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A Systematic Literature Review on Slow Learners' Problem-Solving in Mathematics Education

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Abstract. Slow learners in solving mathematical problems have limited information processing speed and short attention spans. This often makes it difficult for them to follow the problem-solving process properly. However, developing problem-solving skills is very important for slow learners because it helps them understand mathematical concepts better, which is useful in everyday life and in overcoming future challenges. Therefore, conducting a systematic review of existing articles is essential to identify deficiencies in mathematics learning, especially in problem-solving for slow learners. A Systematic Literature Review (SLR) was conducted to identify key factors influencing problem-solving in mathematics learning for slow learners. The search process used Harzing's Publish or Perish software to retrieve relevant articles from the Scopus and Google Scholar databases for 2014–2024 using the keywords: "slow learner," "problem-solving," and "mathematics." After a systematic screening process, 18 articles met the inclusion criteria for review. This study followed a qualitative content analysis approach to synthesize data and identify emerging themes in problem-solving for slow learners. The results showed that slow learners require comprehensive and adaptive learning approaches, such as constructivist models, Polya's problem-solving framework, scaffolding, and technology-based and culturally relevant media integration, supported by trained teachers and inclusive learning environments. These strategies can enhance their motivation, understanding, and skills in effective mathematical problem-solving. This article also analyzes the main shortcomings and limitations in recent research focusing on mathematical problem-solving for slow learners.

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Keywords: Problem-solving; Slow Learner; Mathematics; Education; Systematic Literature Review

1. Introduction

Mathematics is a discipline that focuses on developing critical and analytical thinking skills through problem-solving (Siswanto & Meiliasari, 2024). Mathematics plays a key role in shaping students' cognitive abilities, encouraging logical reasoning, and enabling them to overcome complex challenges. However, slow learners take longer to understand mathematical concepts and face challenges in problem-solving. Slow learners often struggle with abstract concepts, have slower information processing speeds, and have shorter attention spans, which can hinder their ability to solve problems effectively. Although problem-solving is important in mathematics, research on strategies specifically designed to support slow learners in this area is lacking. Mathematics teaches logical and deep thinking, helping students recognize patterns and make decisions based on precise data. Problem-solving trains students to evaluate different approaches and find the most effective solution. This process itself is often a challenge for slow learners. Slow learners have a slower comprehension speed than their peers, even though they do not show significant intellectual disabilities (Amelia, 2016). Slow learners need more time to process information and remember the concepts taught in mathematics learning (Herriot & Sarah, 1967). In mathematics education, slow learners often face obstacles in internalizing abstract concepts and applying problem-solving skills (Murdiyanto et al., 2023). Mathematics's conceptual and logical nature requires thinking skills, which may be difficult for students with these characteristics to achieve. These limitations can result in decreased learning motivation, anxiety, and even loss of self-confidence, especially in questions that require independent problem-solving (Sukma, 1996). Therefore, mathematics's conceptual and logical nature requires efforts to develop effective and innovative learning models that can help slow learners improve problem-solving, which is a concern in mathematics learning.

Problem-solving is one of the core skills of mathematics education and supports the development of students' critical, analytical, and creative thinking skills (Polya, 1957; Schoenfeld, 2013). However, for slow learners, achievement in problem-solving is often a challenge. Slow learners have limited information processing speed and attention span, which often hinders their progress in solving mathematical problems (Fakhruddin et al., 2024; Lowry, 1972). Problem-solving in mathematics requires students to analyze, synthesize, and evaluate mathematical situations independently (Faradillah & Fadhilah, 2021). For slow learners, demands in problem-solving can be an obstacle, given the limitations of slow learners in understanding abstract concepts and applying complex problem-solving strategies (Sangeeta, 2011). Therefore, solving mathematical problems requires an extraordinary approach for slow learners to support the development of analytical and critical skills.

Slow learners have difficulty understanding problems, planning solutions, implementing plans, and properly checking processes and results (Labuem, 2020;

Linda & Jusra, 2021). Lowry (1972) mentioned that for slow learners in problem-solving, the reflective response is often lacking, meaning that students who are slow learners tend to be less able to rethink or evaluate their actions after taking a step in solving a problem. Borah (2013) states that slow learners have difficulty working on questions related to problem-solving because they need more time to relate the knowledge they have learned to new situations and lack confidence in solving problems. Slow learners show varying difficulty levels in understanding problems, planning solutions, implementing plans, and checking results (Ummah & Wahidin, 2022). Asmar and Delyana (2022) mention that slow learners are under the four problem-solving procedures, understanding the problem and planning problem-solving, because they need more time to complete the problems given by teachers in mathematics learning. More structured learning and additional time are needed to help slow learners improve their mathematical problem-solving skills. Therefore, understanding slow learners' problem-solving is important in improving inclusive mathematics learning. Problems faced by slow students learners in mathematics learning, requires special strategies in inclusive education. These strategies must be tailored to the unique needs of each student and need to be adapted based on the abilities and needs of students, including in terms of the methods, media, and learning resources used.

An effective strategy is needed to support mathematics learning for slow learners and must be tailored to their needs. Studies related to slow learners' problem-solving are rarely discussed, so this study aims to conduct a Systematic Literature Review (SLR) to identify, collect, and analyze various findings from the literature related to problem-solving in slow learners in mathematics education. Through the SLR approach, this study is expected to significantly contribute to designing more inclusive and applicable learning so that it can optimally meet the special needs of slow learners. This study formulates the following research questions to ensure a structured approach: 1) What factors influence slow learners' problem-solving in mathematics learning? 2) How is slow learners' problem-solving approached in mathematics education? 3) What are the strategies for slow learners to improve problem-solving when learning mathematics? These research questions serve as a guiding framework to systematically direct the review process and align the findings with the study's objectives, allowing the research to uncover effective practices and strategies to enhance the problem-solving skills of slow learners in mathematics.

2. Literature Review

2.1. Definition and Characteristics of Slow Learners

Slow learners have slightly below-average intellectual abilities, typically with an IQ score between 70 and 89, which hinders them from learning at the same pace as their peers (Kurniasih et al., 2020; Malik, 2009; Sukumaran, 2011). Although they do not meet the criteria for intellectual disabilities, they require more time and repetitive instructions to understand concepts and complete academic tasks (Pratama et al., 2020). Slow learners often struggle with abstract concepts, particularly in mathematics, and exhibit behavioral difficulties due to limited psychological skills, including mechanical abilities, self-concept, interpersonal relationships, communication, and understanding of social roles (Ardianti &

Wanabuliandari, 2021; Borah, 2013; Marheni, 2017; Suarez et al., 2017). Their learning motivation varies depending on psychological, physiological, and sociological factors (Azzahra & Herman, 2021). Facing these challenges, schools need to provide tailored education to improve students' academic and behavioral skills. Slow learners have several key characteristics, such as slow information processing, short attention span, limitations in working memory, and difficulty in logical thinking (Sangeeta, 2011). They often have difficulty completing tasks, understanding academic concepts, and actively engaging in group interactions (Fitriana et al., 2024). Furthermore, they require clear and direct instructions and often have challenges when generalizing information to new situations (Murdiyanto et al., 2023). These students also tend to have difficulty maintaining concentration for extended periods (Ardianti et al., 2023; Linda & Jusra, 2021) and often make systematic errors in solving math problems (Novitasari et al., 2018). These circumstances emphasize the importance of teachers implementing appropriate learning strategies so students can participate meaningfully in an inclusive environment.

2.2. The Importance of Problem-solving in Mathematics Education

Problem-solving is an important skill in mathematics education, which not only encourages critical, analytical, and creative thinking but prepares students to face challenges in everyday life (English, 2023). According to Polya (1957), solving mathematical problems can be divided into four important steps: understanding the problem, planning a solution strategy, implementing the designed strategy, and evaluating the results. These steps help students build a systematic approach in dealing with various mathematical problems and real-world situations, improving their relational understanding of mathematical concepts (Novita et al., 2012; Wanabuliandari & Sekar Dwi Ardianti, 2024). By applying mathematical concepts in the problem-solving process, students strengthen their conceptual understanding and hone their critical and adaptive thinking skills. Problem-solving plays a vital role in developing both conceptual and procedural understanding of students (Altintas & Ozdemir, 2014). This approach is very beneficial for students with learning difficulties because it helps them understand the basics of mathematical concepts, increases their self-confidence, and teaches them how to make structured decisions. When engaged in problem-solving activities, students with learning challenges can feel accomplishment, increasing their motivation and reducing anxiety in learning mathematics. In addition, problem-solving allows students to apply mathematical concepts in practical situations, which in turn trains their logical and systematic thinking skills, competencies that are very much needed in this modern era (Kilpatrick, 2010). These skills are increasingly relevant in a world that demands individuals to be able to identify, analyze, and find solutions to various existing problems.

2.3. Challenges Faced by Slow Learners in Mathematical Problem-solving

Slow learners often face various challenges in solving mathematical problems caused by limitations in working memory and information processing. These challenges make it difficult for them to follow long instructions, understand abstract concepts, and store information in short-term memory. This often results in confusion and frustration when faced with complex mathematical tasks requiring structured reasoning (Lowry, 1972; Sangeeta, 2011). Difficulty

understanding mathematical concepts can also negatively impact their motivation, causing them to lose interest or even feel forced to abandon tasks due to mood swings (Aziz et al., 2016). In addition, slow learners often find it difficult to identify relevant information from the given problem and plan appropriate solving strategies. Sovia and Herman (2019) found that students with learning disabilities generally experience various errors, such as comprehension errors (50%), transformation errors (8%), process skill errors (17%), and coding errors (25%) when solving arithmetic problems. These errors indicate difficulties in interpreting problems, developing strategies, using correct operations, and drawing conclusions. Slow learners typically require more time and structured support, often with the help of teachers who help them break down problems into smaller, more manageable steps (Linda & Jusra, 2021). To address these challenges, teachers need to create supportive learning environments and utilize a variety of teaching aids, such as visual media or assistive technology, to facilitate problem-solving for slow learners.

2.4. Implementation of Inclusive Education in Mathematics Learning for Slow learner

Inclusive education aims to create a supportive learning environment for all students, including those with special needs, such as students with learning disabilities (Kurniasih et al., 2020; Safrudin & Qomarudin, 2021). In practice, the implementation of inclusive education in mathematics learning includes curriculum adjustments, modifications to teaching methods, and assessment strategies that are tailored to the needs of each student (Sakiinatullaila et al., 2020; Wanabuliandari & Purwaningrum, 2018). As part of the education system, inclusive education ensures that all children, including those requiring special attention in learning, receive educational services appropriate to their unique characteristics (Khaerunisa, 2023).

The right to inclusive education is recognized in the Convention on the Rights of Persons with Disabilities, which was ratified at the UN General Assembly in 2006, and in the Sustainable Development Goals, which were also raised at the UN General Assembly in 2015 (Degener, 2017; Guiraudon, 2005). Although inclusive education has various benefits, several challenges must be faced in the implementation process. In the context of mathematics learning, students with learning difficulties require a more specific approach, such as Realistic Mathematics Education (RME), differentiated teaching, and Open Activity Theory Lesson Plans (Demo et al., 2021; Listiawati et al., 2023; Putranto & Marsigit, 2018). Inclusive mathematics learning requires adaptation to learning objectives and collective learning environment arrangements, emphasizing the importance of strong teacher support. Teacher readiness, including pedagogical competence and mastery of the material, is crucial in changing abstract mathematical concepts into more concrete and accessible ones for students with learning difficulties (Mumpuniarti et al., 2020; Wanabuliandari et al., 2024). Teachers with good pedagogical knowledge can teach mathematics more effectively to slow learners (Sintawati et al., 2021). Therefore, the success of inclusive mathematics learning is highly dependent on the teacher's readiness to implement adaptive strategies, ensuring that slow learners get meaningful learning experiences according to their abilities.

3. Methodology

Systematic Literature Review (SLR) is a methodology designed to collect and evaluate studies relevant to a particular topic comprehensively. This method aims to collect, synthesize, and analyze various existing scientific studies (Irshad & Yasmin, 2022; Robinson & Lowe, 2015). This study used a meta-synthesis approach to analyze and interpret qualitative findings from selected literature to ensure a comprehensive synthesis of key themes and patterns related to problem-solving strategies for slow learners.

The selection of the SLR approach aims to provide a structured, transparent, and reproducible method for identifying, analyzing, and synthesizing relevant literature on slow learners' problem-solving. With this approach, a comprehensive evaluation of existing research can be carried out, thus facilitating the identification of gaps and the formulation of evidence-based recommendations. This is especially useful for exploring areas that have limited previous studies. Thus, SLR helps researchers comprehensively understand what is known and explores the results of previous research.

This study adopts the SLR approach, a key element in academic research. By summarizing, analyzing, and synthesizing several relevant literature, SLR allows researchers to test hypotheses, develop new theories, and assess the validity and quality of existing research while identifying weaknesses, inconsistencies, or contradictions in previous studies (Xiao & Watson, 2019). SLRs are used for various purposes, including identifying and reviewing research in a particular area, evaluating results, and interpreting research relevant to a specific question or phenomenon (Alawiyah & Supriatna, 2022). This approach is often used to establish a research foundation and develop a research agenda, and it is an integral part of the preparation of a dissertation, thesis, or research grant application (Triandini et al., 2019). This study consists of four steps: formulating a focused review question (formulation of a focused review question), conducting a thorough and comprehensive search of primary studies (a comprehensive and thorough search of primary studies), identifying inclusion and exclusion criteria (identifying inclusion and exclusion criteria), and assessing the quality of the included studies (assessment of the quality of the included study) (Shahrol et al., 2020).

3.1 Research Question (RQ)

At this stage, research questions are explicitly formulated so that the literature review can be directed and on target. Focused questions help filter relevant studies and ensure the research results can answer the main objectives. Several criteria must be considered before conducting the SLR process to identify research questions for SLR, as presented in Table 1.

Table 1: Criteria And Its Scope

Criteria	Scope
Population	This article aims to discuss slow learners' problem-solving in mathematics learning.
Intervention	Solving factors in slow learners and mathematics learning strategies for problem-solving.
Comparison	The strengths and limitations of each article that discusses slow learners' problem-solvings and mathematics learning strategies to improve slow learners' problem-solvings
Outcomes	Solving factors in slow learners and recommended mathematics learning for problem-solving.

Research questions are created based on the needs of the chosen topic. The following are the research questions in this study:

RQ1. What factors influence slow learners' problem-solving in mathematics learning?

RQ2. How is slow learners' problem-solving approached in mathematics learning?

RQ3. What are the strategies for slow learners to improve problem-solving when learning mathematics?

3.2 Search Process

A thorough search was conducted across various academic sources and databases to identify relevant primary research. This step aims to ensure that all research related to the topic has been covered. The search process obtains relevant sources to answer the Research Question (RQ) and other related references. The search process is done using a search engine using Harzing's Publish or Perish in Scopus and Google Scholar.

The search was conducted through Harzing's Publish or Perish by searching for articles in Scopus from 2014-2024, using the title and abstract of each article. The search was conducted through Harzing's Publish or Perish by searching for articles in Scopus from 2014-2024, using the title and abstract of each article. The selected time range includes the most recent and relevant studies, covering ten years to capture trends, developments, and emerging discussions. This range balances recency with a sufficient historical perspective to analyze the progression of research over time. Researchers only search and collect journal articles and books related to the title. The goal is to identify articles related to problem-solving factors that slow learners or topic areas related to the title. To facilitate the search, we use the keywords: "slow learner," "problem-solving," and "mathematics," making it easier to find articles that match our goals. A sequential, systematic search was conducted in several stages, as described in the previous section. Therefore, from one database to another, duplicate papers were manually removed in stages to extract unique results and ensure the smooth implementation of the research. The data search process uses several keywords that produce different search volumes. The keywords used in the Scopus search using Harzing's Publish or Perish, "slow learner; problem-solving," produced 32 articles. Furthermore, the keyword "slow learner; problem-solving; mathematics" resulted in a search of 5 articles.

The search was performed using Harzing's Publish or Perish, which searched for articles on Google Scholar from 2014-2024, using the title and abstract of each article. The keywords used in Google Scholar using Harzing's Publish or Perish are "slow learner; problem-solving," and 55 articles were produced. Researchers only searched for and collected journal articles related to the title. To facilitate the search, researchers used the keywords "problem-solving; slow learner; mathematics" so that it is easier to find articles that match the researcher's objectives, 18 articles were found.

Table 2: Search Keyword Code

Keyword Code	Detailed Keywords
K1	Factors AND problem AND solving AND slow AND learner; Slow AND learner AND problem AND solving
K2	Problem AND solving AND slow AND learner AND mathematics
K3	Mathematics AND strategies AND slow AND learners AND problem AND solving

In conducting this Systematic Literature Review (SLR), we followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a comprehensive, systematic, and transparent research methodology. The PRISMA flowchart visually represents the stages of the article selection process, from initial identification through database searches to the final inclusion of relevant studies. A comprehensive search was conducted across multiple academic sources and databases, including Scopus and Google Scholar, to identify primary research related to the topic. The search process was directed to cover all relevant studies to gather the sources needed to answer the research questions (RQs) and find other related references. In this search, we used Harzing's Publish or Perish with predetermined keywords, namely "slow learners," "problem-solving," and "mathematics." Initially, we identified 87 records from both databases, covering a variety of sources such as peer-reviewed journal articles, books, and conference papers. After collecting the records, we began the screening process, where the titles and abstracts of all articles were reviewed. As a result, 41 articles were eliminated because they were deemed irrelevant, had methodological issues, or did not meet the inclusion criteria. This left 46 articles for further assessment. In the eligibility phase, we conducted a full-text review of the articles and found 23 that met the inclusion criteria. However, after further analysis, 6 articles had to be excluded because they were less relevant or deemed inadequate. Finally, 18 studies were selected for the final analysis, as they aligned with the research question and provided valuable insights into the challenges slow learners face in problem-solving and strategies that can improve their learning outcomes. The following diagram presents the complete process of this study.

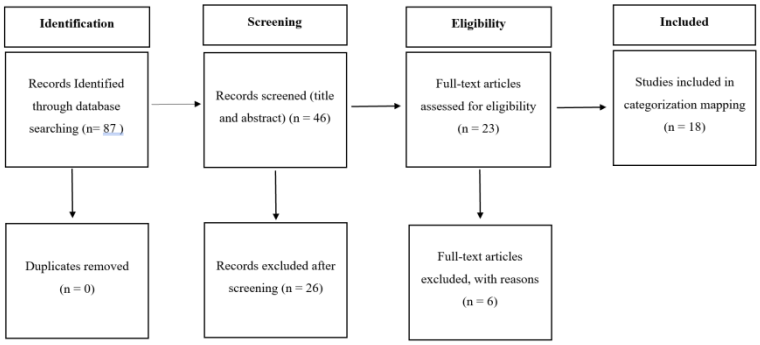

Figure 1: PRISMA Flow Diagram for Systematic Literature Review (SLR)

The article selection followed strict inclusion and exclusion criteria to ensure the review was comprehensive and relevant. In addition to the standard criteria such as methodology, study population, and key findings, the publication language was also considered. Articles published in Indonesian and English were included, as these languages align with the research scope and the accessibility of resources. This ensures that the review incorporates a diverse range of studies, considering both local and international research, and avoids language bias in the findings. Only studies in these languages were included to maintain consistency in understanding and interpretation of the findings. After applying these criteria, 18 studies were included in the review.

3.3 Inclusion and Exclusion Criteria.

This stage is carried out to decide whether the data found is suitable for SLR research. First, articles are reviewed and selected from various library sources, with priority given to articles published in journals and conferences. This study contains articles related to mathematics learning, factors influencing slow learners' problem-solvings, slow learners' problem-solvings in mathematics learning, and mathematics learning strategies for slow learners in problem-solving.

To be relevant to the focus of the study, each selected article must include keywords that describe, propose, or explain problem-solving. Exclusion criteria also applied to this review are articles that do not have appropriate keywords even though they are from related fields. After this selection stage, papers that meet the inclusion and exclusion criteria are further reviewed for final selection. A study is eligible for selection if it meets the following criteria: (1) Scopus and Google Scholar data in the last 10 years, (2) Data were obtained using Harzing's Publish or Perish by searching in Scopus and Google Scholar, and (3) The data used is only related to factors, slow learner, problem-solving, and mathematics learning strategies.

3.4 Quality Assessment (QA)

To validate the quality of the selected articles, several questions have been developed as guidelines for selecting relevant articles for this study. This stage is crucial to ensure that only relevant, valid, and research-related articles are selected and applied to comply with the quality assessment. In SLR research, the data

found were evaluated based on the following quality assessment criteria questions.

QA1. Is the article published in the last 10 years for Scopus and Google scholar?
QA2. Does the article describe the factors influencing mathematical slow learners' problem-solving?
QA3. Is mathematical problem-solving for slow learners discussed in the article?
QA4. Does the article state slow learners' problem-solving in mathematics learning?

Thus, the search process is clarified for articles that partly involve the evaluation process to obtain relevant and appropriate information to meet the quality evaluation; otherwise, the article will be excluded. This process in the selected articles was important to obtain accurate data extraction results. Table 3 describes the questions used in the article selection process.

Table 3: Research Question Structure

Question	Answer
Is the article published in the last 10 years for Scopus and Google scholar?	(Yes/ No / Partially)
Does the article mention the factors that influence mathematical problem-solving slow learners?	(Yes/ No / Partially)
Does the article write about mathematical problem-solving for slow learners?	(Yes/ No / Partially)
Does the article write that the mathematics learning strategy is for slow learners in problem-solving?	(Yes/ No / Partially)

4. Results

To explore slow learners' problem-solving in mathematics learning, 18 selected articles met the criteria, following the steps in the search process as shown in Table 4 below. The Systematic Literature Review (SLR) results reveal various factors that influence problem-solving, the methodologies employed in the studies, and relevant learning strategies to support slow learners' problem-solving. These findings provide insight into the specific problem-solving challenges that slow learners face and the strategies that effectively overcome these challenges. A total of 18 selected articles met the criteria following the steps in the search process, as shown in Table 4.

Table 4: Search Process And Keywords

Search Process	Keyword		
	K1	K2	K3
Exclude	13	7	12
Include	9	6	9

Harzing's Publish or Perish software was used to access two primary databases: Scopus and Google Scholar. The search for information began using three predetermined main keywords: K1 (factors influencing problem-solving in students with learning disabilities), K2 (problem-solving in students with learning disabilities in mathematics learning), and K3 (mathematics learning strategies for students with learning disabilities in problem-solving). In the initial search stage,

34 articles were found for K1, 8 for K2, and 45 for K3. These articles were further filtered by considering the abstract, relevance to the topic, and predetermined quality criteria. The filtering process resulted in 14 articles for K1, 1 for K2, and 23 for K3.

Furthermore, in the exclusion stage, articles that were irrelevant or did not meet specific criteria, such as duplication and low quality, were removed from the list. As a result, 9 articles for K1, 6 articles for K2, and 8 articles for K3 were selected for further analysis. This selection process ensures that the selected articles provide a comprehensive view of the factors that influence slow learners' problem-solving, effective learning strategies for slow learners, and the best approaches to support slow learners in learning mathematics. This study integrates reliable and relevant sources by utilizing Harzing's Publish or Perish and the Scopus and Google Scholar databases. The results of this process will be discussed further in the subsection of the SLR research questions.

4.1 Factors that influence slow learners' problem-solving

The first research question concerns factors that influence slow learners' problem-solving in mathematics learning. From the reviewed research, several related factors influence slow learners' problem-solving. Table 5 shows several related factors that influence slow learners' problem-solving.

Table 5: Factors that influence slow learners' problem-solving

Factors	Article
Environment and Culture	(Tran et al., 2020) ; (Hasibuan et al., 2022)
Teacher Readiness	(Faradillah & Fadhilah, 2021)
Resource	(Wanabuliandari & Sekar Dwi Ardianti, 2024)
Cognitive and Affective	(Hasibuan et al., 2022) ; (Azzahra & Herman, 2021)
Experience and Background	(Linda & Jusra, 2021)
Intervention Strategy	(Asmar & Delyana, 2022) ; (Wanabuliandari ; & Ardianti, 2024)

To further illustrate the significance of these factors, the following bar chart provides a visual representation of the number of articles discussing each factor.

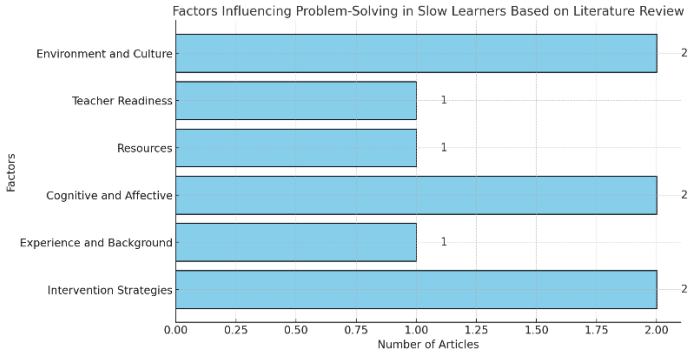

Figure 2: Visual representation of the number of articles discussing each factor

In overcoming the challenges faced by slow-learner students in problem-solving, an approach that considers various factors is needed. The environment and culture have a major influence on students' cognitive and social development. Social support can strengthen problem-solving skills, while cultural barriers and low socioeconomic status often hinder learning success (Hasibuan et al., 2022; Tran et al., 2020). Teacher readiness is also crucial in this process. Well-trained teachers, especially in metacognitive methods, can better support slow-learner students (Faradillah & Fadhilah, 2021). Therefore, special training is needed so that teachers can understand the needs of each student, especially slow learners, and create a more adaptive learning environment. In addition, educational resources such as interactive aids and cognitive games are crucial in improving problem-solving skills for slow learners (Wanabuliandari & Sekar Dwi Ardianti, 2024).

Cognitive and emotional support also play an important role in overcoming challenges such as memory difficulties, low motivation, and math anxiety (Azzahra & Herman, 2021). Metacognitive training, positive feedback, and a supportive learning environment can reduce anxiety and increase student motivation. Equally important is emotional support from the family, which can help students develop cognitive and emotional well-being, which are major predictors of their success (Linda & Jusra, 2021). Family involvement also has a major impact on slow learners' ability to deal with problem-solving difficulties. Consistent emotional support from the family, coupled with structured interventions such as metacognitive methods and Confidence Worksheet Ethno-Edutainment, are effective in improving problem-solving skills (Asmar & Delyana, 2022; Wanabuliandari & Ardianti, 2024). Therefore, collaboration between families, teachers, and schools is essential in creating a supportive learning environment so that slow learners can achieve their academic potential.

4.2 Slow learners' problem-solving in mathematics learning

The second research question concerns slow learners' problem-solving in mathematics learning. The reviewed research shows several problem-solving analyses in slow learners in mathematics learning. Table 6 shows some analysis of problem-solving in slow learners in mathematics learning.

Table 6. Slow Learners' Problem-solving in Mathematics Learning

Problem-solving Step		Point of Discussion
Understand the problem	(Linda & Jusra, 2021) ; (Labuem, 2020) ; (Asmar & Delyana, 2022) ; (Sovia & Herman, 2019) ; (Azzahra & Herman, 2021) ; (Faradillah & Fadhilah, 2021) .	Slow Learners face challenges in understanding mathematical problems, including difficulty identifying important information, understanding context, and overcoming emotional barriers that affect their focus.
Devise a Plan		Slow learners often have difficulty planning and problem-solving due to a lack of conceptual understanding, experience, independence, effective strategies, and emotional factors that influence them.
Carry Out the Plan		Slow learners face barriers in implementing the resolution plan, including operational errors, lack

		of procedural skills, dependence on external assistance, confusion in the face of obstacles, lack of practice, and the influence of negative emotions.
Reflect		Slow Learners often neglect the review stage, which is important for evaluating and learning from experience. This is due to a lack of reflection habits, low learning independence, lack of guidance, and the influence of negative emotions.

Slow learners often face difficulties in understanding mathematical problems. They often experience obstacles in identifying important information from the problem, which interferes with their initial understanding of the problem given (Rakhmawati, 2017). In addition, limitations in understanding the instructions for the problem prevent them from identifying what is being asked for in the problem (Linda & Jusra, 2021; Nafsy et al., 2022). At the planning stage of solving, slow learners often have difficulty designing effective strategies due to a lack of understanding of basic mathematical concepts (Rakhmawati, 2017). Lack of practice in problem-solving also causes them not to have effective strategies (Nafsy et al., 2022). When implementing plans, slow student learners often make operational errors and lack procedural skills, so they cannot implement plans properly (Asmar & Delyana, 2022; Rakhmawati, 2017). Lack of practical training also causes them to be unaccustomed to implementing the plans that have been made (Nafsy et al., 2022). At the review stage, slow learners rarely evaluate the solutions they have obtained, so the same mistakes tend to be repeated (Rakhmawati, 2017). The lack of guidance in conducting reflection also causes them not to understand the importance of reviewing the solutions (Labuem, 2020; Nafsy et al., 2022). Overall, slow learners face various difficulties at each stage of problem-solving. Appropriate interventions, such as problem-based learning and emotional intelligence development, are needed to help them overcome these obstacles and improve their mathematical problem-solving abilities.

4.3 Mathematics teacher strategies to improve slow learners' problem-solving

The third research question is how mathematics teachers improve slow learners' problem-solving. The research shows several strategies for improving slow learners' problem-solving in mathematics learning. Table 7 shows several strategies for improving slow learners' problem-solving in mathematics learning.

Table 7. Mathematics Learning Strategies for Slow Learners in Problem-solving

Category		Point Of Discussion
Model	Improved Problem-solving Skills Slow learners In Elementary School Through The Use Of Constructivism Learning Model (Asmar & Delyana, 2022)	The constructivist learning model significantly improves the problem-solving abilities of slow learners. The constructivist learning model emphasizes students' active role in constructing their knowledge through direct experience and social interaction. This approach allows them to understand concepts more deeply and develop effective problem-solving strategies. By directly being involved in

		the learning process, slow learners can relate new knowledge to previous experiences, strengthening their understanding.
Framework	Teacher strategies for teaching slow learners in low-grade primary schools (Asri & Nuroh, 2023); The Thinking Process of Children with Special Needs (Slow Learner) In Inclusive Classrooms In Solving Mathematical Problems (Labuem, 2020)	Polya's framework includes steps such as understanding the problem, planning a solution, implementing the plan, and reviewing the results. These stages provide systematic guidance for slow learners in solving mathematical problems so that they can understand the steps better. Teachers also need to take a more intense approach so that slow learners feel comfortable learning mathematics. In addition, teachers can make modifications related to simplifying materials, modifying questions, adding study hours, rotating seats, and providing motivation.
Approach	Gesture of slow learners in mathematics Communication (Sovia & Herman, 2019); Cognitive abilities characteristics and learning motivation on slow learner students in solving mathematics problems (Azzahra & Herman, 2021); Mathematical Problem-solving on Slow Learners Based on Their Mathematical Resilience (Faradillah & Fadhilah, 2021) .	The contextual learning approach effectively improves problem-solving skills in slow learners because it allows students to connect the material to real experiences. In addition, scaffolding helps slow learners understand the problem-solving steps gradually, increasing their confidence and independence. Thus, both findings indicate the importance of an adaptive learning approach and supporting the individual needs of slow learners in improving problem-solving skills.
Media	Improving mathematics problem- solving skills in slow learners through confidence worksheet Ethno Edutainment (Wanabuliand ari & Sekar Dwi Ardianti, 2024); Teaching Strategies for Slow Learning Students Learner): A Narrative Review (May Lina Wati & Wiwin Hendriani, 2024); Mathematical Problem-solving on Slow Learners Based on Their Mathematical Resilience (Faradillah & Fadhilah, 2021). Learning Analytics: Virtual Reality for Programming Course in	Visual and contextual media are very effective in helping slow learners. Learners understand the steps of problem-solving. By utilizing visual aids and simulations, slow learners can more easily understand complex concepts and apply problem-solving strategies effectively. In addition, integrating technology into learning allows for real-time feedback, which helps students identify errors and improve their understanding in real time. Interactive modules are specifically designed to meet the individual needs of slow learners. So that they can improve their skills in solving mathematical problems, using technology-based media, such as educational games, can increase motivation and slow learners' problem-

	Higher Education (Srimadhaven et al., 2020).	solving in the learning process. Therefore, selecting and developing appropriate media is key in supporting mathematics learning for slow learners.

To further illustrate the significance of these categories, the following bar chart provides a visual representation of the number of articles discussing each category concerning slow learners' problem-solving. The categories include Model, Framework, Approach, and Media, each representing different aspects of instructional strategies and interventions.

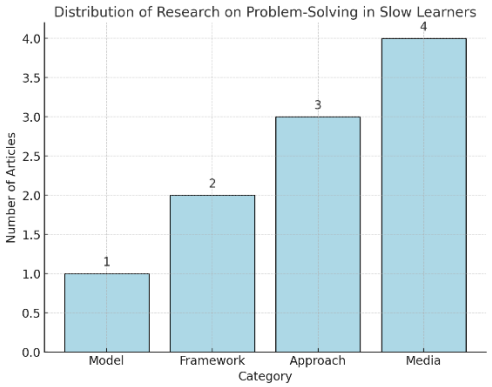

Figure 3: The visual representation shows the number of articles discussing each category related to problem-solving for slow learners.

The Model category (1 article) highlights the effectiveness of constructivist learning models, which actively engage slow-learning students through hands-on experiences and social interactions, strengthen conceptual understanding, and develop problem-solving skills (Asmar & Delyana, 2022). The Framework category (2 articles) emphasizes Polya's systematic approach to problem-solving, which guides students through stages of understanding, planning, implementing, and reviewing while also incorporating adjustments such as seating rotation and additional motivation to make students more comfortable (Asri & Nuroh, 2023; Labuem, 2020). The Approach category (3 articles) focuses on adaptive strategies such as contextual learning, which connects mathematics to real-world experiences, and scaffolding, which provides incremental support to increase students' confidence and independence (Azzahra & Herman, 2021; Sovia & Herman, 2019). Mathematics resilience is also important in overcoming learning challenges (Faradillah & Fadhilah, 2021). The Media category (4 articles) highlights the importance of technology-based tools, such as virtual reality and Ethno-Edutainment, in enhancing motivation and more profound understanding through interactive modules that simplify complex concepts and provide immediate feedback (Faradillah & Fadhilah, 2021; Srimadhaven et al., 2020; Wanabuliandari & Sekar Dwi Ardianti, 2024). Combining adaptive strategies, structured frameworks, and innovative media creates an effective learning environment to enhance slow learners' problem-solving skills.

5. Discussion

The results of this study provide important insights into problem-solving strategies for slow learners in mathematics. One of the main findings suggests that slow learners often face significant challenges due to cognitive limitations, memory retention problems, slow information processing speed, and shorter attention spans. These cognitive barriers interfere with their ability to understand abstract mathematical concepts and apply problem-solving techniques effectively. This finding is consistent with previous studies highlighting the cognitive challenges slow learners face, especially in mathematics (Fakhruddin et al., 2024; Sangeeta, 2011). In the context of the problem-solving approach, it is apparent that incremental scaffolding, concrete examples, and visual aids play a critical role in helping students with learning difficulties relate abstract concepts to everyday situations. This approach is supported by constructivism theory, which encourages active learning through hands-on experiences and tailored support (Polya, 1957; Schoenfeld, 2013). In addition, using assistive technology and personalized learning strategies can significantly improve slow-learner students' problem-solving, in line with research showing how technology can support the learning process for students with special needs (Khaira & Herman, 2020; Park et al., 2020). The implications of these findings highlight the importance of adaptive teaching methods, which consider the unique cognitive and emotional needs of slow-learner students. This study shows that personalized learning, structured learning, and technology-based tools can improve these students' problem-solving. These findings contribute to the development of knowledge in the inclusive education field by emphasizing the importance of customized educational strategies to improve slow-learner students' learning experience and success. However, this study is not without several limitations. For example, this study is only based on existing literature, which may not fully cover real-world classroom dynamics. In addition, this study relies on articles available on Scopus and Google Scholar, which may have excluded relevant studies published elsewhere or in different languages. Nevertheless, these findings remain valid based on a comprehensive review of peer-reviewed research. Future research could delve deeper into the long-term effects of these strategies and conduct empirical research to validate the findings in real classroom settings.

5.1 Factors that influence slow learners' problem-solving

Addressing the challenges of problem-solving for slow learners requires considering various factors, including the environment and culture. Strong social support has the potential to improve their problem-solving, while low socioeconomic status and limited access to educational resources can hinder the development of children's cognitive functions (Hasibuan et al., 2022). Research in Vietnam revealed that environmental and cultural factors play an important role in problem-solving for slow learners. Barriers to academic success can arise at home and school, so individualized support and a tailored process are needed (Tran et al., 2020). In addition, cultural diversity suggests that successful interventions in one cultural context may not be effective in another, so teachers should choose interventions appropriate to their country's cultural characteristics (Tran et al., 2020). So, teachers must adopt interventions that follow their country's cultural characteristics.

This study examines strategies to improve slow learners' problem-solving, keeping in mind the importance of analyzing the foundations of mathematics education, both traditional and modern. Traditional mathematics education usually focuses on teacher-dominated approaches, such as rote memorization and standardized testing, which may not meet the diverse needs of slow learners. In contrast, modern mathematics education emphasizes student-centered learning processes, active problem-solving, and technology integration. These approaches can provide more support for slow learners by encouraging critical thinking and individualized strategy application. Modern methods, such as constructivism and Polya's problem-solving framework, offer greater moments, making them particularly effective for slow learners. Combining the two approaches can create a more inclusive and adaptive learning environment that can address the unique needs of each student. In addition, teacher readiness to address the specific needs of slow learners is also important. Teachers with the constraints and training to implement learning strategies tailored to individual needs can provide effective interventions. Training in metacognitive methods can strengthen teachers' abilities in supporting the cognitive development of slow-learner students to solve mathematical problems better (Faradillah & Fadhilah, 2021).

The availability of educational resources, such as interactive learning tools and cognitive games, can significantly improve the problem-solving skills of slow learners. Access to comprehensive assessments and personalized interventions is also critical to meeting the unique needs of each student. Thus, providing adequate resources can help slow learners overcome difficulties in solving mathematical problems (Wanabuliandari & Sekar Dwi Ardianti, 2024).

From a cognitive and affective perspective, slow learners often face memory, attention, and executive function deficits that affect their problem-solving abilities. In addition, emotional and behavioral regulation also play a role in their cognitive performance. Targeted interventions are needed to address these deficits and improve the problem-solving abilities of slow learners (Hasibuan et al., 2022). Cognitive and affective factors in slow learners' problem-solving include difficulty with cognitive abilities such as reading comprehension, logical analysis, and application of learned skills to new problems (Azzahra & Herman, 2021). Slow learners are usually successful in routine tasks but have difficulty with nonroutine problems because of limited cognitive processing skills. Affective difficulties are motivation, interest, and anxiety that affect problem-solving (Azzahra & Herman, 2021). For example, math anxiety can hinder performance, while positive self-image and high motivation can improve it. Slow Learners often exhibit higher levels of anxiety and low self-confidence, which negatively impacts their problem-solving.

Early life experiences, including trauma and social interactions, significantly impact slow learners' cognitive development and problem-solving abilities (Linda & Jusra, 2021). Strong family support and effective coping strategies are important predictors of their cognitive and emotional well-being. Therefore, involving

families in the educational process and providing emotional support can help slow learners develop problem-solving skills.

Intervention strategies such as metacognitive methods, cognitive behavioral therapy, and problem-solving training can improve the cognitive functioning of slow learners (Asmar & Delyana, 2022). Structured and consistent training programs can result in significant improvements in academic achievement. Interventions that promote the development of cognitive strategies for solving mathematical problems and positive perceptions of problem-solving competence result in more substantial benefits in emotions and emotion regulation strategies and improved problem-solving performance. Interventions by applying Confidence Worksheet Ethno Edutainment can improve slow learners' problem-solving (Wanabuliandari & Ardianti, 2022). Therefore, implementing appropriate and sustainable interventions is very important to support slow learners' cognitive and emotional development to achieve their optimal academic potential.

5.2 Slow learners' problem-solving in mathematics learning

Slow learners face major challenges in understanding mathematical problems. Linda and Jusra (2021) found that students often have difficulty identifying important information from the problem, so their initial understanding of it is hampered. Labuem (2020) added that students often do not understand the context and purpose of the problem, especially in complex topics such as linear programming, so they cannot determine the proper initial steps. In addition, Asmar and Delyana (2022) noted that low learning independence makes students highly dependent on external help to understand the problem. This difficulty is exacerbated by a lack of understanding of mathematical terms and concepts, as reported by Sovia and Herman (2019), and limitations in understanding problem instructions (Azzahra & Herman, 2021). Emotional factors also play a role, with low emotional intelligence affecting students' ability to stay focused and calm when trying to understand the problem (Faradillah & Fadhilah, 2021).

Slow learners often experience obstacles in designing problem-solving strategies. Linda and Jusra (2021) noted that a lack of understanding of basic mathematical concepts makes students unable to design the right strategy. Labuem (2020) added that students often do not have planning experience, so they do not know what steps to take after understanding the problem. In addition, low learning independence, as reported by Asmar and Delyana (2022), makes students dependent on teachers to plan solutions. The lack of habit of using aids such as diagrams or tables is also an obstacle (Sovia & Herman, 2019). Azzahra and Herman (2021) showed that a lack of problem-solving practice causes students not to have effective strategies, while Faradillah and Fadhilah (2021) emphasized that negative emotions, such as despair, often prevent students from planning solutions.

When implementing the settlement plan, students are slow learners and often face various obstacles. Linda and Jusra (2021) reported that students often make operational errors when trying to implement the plans that have been made. Lack of procedural skills, as found by Labuem (2020), makes students unable to

implement plans properly. Dependence on external assistance is also a major problem (Asmar & Delyana, 2022), resulting in students not being confident in implementing plans independently. Sovia and Herman (2019) noted that students are often confused when faced with obstacles in implementing plans and do not know how to overcome them. Azzahra and Herman (2021) reported that a lack of practical training makes students unaccustomed to implementing plans, while Faradillah and Fadhilah (2021) emphasized that anxiety often prevents students from implementing plans effectively.

The re-checking stage is also a challenge for slow learners, although less discussed in depth in this article. Students often do not evaluate their work due to a lack of reflective skills and self-confidence. The habit of immediately accepting the final answer without considering its correctness, as found by Labuem (2020), prevents them from re-examining the steps that have been taken. The lack of reinforcement from teachers to train self-evaluation also affects their ability to reflect on problem-solving. Therefore, guidance needs to focus on developing reflective skills so that slow learners can be more confident in evaluating the solutions they produce.

5.3 Mathematics teacher strategies to improve slow learners' problem-solving

As explained by Asmar and Delyana (2022), the constructivist learning model has been proven effective in improving the problem-solving skills of slow learners. This model emphasizes the active involvement of students in constructing their knowledge through direct experience and social interaction. This process allows students to connect new knowledge to previous experiences, strengthening their understanding of complex mathematical concepts. By placing students as the subject of learning, this model allows them to develop more effective and independent problem-solving strategies.

The systematic approach through Polya's framework (Asri & Nuroh, 2023; Labuem, 2020) benefits slow learners in solving mathematical problems. This framework consists of four stages: understanding the problem, planning a solution, implementing the plan, and reviewing the results. Teachers play a key role in guiding students through these steps, especially by modifying the material to make it simpler and more relevant to students. Labuem (2020) explains that adjustments in teaching methods, such as seating rotation and providing additional motivation, also increase students' comfort in the learning process. This approach helps slow learners build a more organized and logical mindset.

Contextual-based approaches, as expressed by Sovia and Herman (2019), allow slow learners to learn mathematics with their everyday experiences. This helps deepen their understanding of the concepts being taught. On the other hand, the scaffolding strategy described by Azzahra and Herman (2021) provides gradual guidance in solving problems, increasing students' self-confidence and supporting the development of independence during the learning process. Faradillah and Fadhilah (2021) also emphasize the importance of mathematical resilience in the success of slow-learner students, especially in dealing with difficulties in solving math problems. With an adaptive approach and a focus on

individual needs, slow learners' problem-solving can improve significantly. Appropriate learning media is also key to supporting the development of problem-solving skills in slow-learner students. Technology-based devices like virtual reality are important for creating an interactive and engaging learning environment (Srimadhaven et al., 2020). In addition, Etno Edutainment can increase the learning motivation of slow learners through a relevant cultural-based approach (Wanabuliandari & Sekar Dwi Ardianti, 2024). Furthermore, visual-based media, such as interactive modules, allow slow learners to understand complex concepts more straightforwardly (Faradillah & Fadhilah, 2021). By using specially designed learning media, slow learners can more easily identify errors and improve their understanding of solving math problems.

6. Conclusion

This study examines the challenges faced by slow learners in the problem-solving process in mathematics education, emphasizing the importance of a holistic and adaptive approach. The study's findings indicate that slow learners can benefit from various strategies, including constructivist approaches, Polya's problem-solving framework, scaffolding, and the use of technology-based learning media. All of these can significantly improve slow learners' problem-solving. These approaches help these children deepen their understanding, learn with real experiences, and build confidence in solving mathematics problems. One of the main takeaways from this study is that to optimize slow learners' problem-solving, a combination of adaptive learning models, systematic frameworks, and innovative media is needed. Continuous implementation tailored to the needs of each slow learner can significantly increase their cognitive and emotional potential, supporting the overall learning success of slow learners. Therefore, the government needs to establish policies that support early identification of slow learners. In addition, teachers need to undergo training to identify their characteristics and provide appropriate interventions. Collaboration between schools, teachers, and families is also key in ensuring that slow learners receive the support they need to reach their full potential. The findings of this study have both practical and theoretical implications. In practical terms, the study's results emphasize integrating various teaching strategies, such as constructivist approaches and technology-based tools, to improve slow learners' problem-solving skills. These strategies can be directly applied to improve student learning outcomes. Theoretically, this study contributes to knowledge development by providing insights into applying effective educational frameworks, such as the Polya model, and the importance of cultural context in learning to improve problem-solving strategies in slow learners. This study also opens up opportunities for future studies to investigate interventions more focused on the individual characteristics of slow learners, potentially resulting in more personalized and effective educational approaches. Researchers are expected to conduct further investigations, especially regarding the long-term impact of technology-based interventions, such as virtual reality, on slow learners' cognitive and emotional development. Investigating cross-cultural differences in applying problem-solving strategies across educational settings could also provide valuable insights into culturally adaptive teaching methods. In addition, it is important to research teachers' perceptions and how their training influences the

education and support of slow learners in the classroom environment. Further research on personalized learning approaches and their effectiveness in improving problem-solving skills in slow learners is also worth exploring. Finally, future research can focus on developing new assessment tools that can help identify slow learners earlier in their educational journey and measure their progress more accurately.

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Appendix 1

Research Question (RQ)

RQ1. What factors influence slow learners' problem-solving in mathematics learning?
RQ2. How is problem-solving in slow students in mathematics learning?
RQ3. What are the strategies for learning mathematics for slow learners in problem-solving ?

Appendix 2

Quality Assessment (QA)

QA1. Is the article published in the last 10 years for Scopus and Google scholar ?
QA2. Does the article describe the factors that influence mathematical slow learners' problem-solving?
QA3. Is mathematical problem-solving for slow learners discussed in the article?
QA4. Does the article state that mathematics learning is slow learner in problem-solving?

Appendix 3

Research Question Structure

Question	Answer
Is the article published in the last 10 years for Scopus and Google scholar?	(Yes/ No / Partially)
Does the article mention the factors that influence mathematical slow learners' problem-solving ?	(Yes/ No / Partially)
Does the article write about mathematical problem-solving for slow learners?	(Yes/ No / Partially)
Does the article state that mathematics learning strategies for slow learners in problem-solving?	(Yes/ No / Partially)

Appendix 4

Article Selection Process and Inclusion/Exclusion Criteria

Inclusion Criteria:

1. Articles published between 2014 and 2024.
2. Articles that focus on problem-solving strategies for slow learners in mathematics.
3. Articles that discuss mathematics learning strategies for slow learners.
4. Peer-reviewed journal articles and academic conference papers.
5. Articles published in English and Indonesian.

Exclusion Criteria:

1. Articles not related to slow learners or problem-solving in mathematics.
2. Articles published before 2014.
3. Non-peer-reviewed articles or sources not available in full text.
4. Articles not relevant to the research questions or objectives.

Appendix 5:

Data Extraction Form

This appendix contains the data extraction form used to systematically collect key information from the selected articles. This form ensures consistency and clarity in the data collected across all studies.

Article Title	**Author (s)**	**Year of Publication**	**Study Design**	**Population/ Participants**	**Key Findings**	**Methodology**	**Intervention/ Strategy**	**Conclusions/ Recommendations**
Title of Article	Author Names	Publication Year	Study Type (Qualitative/ Quantitative/ Mixed)	Description of Slow Learners	Main Findings Related to Problem-solving	Methods Used in the Study	Intervention or Strategy Applied	Conclusions and Recommendations for Educators