	31.2	50.0	0.27	Low
GS	56.25	75.0	0.43	Currently
DOWN	43.75	68.8	0.44	Currently
Rata-Rata	42.5	64.4	0.37	Currently

Overall, after learning with the Realistic Mathematic Education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia, it influences students' mathematical logical intelligence with the results: Average score *pretest* 42.5; average value *posttest* 64.4; and average value *n-Gain* 0.37, which shows that the increase in students' mathematical logical intelligence in the Realistic Mathematics Education (RME) by DIMSMOVE based on local excellence on the North Coast of Java, Indonesia reached medium criteria.

5. Discussion

Students' mathematical logical intelligence can be increased by using the Realistic Mathematics Education (RME) Digital Mathematics Science Module With Voice Recording model based on local advantages on the North Coast of Java, Indonesia. This is proven by the results *one sample t test* The P-value obtained$value$ more than α namely 0.025. Because 0.387 > 0.025, this means that the average mathematical logical intelligence of students using the Realistic Mathematics Education (RME) model assisted by the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia is more than 60 or the KKM score. And on the test results *n-gain*% of 38% which is interpreted in the medium category. This means that the use of the RME model assisted by the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia is effective in improving the mathematical logical intelligence of fourth grade elementary school students.

This is in line with the results of research that has been carried out in classes using a realistic mathematics learning model assisted by Digital Mathematics Science Module With Voice Recording based on the local advantages of the North Coast of Java, Indonesia. It can be seen at the stage of understanding contextual problems that in using the Digital Mathematics Science Module With Voice Recording based The local advantages of the North Coast of Java, Indonesia can increase students' mathematical logical intelligence because the Digital Mathematics Science Module With Voice Recording based on the local advantages of the North Coast of Java, Indonesia is designed with contextual problem content with interesting images and videos so that students do not get bored quickly in learning. According to Hartati & Azizah, (2019) Learning for children with special needs, including children with mild intellectual disabilities, requires special strategies according to their individual needs, including teaching materials and media that will be used in learning. Children with intellectual disabilities require learning media that are concrete, colorful, and engaging to maintain their attention and support their learning process due to their limited concentration and slower cognitive grasping abilities (Marsyaelina et al., 2022; Nugraha & Mumpuniarti, 2019; Ramadanti, 2022). Apart from that, by using the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia, students can more easily understand the material because the digital module is content based on real life. Learning makes children understand the material better because children are directly involved in it.

At the stage of understanding contextual problems, students can develop logical reasoning when understanding the contextual problems given. Improving students' reasoning abilities through realistic or concrete learning experiences helps them grasp abstract mathematical concepts more effectively, as students more easily understand mathematical

concepts by making connections with real-world problems and representing abstract objects using concrete materials (Cindyana et al., 2022; Saleh et al., 2018) (Marsyaelina et al., 2022; Nugraha & Mumpuniarti, 2019; Ramadanti, 2022). These findings support the notion that learning methods which emphasize concrete reasoning and contextual understanding are essential tools for improving students' comprehension of abstract math content. In accordance with research by Anggani et al., (2019) that the application of the RME model can improve students' reasoning. Apart from that, the use of interactive digital modules based on local advantages of the North Coast of Java, Indonesia also influences the process of developing students' reasoning because in the digital modules there are illustrated story narratives and short dialogues. Using picture stories or narrative dialogues in learning media can significantly develop students' reasoning processes, because when students observe visual representations or read contextual dialogues containing mathematical ideas, they engage in structured thinking that supports understanding and problem solving (Ramadanti, 2022). In conclusion, fostering students' reasoning abilities requires learning approaches that are grounded in real, contextual experiences and supported by engaging media such as picture stories and narrative dialogues. Through the integration of the RME model and interactive digital modules that reflect local contexts, students are not only better equipped to understand abstract mathematical concepts but also more actively involved in structured, meaningful learning processes that enhance their logical thinking and problem-solving skills.

After the stage of understanding contextual problems, the next learning activity is explaining contextual problems with the help of the Digital Mathematics Science Module With Voice Recording based on local advantages of the North Coast of Java, Indonesia. The problems given must of course be directed according to the goals to be achieved in learning, so the teacher provides instructions about the problems that have been given. The teacher asks students to open the explanation menu for the material available. Digital Mathematics Science Module With Voice Recording is based on the local advantages of the North Coast of Java, Indonesia. In the Digital Mathematics Science Module With Voice Recording, based on local advantages on the North Coast of Java, Indonesia, there are explanatory steps in solving contextual problems that have been adapted to indicators of logical intelligence and there is a voice recording feature. Voice recording can be used by students to play or record the teacher's explanation of material repeatedly to further clarify concepts that are difficult to understand. In addition, voice recording can be adapted to meet the needs of students with various learning styles and special needs, such as those who require additional explanations or access to material in a format that is easier to understand (Meyer et al., 2021). In conclusion, the integration of the Digital Mathematics Science Module With Voice Recording enriched by local cultural contexts and voice features provides a meaningful, accessible, and inclusive learning experience. By combining contextual problem-solving with adaptive audio support, this module not only strengthens students' logical-mathematical intelligence but also accommodates diverse learning needs, especially for those requiring repeated explanations and personalized learning pathways.

Furthermore, after students understand the meaning of contextual problems, students solve contextual problems in their own way in the Digital Mathematics Science Module With Voice Recording based on local advantages on the North Coast of Java, Indonesia. In the Digital Mathematics Science Module With Voice Recording. Here the teacher encourages students to solve contextual problems themselves but by providing guiding questions to students so that students discover their own concepts. At this stage students discover their own concepts so that after discovering these concepts the material provided will be better remembered by students. This is in accordance with the RME concept according to Freudenthal that knowledge obtained by discovery is more understandable and better remembered by students than knowledge obtained passively. In line with Elwijaya et al., (2021) that by applying concepts, students can construct their own knowledge better. Apart from that, students can form their own thought patterns in solving contextual problems. Anggani et al., (2019), realistic mathematical education is oriented towards real student reasoning for the development of logical thinking patterns. Students can develop symbolic models of the problems posed.

At this stage, the use of the Digital Mathematics Science Module With Voice Recording is based on the local advantages of the North Coast of Java, Indonesia. In the Digital Mathematics Science Module With Voice Recording, student learning activities are more meaningful because the interactive digital module presents information concisely and structured according to indicators of mathematical logical intelligence. According to Turnip & Karyono, (2021) digital modules present material in a structured manner packaged interactively. In line with Maniq et al. (2022) learning with digital modules makes mathematics learning more meaningful because digital modules can attract students' attention and students are not only fixated on books and pencils (Ardianti, Wanabuliandari, Gunarhadi, et al., 2023; Danuria et al., 2024; Florentina Turnip & Karyono, 2021; Kurniasih et al., 2020b; Maniq et al., 2022). This is in line with Albab et al., (2021) stating that the use of digital media can make students understand the material more deeply by providing problems related to everyday life. In conclusion, the Digital Mathematics Science Module With

Voice Recording rooted in local wisdom and supported by structured digital content offers a powerful medium to foster meaningful mathematics learning. By presenting material interactively and aligning with indicators of mathematical logical intelligence, this module enhances students' understanding, sustains their attention, and connects abstract concepts to real-life contexts, especially for diverse learners with varying needs.

Digital Mathematics Science Module With Voice Recording learning media based on local excellence on the North Coast of Java, Indonesia can also increase students' learning motivation because it is interactive and interesting, thereby fostering students' interest in learning. Interactive digital modules can increase students' learning interest and motivation in understanding learning material because they contain text, images, audio and video so they are interactive (Nasrulloh et al., 2024; Qotimah & Mulyadi, 2021; Saharani & Abadi, 2024; Susanti et al., 2019; Widodo et al., 2021). Research (Herawati & Ulya, 2021) also shows that the use of digital-based learning media can increase students' enthusiasm for learning. Digital modules based on ethnomathematics can motivate students in learning, so that the higher the students' motivation, the more they want to learn and make learning more meaningful (Andhany & Maysarah, 2023; Ardianti, Wanabuliandari, & Tanghal, 2023; Rahmaniah & Zainuddin, 2023; Wanabuliandari & Sekar Dwi Ardianti, 2024). Learning using IT-based media, this can be seen from the students' activeness during learning (Saputra & Febriyanto, 2019; Swanson, 2010)(Saputra & Febriyanto, 2019; Swanson, 2010). In conclusion, the Digital Mathematics Science Module With Voice Recording, enriched with local cultural elements and interactive features, proves to be a highly effective medium for enhancing students' learning motivation. By integrating multimedia elements and ethnomathematical contexts, this digital module not only captures students' interest but also encourages active participation, fosters deeper engagement with mathematical content, and ultimately creates a more meaningful and enjoyable learning experience.

Apart from that, learning with the assistance of the Digital Mathematics Science Module With Voice Recording based on local excellence on the North Coast of Java, Indonesia helps students increase their understanding and activeness in learning. Presenting learning with interactive digital media, learning will be quickly captured by students with intellectual disabilities (Maulidiyah, 2020). In the results of research in several journals, students with special needs who are mildly mentally retarded are helped by learning that uses interactive learning media with attractive designs and its use can increase student activity.

At the stage of comparing and discussing answers, learning is active and interaction occurs between friends or teachers. Interaction between students and teachers during learning plays a crucial role in developing students' cognitive abilities, critical thinking, and conceptual understanding, as dialogic exchanges encourage students to articulate, reflect, and justify their ideas (Darling-Hammond et al., 2020; Webb, 2009)(Webb, 2009; Rosenshine & Meister, 1994; Darling-Hammond et al., 2020). Furthermore, interactive learning environments supported by digital tools and responsive instruction have been shown to foster brain connectivity, student engagement, and academic performance, particularly when built upon warm, supportive teacher-student relationships (Bhuttah et al., 2024; Xiao et al., 2023). In conclusion, the comparing and discussing stage not only activates students' thinking but also strengthens their understanding through meaningful social interaction. When supported by digital tools and guided teacher facilitation, such dialogic learning environments enhance cognitive development, foster deeper engagement, and build a collaborative classroom culture that supports long-term academic success.

At the end of the lesson, the concept of contextual problems is discovered after comparing answers in class discussions. Students and teachers together summarize the lessons learned. This is in line with the characteristics of RME, namely that students reflect on the process during learning (Anggani et al., 2019). After learning is complete, students can also see the conclusions of the concepts obtained in the Digital Mathematics Science Module With Voice Recording based on local advantages of the North Coast of Java, Indonesia and the material. What you have obtained can be seen anywhere and at any time so that learning is easier for students to remember. Learning using interactive digital modules can train children's memory and thinking because they can be accessed anywhere, using interactive digital modules is the right choice because the material presented is concrete and unconventional (Maulidiyah, 2020). In conclusion, concluding the lesson through class discussions and reflection helps students internalize mathematical concepts more effectively, in line with the principles of Realistic Mathematics Education (RME). By utilizing the Digital Mathematics Science Module With Voice Recording, students gain flexible access to structured and contextual material, which not only reinforces memory but also enhances understanding through concrete, interactive, and meaningful learning experiences.

Apart from that, after learning is finished, students can still repeat the teacher's explanations that have been given using the voice recording feature so that they remember more about the material given. These recordings can be used to clarify concepts that are difficult to understand and provide more detailed explanations than can be delivered in

face-to-face sessions (Hattie & Timperley, 2007). This feature also allows for student and teacher feedback when there is an explanation that is not understood and needs to be clarified.

6. Conclusion

Based on data analysis and discussion, it can be concluded that mathematics learning using the *Realistic Mathematics Education* (RME) model assisted by the *Digital Mathematics Science Module With Voice Recording* (DIMSMOVE) based on local excellence of the North Coast of Java has proven effective in enhancing the mathematical logical intelligence of students with mild intellectual disabilities. This is evident from the post-test results, where all students achieved scores above the Minimum Completeness Criteria (MCC), and the average N-Gain score of 0.37 falls into the medium improvement category. A key finding of this study is that the use of DIMSMOVE provides contextual, adaptive, and interactive learning. The voice recording feature facilitates students' reflection, repetition, and flexible access to learning materials. Thus, this media not only enriches the method of delivering information but also strengthens understanding through learning experiences that are closely related to students' daily lives. However, the absence of students achieving high improvement categories indicates that the learning intervention still has room for further refinement. This suggests the need for more personalized and tiered instructional strategies to accommodate the individual learning needs of students with special needs. The implications of this study show that integrating local cultural values with interactive digital technology such as DIMSMOVE can be an inclusive and effective educational strategy to improve cognitive competencies in students with intellectual disabilities. Therefore, it is recommended to further develop DIMSMOVE by adding varied levels of difficulty, formative assessment-based interactive features, and integration with supporting technologies such as augmented reality to enhance student engagement and learning outcomes. Future studies are encouraged to involve a broader population and adopt a mixed-methods approach to explore the affective and social aspects that also influence the improvement of learning outcomes among students with special educational needs.

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Authors contributions

Savitri Wanabuliandari was actively involved in the development of research instruments, selection of research sites, content validation of the DIMSMOVE module, writing of the introduction and discussion sections, as well as editing the language and formatting of the manuscript. She also facilitated coordination among team members and assisted in the implementation of the learning media trial in schools. Sumaji served as the principal investigator of this study. He initiated the research idea, designed the conceptual framework, led the construction of the RME-based learning model integrated with DIMSMOVE, and supervised the data analysis process and conclusion formulation. Sumaji also ensured scientific quality control at each stage, from planning to the final revision of the manuscript. Feby Fauzia Ulya was responsible for technical coordination of data collection at SDLB Sunan Kudus, field documentation, writing the methodology section, and tabulating and validating the measurement results. Sekar Dwi Ardianti drafted the initial version of the introduction and literature review and assisted in developing the module content to match the characteristics of students. Muhammad Imam Ghozali prepared tables and data visualizations, reviewed the reference list, and ensured the manuscript adhered to journal formatting guidelines. All authors read and approved the final manuscript. The second author, Sumaji, was fully responsible as the main scientific coordinator of this research.

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