

A Qualitative Approach in Designing Differentiated Numeracy Learning Strategies for Lower Grade Slow Learner Students

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Abstract

Slow learners often face difficulties in grasping abstract mathematical concepts, necessitating adaptive teaching strategies. The purpose of this study is to design an effective learning strategy using a concrete object-based approach. This research utilizes a qualitative approach, combining case studies and a systematic literature review. Data was collected through classroom observations, teacher interviews, and document analysis. The findings indicate a significant improvement in slow learner students' ability to recognize numbers and relate them to physical objects and shapes. The discussion highlights that the five activities designed, namely counting objects, matching numbers with the number of objects, grouping objects, recognizing flat shapes, and drawing, can improve students' numerical understanding, where this approach not only helps students recognize numbers but also builds relationships between numbers and objects around them. The implications of this study emphasize the importance of using concrete aids and flexible teaching strategies in learning for slow learner students, as well as the need for collaboration between teachers and parents to support a more inclusive and effective learning process.

Keywords: Differentiated Teaching Strategies, Numeracy, Slow Learner Students

Introduction

Numeracy learning is a fundamental aspect of elementary education aimed at equipping students with essential basic math skills crucial for everyday life (Mustofa, 2020; Setianingsih et al., 2022). In addition to arithmetic skills, numeracy also includes a broader understanding of mathematical concepts such as measurement, geometry, and practical applications in problem-solving (Mustofa, 2020; Setianingsih et al., 2022). In practice, numeracy instruction in elementary schools often faces challenges, particularly for students with special needs, such as slow learners (Ermiana et al., 2021; Muyassaroh, 2023; Widodo et al., 2022). Slow learners exhibit slower cognitive development compared to their peers (Aziz et al., 2016; Mandagani et al., 2022; Supriyani et al., 2022). Therefore, slow learners require more specific and guided learning strategies to effectively grasp mathematical concepts.

Effective learning, particularly in the context of inclusive education, requires attention to the learning needs of slow learners to ensure they do not fall behind (Pramesti et al., 2023; Purwanti et al., 2022; Putri & Fakhruddiana, 2018). Previous studies have shown that slow learners tend to struggle with mastering abstract concepts such as numbers and arithmetic operations (Rofiah et al., 2017; Hadi, 2016). They also require more time to process information, meaning that the learning (Hadi, 2016; Rofiah & Rofiana, 2017) strategies employed must be tailored to their needs (Amelia, 2016; Sumiati & Gumindari, 2022; Wati & Hendriani, 2024). A

special needs-based learning approach can be an effective solution, where teachers design strategies that match the learning style and abilities of slow learners.

Adjustments can be made by emphasizing the importance of differentiated approaches in teaching strategies (Natsir & Manaf, 2023; Pratiwi et al., 2023). This is key to meeting the diverse learning needs of students (Arista et al., 2022; Sarnoto, 2024). Differentiation involves adjusting content, methods, and assessments according to the students' ability levels and learning styles (Samsiyah, 2022). For slow learners, the strategies employed must be concrete and practical, utilizing visual and manipulative media to help them better understand numeracy concepts (Deda et al., 2023; Nurzanah, 2024). Additionally, repetition of material becomes essential to reinforce understanding (Meilani et al., 2023). This approach enables students to achieve numeracy competence in line with their developmental stage without feeling overwhelmed by overly challenging concepts.

Field evidence shows that, despite the development of various special needs-based numeracy learning strategies, their implementation in practice often faces significant challenges, particularly in optimizing instruction. Teachers' limited understanding of the unique characteristics of slow learners can lead to difficulties in designing appropriate learning experiences (Murtafiah et al., 2024). Furthermore, the lack of resources supporting inclusive learning, such as teaching aids and educational media, also poses challenges (Mukti et al., 2023). Inadequate teacher training in designing and implementing effective teaching strategies renders the teaching process less optimal (Cahyaningrum et al., 2023; Murtafiah et al., 2024). Thus, it is crucial to further explore how effective learning strategies can be optimally applied to support the learning needs of slow learners.

Based on the discussion above, it can be concluded that an in-depth understanding of the challenges faced by slow learners in numeracy learning is essential, including their difficulties in grasping basic concepts and the impact on their motivation and self-confidence (Nurfadhillah et al., 2022; Simbolon et al., 2022). It is important for educators to identify and implement appropriate learning strategies suited to these students' characteristics so they can develop a better understanding of numeracy concepts (Maulyda et al., 2021). With the right approach, slow learners are expected not only to overcome existing difficulties but also to improve their overall academic abilities.

Previous studies have generally focused on differentiated learning in broad contexts without specific consideration for slow learners' numeracy needs in lower elementary grades. Therefore, this study fills a crucial gap by focusing specifically on designing differentiated numeracy learning strategies for slow learners in these grades. The novelty of this research lies in its targeted approach, focusing on the integration of tailored learning activities and multimedia tools that address the unique cognitive and emotional needs of slow learners. This study will address two primary research questions. First, it will explore how numeracy instruction is currently implemented for slow learners, including the challenges faced by educators in adapting their teaching methods. Second, it aims to design numeracy learning activities that help slow learners better understand basic numeracy concepts, while also enhancing their engagement and motivation in the learning process. Through a qualitative approach and case study, this research hopes to provide in-depth insights into current practices and offer recommendations for more effective numeracy education strategies for students with special needs.

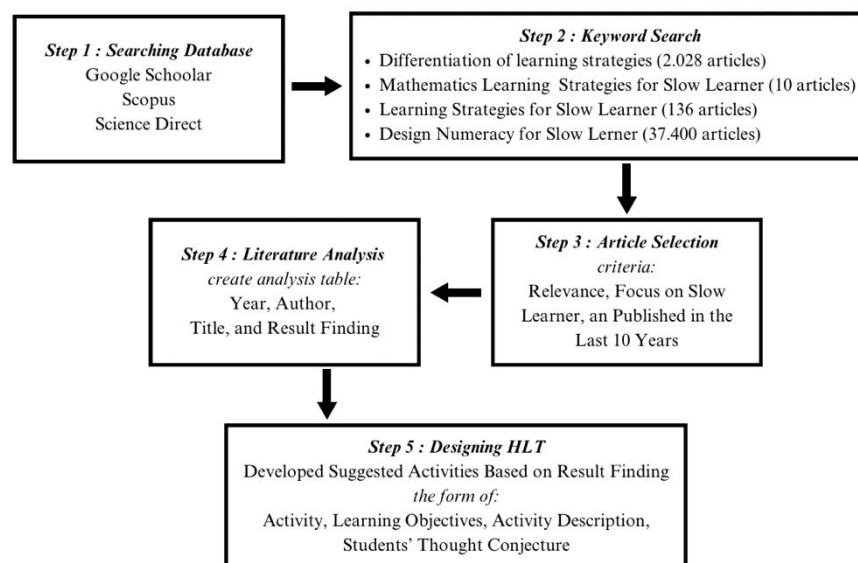
Method

This study employs a mixed-methods qualitative approach, combining both case study and literature review methods to identify and design appropriate numeracy learning strategies

for slow learners in elementary schools. The case study method involves fieldwork in selected elementary schools, where the researcher will conduct classroom observations to record the methods and approaches used by teachers during numeracy instruction. The observation will focus on identifying teaching strategies, classroom dynamics, and the use of learning materials tailored for slow learners. Additionally, interviews with teachers will be conducted to explore their understanding of the characteristics and needs of slow learners, as well as how they design and implement learning activities that address these needs. The informants for the interviews will be selected from teachers who have experience working with slow learners in numeracy education. Furthermore, documentation will be carried out by reviewing lesson plans, teaching materials, and any assessments used during the lessons. These documents will provide a more comprehensive view of the strategies applied in numeracy teaching and help in evaluating the alignment between planned and implemented strategies. The data obtained from observations, interviews, and document analysis will be analyzed thematically, focusing on identifying key themes related to effective numeracy teaching practices for slow learners.

In parallel, the literature review method involves the search and analysis of articles from various academic databases such as Google Scholar, Scopus, and ScienceDirect. The research focuses on keywords such as "differentiated learning strategies," "mathematics learning strategies for slow learners," and "numeracy design for slow learners." This search yields a large number of articles, and only those directly relevant to numeracy learning for slow learners and published within the last 10 years were selected. The literature review includes six articles that were then analyzed to extract key findings related to the design and implementation of numeracy learning strategies for slow learners. These findings, along with the insights gained from the field study, were used to design a HLT (Hypothetical Learning Trajectory) that outlines proposed learning activities and strategies for numeracy instruction tailored to the needs of slow learners. The results of the literature review are organized and presented in a table for clarity.

By combining field-based research and a comprehensive literature review, this study provides a holistic approach to designing effective numeracy strategies for slow learners, blending both empirical evidence from classroom practices and theoretical insights from the existing literature.. The following is a chart for the existing literature review:



Picture 1. Stages of the literature review method

Results

Implementation of Numeracy Learning for Slow Learner Students in Elementary Schools

The results of this study reveal that the implementation of numeracy learning for slow learner students in elementary schools requires a specialized and adaptive approach. Through observations and interviews with several teachers, it became apparent that the main challenges in teaching slow learners are building their confidence and giving enough attention to their needs. Teachers often provide special attention in learning, such as asking slow learner students questions after explaining the material. Teachers face difficulties in explaining complex numeracy concepts, which forces them to find innovative ways to deliver the material so that it can be understood effectively. The limited learning abilities of slow learner students often become a barrier that requires extra attention from the teacher.

Based on the interviews, many teachers emphasized the importance of repetition in the learning process. They often had to repeat explanations in simpler ways and use visual aids, such as pictures and concrete objects. In diagnostic assessments, it was found that slow learner students tend to have a visual learning style, prompting teachers to use more visual aids like images and concrete items. These tools greatly assist students in understanding basic numeracy concepts that might be difficult to grasp through verbal explanations alone. Thus, the use of visual aids not only enhances students' understanding but also makes the learning process more enjoyable. Additionally, observations showed that material repetition was consistently employed to strengthen student understanding. Teachers agreed that repetition helps in retaining information and gives students the opportunity to explore learned concepts in different contexts.

The assessment results also indicated that slow learner students had not yet fully grasped numbers 1-10 and struggled with counting, as well as understanding the concepts of 2D and 3D shapes. Therefore, teachers designed engaging and interactive learning activities tailored to the students' abilities. These activities included simple games to maintain students' interest in learning numeracy. The game-based method not only reduced tension during learning but also helped students internalize numeracy concepts more naturally. Although there was no significant difference in the teaching modules between regular and special needs students, adjustments to the Student Worksheets (Lembar Kerja Peserta Didik/LKPD) were essential. Simpler worksheets were specifically designed for slow learner students to allow them to actively participate in each learning activity.

The evaluation of students' progress was conducted through observations of their participation and behavioral changes during learning activities. Teachers directly observed students' responses to instructions and feedback. Through this method, teachers could assess the extent of students' understanding of numeracy material and adjust their teaching strategies as needed. This observation-focused evaluation method became a more effective way to support the development of slow learner students. On the other hand, challenges in this learning process also included the need to create an environment that fosters students' self-confidence and accommodates their shorter attention spans. Some teachers mentioned that slow learner students often feel frustrated when they struggle to keep up with lessons.

The importance of collaboration with parents was also highlighted in this study. Several teachers revealed that parental involvement in supporting their children's learning at home is crucial. Parental involvement in the learning process can increase students' motivation and help them better understand numeracy concepts. Therefore, teachers recommended involving parents in learning activities, such as providing homework or exercises that can be done at home. With the cooperation between teachers and parents, slow learner students are expected to experience a significant positive impact on the development of their numeracy skills.

Overall, the results of this study demonstrate that the application of appropriate strategies and continuous support can improve the numeracy abilities of slow learner students in lower grades. This research emphasizes the importance of adaptive and responsive approaches to individual students' needs. As a result, students are expected to develop better numeracy skills and increase their confidence in learning. Since the success of numeracy learning for slow learner students heavily depends on the active involvement of all parties, teachers, students, and parents, the implementation of inclusive and adaptive strategies will positively impact the teaching and learning process in lower-grade classrooms.

Analysis of Literature Review on Numeracy Learning Activities for Slow Learner Students

The results of the research based on the Literature Review method regarding numeracy learning for slow learner students identify several significant findings. The researchers analyzed accredited articles published in the last 10 years on the topic of numeracy learning strategies at the elementary school levels. The findings of this analysis are presented in the following table:

Table 1. Results of the Literature Review Analysis

Tahun Terbit	Nama Penulis	Judul Artikel	Hasil Penelitian
2016	Suvarna Ganvir, Shyam Ganvir	Strengthening Learning Styles May Improve the Academic Performance of Slow Learners	The numeracy learning activities for slow learners involve several stages. It begins with identifying participants to determine students facing difficulties, followed by administering the VARK questionnaire to identify their learning styles. Based on the questionnaire results, students are grouped into unimodal or multimodal categories and provided with information about their learning styles and how to utilize them effectively. Next, counseling sessions are conducted to help students understand and strengthen their learning styles, accompanied by biweekly visits to monitor progress. Evaluation is carried out through numeracy tests to measure the students' improvement, and the results are analyzed to assess the effectiveness of the intervention. These stages are designed to enhance students' awareness of their learning styles and support them in adapting to numeracy learning.
2019	Nur Rahmah Zulkifli, Nur Azan Mat Zin, Rosadah Abd Majid	Gamification Design for Teaching Numeracy to Slow Learners	The numeracy learning activities in the NUMERATICA application for slow learners are designed in stages. It begins with the Learning Module, which introduces numbers and how to write them using multimedia elements such as images and audio that can be replayed to aid understanding. Next, students proceed to the Game Module, which is interactive and engaging, reinforcing the concepts they have learned while enhancing their learning engagement. Finally, the Quiz Module evaluates students' understanding through multiple-choice questions with immediate feedback to motivate them further. This sequence ensures that the NUMERATICA application is designed to make numeracy learning more enjoyable and effective.
2020	Mohamed Al-Mahdi Mohamed Abdul-Rahman	The Effectiveness of Learner Control and Program Control Strategies in Enhancing	Numeracy learning activities for slow learners are designed to enhance conceptual understanding progressively. The process begins with transforming words into symbols, helping students convert sentences into mathematical equations, followed by

		Mathematical Thinking Among Slow Learners	logic statements and proofs that train mathematical thinking. The lessons are made engaging through interactive topics, while the use of technology, such as computer programs, allows students to learn at their own pace. This approach is enriched with multisensory methods, combining visual, auditory, and kinesthetic elements to support comprehension. With this strategy, students are expected to improve their numeracy skills effectively and participate more actively in learning.
2021	F. Setyawan, Andriyani, Tri Kinasih Handayani, Koesoemo Ratih, Anam Sutopo, Tri Indah Rusli, Nur Rizky Alfiany.	Rigorous Thinking in Mathematics Modelling for Slow Learners	The numeracy learning activities proposed in this study for slow learners focus on structured mathematical modeling stages. Students are guided to answer rigorous questions designed to connect mathematical concepts with real-life situations, fostering deeper understanding. They then engage in mathematical modeling activities, which involve identifying variables, determining suitable models, and solving problems using relevant strategies. Subsequently, students are encouraged to discuss and reflect on the problem-solving process, enhancing their critical thinking strategies and confidence. Throughout this process, instructors act as mediators, providing feedback and analogies to help students relate mathematical concepts to everyday life. This approach aims to actively engage slow learners, improve their understanding of the material, and effectively develop their numeracy skills.
2023	Nur Listiawati, Simon Sili Sabon, Siswantari, Subijanto, Slamet Wibowo, Zulkardi, Bambang Riyanto	Analysis of Implementing Realistic Mathematics Education Principles to Enhance Mathematics Competence of Slow Learner Students	Numeracy learning activities for slow learners involve the use of familiar media such as images, videos, and games, as well as simulations of real-life experiences to enhance their understanding of mathematical concepts. Students are encouraged to actively participate in solving mathematical problems through discussions, interactive question-and-answer sessions, and the application of relevant concepts from daily life. The learning process is enriched with enjoyable math games, recognition of student achievements to boost motivation, and collaboration with parents to support learning at home. This approach is designed to facilitate slow learners in comprehending and mastering the material effectively.
2024	Nur Puji Rahayu, Lusiana Pratiwi, Windi Setiawan	Improving The Numeracy Skills of Slow Learners with Ice Cream Stick Media: Single Subject Research	Numeracy learning activities for slow learners begin with the use of Cuisenaire rods to help them understand addition and subtraction concepts concretely. Next, ice cream sticks are used as manipulatives for performing basic operations such as addition and subtraction, making the learning process more interactive and easier to understand. Additionally, play-based activities involving counting with manipulatives are integrated into the learning process, allowing students to learn while playing, which in turn enhances their interest and concentration in mathematics.

The findings from various studies on numeracy learning for slow learners reveal several key strategies aimed at gradually enhancing their understanding of mathematical concepts in an engaging manner. These strategies include the use of concrete manipulatives such as Cuisenaire rods and popsicle sticks, which are effective in supporting comprehension of basic mathematical operations like addition and subtraction. Additionally, multimedia elements, such as images and audio integrated into interactive learning applications, are frequently employed to capture students' interest and facilitate step-by-step mastery of numeracy concepts. A multisensory approach, encompassing visual, auditory, and kinesthetic modalities, further tailors instruction to the unique learning styles of slow learners.

Beyond these methods, the studies also emphasize the role of mathematical modeling and experiential educational games that incorporate real-life scenarios to boost student engagement and motivation. These approaches are designed to make learning more accessible and enjoyable, ensuring that slow learners actively participate in lessons and progressively improve their numeracy skills.

From an analytical perspective, the literature shows a recurring trend of prioritizing hands-on, interactive, and individualized teaching strategies. However, a critical gap exists in the consistency of their implementation due to challenges such as limited teacher training and inadequate resources in inclusive education settings. Additionally, while the studies highlight the effectiveness of these strategies in the short term, there is limited empirical evidence on their long-term impact on academic performance and cognitive development among slow learners.

Synthesizing these findings provides a comprehensive overview of effective practices and highlights opportunities for innovation, such as integrating technology-based learning tools and developing cost-effective teaching aids. These insights not only align with the study's research questions but also underline the importance of adaptive and inclusive numeracy teaching strategies. In practice, the findings suggest that implementing these strategies can significantly improve the learning outcomes of slow learners, thereby contributing to the broader goals of equity and inclusivity in education.

Discussion

The implementation of numeracy learning for slow learner students in elementary schools requires a special and adaptive approach (Harahap, 2022; Sumiati & Gumiandari, 2022). Slow learner students often face challenges in absorbing information at the same pace and manner as their peers (Hanifah et al., 2024; Rohida et al., 2024). Therefore, it is crucial for teachers to develop teaching strategies that not only align with the curriculum but also meet the specific needs of the students (Muhimmah, 2022). In this context, teachers play an essential role in creating a supportive learning environment where students feel safe and comfortable to learn (Latifah et al., 2023; Mariana et al., 2021). Building students' self-confidence is a critical factor that must be developed so that they feel empowered to express the difficulties they encounter in learning.

When designing learning strategies, it is important to consider various aspects, including the learning objectives to be achieved, the activities students will engage in, and a description of activities that can help students better understand the material. Taking into account the characteristics of slow learner students, the strategies designed should be flexible and adaptive, allowing for adjustments based on each student's needs (Handayani et al., 2024; Sholihin & Ibrahim, 2023). This includes the use of various media and aids that can enhance students' understanding of the material being taught (Ambarwati et al., 2022). Through this research, it is hoped that a design will be produced that can improve students' learning experiences in

understanding numeracy concepts (Lukman, 2023). The design of numeracy learning activities for slow learner students can be summarized in the following Hypothetical Learning Trajectory (HLT) table:

Table 2. Hypothetical Learning Trajectory (HLT)

Activity	Learning Objectives	Activity Description	Students' Thought Conjecture
Counting Concrete Objects	Students can count numbers 1-10	Students are given concrete objects such as marbles, and they are asked to count the number of marbles present.	Students may begin to understand that each marble counted represents one number, and they can associate the quantity with the correct number.
Matching Numbers with the Quantity of Objects	Students can match numbers with the quantity of objects	Students have number cards from 1 to 10 and concrete objects. They are asked to match the number cards with the corresponding quantity of objects (for example, 3 marbles for the number 3).	Students will think about the relationship between numbers and the quantity of objects, and they will try to figure out which number matches the quantity of objects they see.
Grouping Objects Based on Numbers	Students can group objects according to numbers 1-10	Students are asked to create groups of objects according to the specified numbers, such as a group of 2 balls, 4 blocks, and 1 doll.	Students may realize that each group reflects a different number and learn to group correctly, thereby strengthening their understanding of numbers.
Matching Numbers and Flat Shapes	Students can recognize flat shapes and match numbers	Students are given cards of flat shapes (such as triangles and squares) and number cards. They match the number of sides of the flat shapes with the corresponding number.	Students will think about the shapes of flat objects and will try to remember the number of sides of each shape to make the matches, helping them recognize the characteristics of shapes.
Counting Game and Drawing Lines	Students can count numbers and match them with the number of flat shapes	Students count objects (for example, 1-10 marbles) and draw lines from images of flat shapes corresponding to the numbers they counted.	Students will practice linking numbers with visual shapes and improve their fine motor skills through drawing lines, as well as understanding the relationship between numbers and geometric shapes.

The conclusion of the efforts to introduce numbers 1-10 to students through concrete objects shows that the five designed activities—counting objects, matching numbers with quantities, grouping objects by numbers, matching numbers with flat shapes, and drawing flat shapes—are effective approaches in building numerical understanding. These activities not only assist students in recognizing numbers but also relate them to geometric concepts and the real world. Through these activities, students gain concrete and interactive learning experiences, encouraging them to actively participate and collaborate. It is hoped that the students' thought conjectures indicate that they are beginning to understand the relationship between numbers and the objects around them, while also developing more complex cognitive skills. Overall, the implementation of concrete object-based activities in introducing numbers can help students establish a strong foundation in understanding basic mathematical concepts, which will be beneficial for their future learning,

Furthermore, the identification of limitations in the existing literature reveals that research on numeracy learning strategies for slow learners often focuses on short-term interventions without exploring their long-term impacts on academic achievement and cognitive

development. Additionally, there is a lack of studies addressing the scalability of adaptive strategies in diverse classroom environments, particularly in under-resourced schools. Moreover, many studies do not comprehensively evaluate the effectiveness of teaching aids or the role of teacher professional development in ensuring the consistent implementation of these strategies. These gaps highlight the need for future research to investigate sustainable practices and the integration of cost-effective technological tools in numeracy education for slow learners.

Thus, the synthesis of findings underscores the significant contribution of this study to advancing adaptive and inclusive teaching practices. By emphasizing the design of strategies tailored to the specific characteristics of slow learners, this research offers practical implications for improving learning experiences and outcomes. Future studies should explore areas such as the long-term benefits of adaptive strategies, the feasibility of implementation in various educational contexts, and the impact of teacher training on enhancing numeracy learning for slow learners.

Conclusion

The conclusion/closing section contains research findings in the form of answers to The conclusion of this study indicates that a concrete object-based numeracy learning approach is effective in enhancing slow learners' understanding of the concepts of numbers 1-10. Through various designed activities, such as counting objects, matching numbers with quantities, and recognizing flat shapes, students not only become capable of recognizing numbers but also relate them to the objects and geometric concepts around them. The findings of this study address the research question emphasizing the importance of adaptive teaching strategies to meet the learning needs of students with learning difficulties. Therefore, it is recommended that educators implement inclusive learning approaches and use concrete aids in the learning process, allowing students to feel more confident and comfortable in their studies. Additionally, teachers should involve parents in supporting learning at home so that collaboration between school and family can enhance students' overall learning experiences. Thus, it is hoped that slow learners can develop better numeracy skills and have a strong foundation for future mathematics learning.

The future recommendation that the Hypothetical Learning Trajectory (HLT) be systematically applied in designing differentiated numeracy learning strategies for slow learner students. The HLT framework provides a structured approach to anticipating student thinking and adapting teaching interventions accordingly. However, challenges such as limited teacher resources and the need for ongoing professional development may influence the effectiveness of its implementation. Further research should explore strategies to overcome these barriers, such as integrating more robust teacher training programs and utilizing adaptive learning technologies to support differentiated instruction in numeracy.

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