STKIP PGRI Situbondo @2023
DOI. https://doi.org/10.47668/jrrei.v1i1.2181

# LITERATURE REVIEW ON FACTORS CAUSING STUDENTS' DIFFICULTIES IN LEARNING MATHEMATICS

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**Abstract**: Mathematics is a basic subject that plays an important role in developing students' logical, critical, and analytical thinking skills. However, various studies show that mathematics remains a subject that causes many difficulties for students at various levels of education. These difficulties are reflected in poor conceptual understanding, errors in solving problems, and negative attitudes towards mathematics learning. This study aims to review and analyze the factors causing students' difficulties in learning mathematics based on the results of previous research. The method used is a Systematic Literature Review (SLR) by analyzing 20 national and international scientific articles published in the last five years and obtained through the Google Scholar database. The reviewed articles consist of descriptive qualitative and quantitative research analyzed using a thematic approach. The results of the study indicate that mathematics learning difficulties are influenced by internal and external factors of students. Internal factors include weak conceptual understanding, low motivation and interest in learning, negative attitudes, and mathematics anxiety. Meanwhile, external factors include learning strategies, the role of teachers, the use of learning media, and support for the learning environment. Quantitative findings strengthen the results of qualitative research by showing a significant relationship between students' learning interests, conceptual understanding, and interpretative abilities and the level of mathematics learning difficulties. This study confirms that mathematics learning difficulties are multifactorial and require a comprehensive and integrated learning approach.

**Keywords: Mathematics Learning Difficulties, Conceptual Understanding, Affective Factors, Learning Strategies, Systematic Literature Review.**



## INTRODUCTION

Mathematics is a basic discipline that plays a strategic role in developing students' logical, critical, analytical, and systematic thinking skills (Gusmarlia et al., 2025) and (Bogaart & Ginkel, 2025) . Ideally, mathematics learning should focus not only on mastering procedures but also on understanding concepts, developing problem-solving skills, and applying mathematical knowledge in various everyday life contexts (Widad & Hadi, 2025) . However, the reality in the field shows that mathematics remains one of the subjects that causes the most difficulties for students at various levels of education (Surur et al., 2019) .

Various studies report that students' difficulties in learning mathematics are evident in their poor conceptual understanding, errors in problem solving, and negative attitudes toward mathematics (Maryanti & Asmara, 2025) . This situation indicates a gap between mathematics learning objectives, which emphasize understanding and higher-order thinking skills, and student learning outcomes, which are still dominated by memorization of procedures and formulas. This gap indicates that the problem of difficulty learning mathematics cannot be viewed as a single issue, but rather as a complex phenomenon influenced by various factors.

Theoretically, mathematics learning difficulties are influenced by cognitive, affective, and environmental factors (Parisu, 2025) . Cognitive factors include reasoning abilities, conceptual understanding, and problem-solving skills, while affective factors include attitudes toward

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DOI. https://doi.org/10.47668/jrrei.v1i1.2181

mathematics, learning motivation, and mathematics anxiety (Tartilla & Surur, 2019) . On the other hand, external factors such as learning methods, teacher competence, and learning environment support also play a significant role in determining the success of mathematics learning. Recent studies have shown that learning that does not emphasize conceptual understanding and connections to real-world contexts tends to increase students' learning difficulties (Ervina et al., 2025) .

Although numerous studies have addressed students' difficulties in learning mathematics, most of these studies are partial and focus on specific factors in isolation. In addition to qualitative research, several quantitative studies have also empirically demonstrated that conceptual understanding, interest, and mathematical interpretation skills are significantly related to students' difficulties in learning mathematics. Therefore, studies that integrate various research findings are needed to provide a more comprehensive picture of the factors causing students' difficulties in learning mathematics. A literature review is crucial for summarizing, analyzing, and synthesizing previous research findings to identify patterns, trends, and gaps in research.

The novel value of this research lies in its presentation of a systematic synthesis of the literature on the factors causing student difficulties in learning mathematics, which encompasses both internal and external factors in an integrated manner. The results of this review are expected to provide theoretical contributions to enriching the study of mathematics education and provide a practical basis for teachers and policymakers in designing more effective, student-centered learning strategies.

Based on the description, the aim of this study is to review and analyze the factors causing students' difficulties in learning mathematics based on the results of previous research, and to identify their implications for improving the mathematics learning process.

## METHOD

This study uses a Systematic Literature Review (SLR) approach to identify, analyze, and synthesize previous research findings related to the factors causing students' difficulties in learning mathematics (Rahmi, Yumami, & Nurmi 2023; Fauziah et al. 2022; Triandini et al. 2019) . The SLR method was chosen because it is able to provide a comprehensive, objective, and structured overview of the development of scientific studies on the topic.

This SLR research procedure was developed through four crucial phases , namely **:**


Figure 1. SLR Research Steps

### Identification

A literature search was conducted through the Google Scholar database using keywords including: mathematics learning difficulties, relevant mathematics learning methods, and factors of mathematics difficulty. The articles reviewed were limited to publications published between 2020 and 2025 to ensure the study's currency and relevance.

### Screening

The collected literature was then selected by eliminating duplicate articles, then an initial assessment of the title and abstract was carried out to ensure suitability with the research focus.

### Eligibility

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Articles that passed the screening stage were further analyzed through full-text review based on inclusion and exclusion criteria. Selected articles must explicitly address mathematics learning difficulties, have a clear research methodology, and be available in full-text format.

**Included**

A total of 20 articles that met all inclusion criteria were then analyzed using thematic analysis to identify patterns of findings and the main factors causing difficulties in learning mathematics.

To ensure transparency and clarity in the literature selection process, this study implemented article selection stages guided by the SLR research procedure **.** The selection process was carried out systematically through several stages, including identifying articles from scientific databases, initial screening based on title and abstract relevance, evaluating eligibility through full-text review, and determining the final articles that met the inclusion criteria. A summary of the number of articles at each selection stage is presented in Table 1 to provide a structured overview of the literature selection process in this study.

Table 1. Article Selection Process

| SLR Stage | Article Selection Process | Number of Articles |
|---|---|---|
| **Identification** | Articles were identified through the Google Scholar database using keywords related to mathematics learning difficulties. | 35+ |
| | Article after duplication removed | ±30 |
| **Screening** | Articles are selected based on the suitability of the title and abstract to the research focus. | ±30 |
| | Article excluded due to irrelevance to research topic | ±5 |
| **Eligibility** | Articles are assessed through full text assessment. | ±25 |
| | Articles were excluded based on exclusion criteria (not focused on mathematics learning difficulties, no full text available, or not within the 2020–2025 publication year range). | ±5 |
| **Inclusion** | Articles that meet all inclusion criteria and are analyzed in a Systematic Literature Review | **20** |

Based on the research objectives in the article, here are several research questions that can be formulated:

1. What are the factors that cause students' difficulties in learning mathematics?
2. What are the implications of the factors causing students' difficulties for improving the mathematics learning process?
3. To what extent do previous research results identify factors of mathematics learning difficulties and their implications?

The next step was for the researcher to compile the articles into a table. Then, they intensively reviewed the articles, particularly the results section. Finally, they compared the findings with those of the previous articles and drew conclusions (Setiowati et al. 2024) .

Table 2. Limitations of the Systematic Literature Review

| | |
|---|---|
| Publication Year | 2020-2025 |
| Database | Google Scholar |
| Document type | Article |
| Subject | Elementary, Middle, and High School Students |

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| Keywords | Conceptual understanding, affective factors, learning strategies |
|---|---|

## RESULT

Students' difficulties in learning mathematics are a complex issue and continue to attract attention from educational researchers. Mathematics, as an abstract subject, demands logical thinking, conceptual understanding, and problem-solving skills, which are not always easily achieved by all students. Various studies have shown that difficulties in learning mathematics are not solely caused by students' cognitive abilities but are also influenced by affective factors, learning strategies, the learning environment, and the role of teachers and families.

Numerous studies over the past five years have examined the factors causing students' difficulties in learning mathematics at various levels within educational contexts. Therefore, a systematic literature review is needed to identify patterns of findings, similarities, and differences between previous research results. This literature review aims to summarize and analyze 20 relevant scientific articles to obtain a comprehensive overview of the factors causing students' difficulties in learning mathematics. A summary of the study results is presented in a literature review table as a basis for further synthesis and discussion.

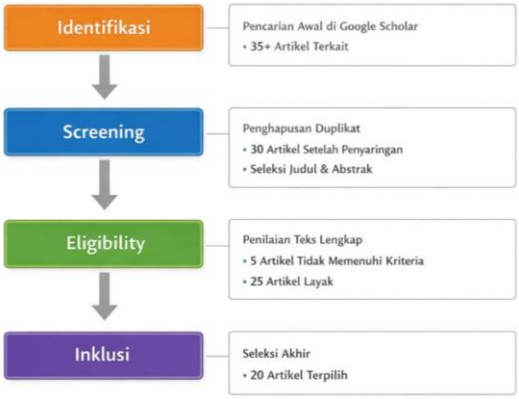


Figure 2. Literature Selection Results

The flowchart in Figure 2 illustrates the literature selection stages in this study, which adopted the principles of a systematic literature review (SLR). The process began with literature identification through the Google Scholar database using keywords relevant to mathematics learning difficulties, resulting in over 35 initial articles.

In the initial screening stage, approximately five duplicate articles were removed. Next, titles and abstracts were screened to assess their relevance to the research focus, namely the factors causing student difficulties in learning mathematics. Approximately 30 relevant articles were obtained.

The next stage was a full-text evaluation, which examined the suitability of the research objectives, methods used, and the relevance of the results to the study topic, leaving 25 articles. In the final stage, inclusion and exclusion criteria were applied, including publication years between 2020 and 2025, research subjects from elementary to high school students, and the availability of full articles. This process resulted in 20 selected articles, which were then analyzed in depth in a systematic literature review.

Table 3. Article Review Results

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| No | Author (Year) | Research methods | Key Indicators | Definition of Research Results |
|---|---|---|---|---|
| 1 | Hamidah & Quratul Ain (2022) | Qualitative (Descriptive) | Internal & external factors | Difficulties in students arise from a lack of motivation, understanding of concepts, and inappropriate learning strategies in fourth grade students. |
| 2 | BPH Netson & SQ Ain (2022) | Qualitative (Descriptive) | Arithmetic operations, question language, use of formulas | Students have difficulty understanding arithmetic operations, problem language, and the use of formulas in mathematics. |
| 3 | Farhan & Jumardi (2023) | Qualitative (Observation & Interview) | Internal & external factors | Difficulties in learning mathematics are caused by internal factors (understanding the material) and external factors (learning environment). |
| 4 | Astuti et al. (2023) | Qualitative (Case Study) | The role of teachers, student obstacles | Obstacles to learning mathematics occur due to low understanding of the material and lack of active learning support from teachers. |
| 5 | Raharjo et al. (2021) | Qualitative (Data Triangulation) | Student factors | Learning difficulties are identified through the characteristics of students who have not yet mastered the material conceptually. |
| 6 | Zuliani & Rini (2021) | Qualitative (Descriptive) | Conceptual difficulties, use of symbols | The mismatch between conceptual understanding and the ability to apply mathematical symbols is the main cause of difficulties. |
| 7 | Lubis & Quratul Ain (2022) | Qualitative (Descriptive) | Internal student barriers | Students' difficulties in mathematics are caused by low motivation, negative learning attitudes, and lack of understanding of the material. |
| 8 | Handayani et al. (2021) | Combination of Questionnaire & Observation | Motivation, interest, understanding | Low motivation and interest in learning as well as understanding of concepts are the dominant factors causing student difficulties. |
| 9 | Adeana et al. (2023) | Qualitative (Observation, Interview) | Forms of difficulty & causes | Learning difficulties arise from conceptual difficulties that are |

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| | | | | not fully addressed in the learning process. |
| 10 | Febrianti & Nurfitriani (2025) | Literature Study | Concept understanding, memorization | Mathematical difficulties are identified by weak conceptual understanding, difficulty memorizing facts, and lack of connection to real life. |
| 11 | Rismawati (2021) | Qualitative Descriptive | Interest, environment, online learning, self-awareness | Mathematics difficulties during the pandemic were influenced by low interest, less effective online learning, and health and environmental conditions. |
| 12 | Saputra, Japa & Simamora (2022) | Qualitative Descriptive | Conceptual understanding, class interaction, assignments | Student difficulties are characterized by low conceptual understanding, lack of interaction, and lack of fulfillment of learning tasks. |
| 13 | Prasetyo (2025) | Qualitative (Case Study) | Learning media, student attention | Difficulties in learning mathematics are triggered by a lack of learning media and student attention in the classroom. |
| 14 | Sinaga et al. (2025) | Descriptive Qualitative | Solving flat shape story problems | Even students at a high ability level still experience difficulties with story problems due to a lack of contextual understanding. |
| 15 | Faiha, Sapitri, Astradika & Giwangsa (2023) | Descriptive Qualitative | The concept of division, arithmetic operation skills | Difficulties in learning mathematics are seen in the material on tiered division due to weak understanding of prerequisite concepts, lack of practice, and family support. |
| 16 | Lina (2020) | Descriptive Quantitative | Students' interest in learning mathematics | Difficulty in learning mathematics is a condition where students experience obstacles in learning mathematics which is characterized by low interest and involvement in learning. |
| 17 | Iik Mudrikah & Imas (2023) | Descriptive Quantitative | Understanding basic mathematical concepts | Students' difficulties in understanding numbers and basic arithmetic operations |
| 18 | Annisa et al. (2025) | Descriptive Quantitative | Interpretive difficulties in statistical material | Students' difficulties in interpreting statistical data, such as understanding the |

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|---|---|---|---|---|
| | | | | meaning of questions and reading tables, graphs and diagrams |
| 19 | Nusalawo & Kenden (2025) | Descriptive Quantitative | Mathematical measurement material | Students' difficulties in understanding mathematical measurement material, especially distance, time, and length |
| 20 | Nurizlan et al. (2022) | Descriptive Quantitative | Understanding trigonometry story problems | Obstacles in the stage of understanding trigonometry story problems, especially in changing the problem into mathematical form |

Based on the results of a review of 20 scientific articles summarized in Table 3, it can be identified that student difficulties in learning mathematics are a complex and multidimensional phenomenon. All reviewed articles indicate that difficulties in learning mathematics are not caused by a single factor, but rather by the interaction of various internal and external factors within the student. Quantitative research also provides empirical evidence that low interest in learning, weak understanding of basic concepts, and difficulty in interpreting mathematical problems and data are significantly related to students' level of learning difficulties. These findings reinforce the results of qualitative research which shows that students often experience obstacles in understanding concepts and applying mathematics in the context of story problems and real-world problems.

Most articles emphasize that weak understanding of mathematical concepts is a dominant finding in research. This difficulty is reflected in students' inability to grasp the meaning of concepts, errors in using mathematical symbols, and errors in applying problem-solving procedures. Several studies report that students tend to memorize formulas without understanding the underlying concepts, thus experiencing difficulties when faced with contextual or word problems.

Apart from cognitive aspects, affective factors Students' difficulties also consistently emerge in research findings. Several articles reveal that low motivation to learn, interest in mathematics, and negative attitudes significantly contribute to the emergence of learning difficulties. Several studies also highlight the presence of math anxiety, which causes students to lack confidence, give up easily, and tend to avoid challenging math tasks.

The review also showed that learning strategies and the teacher's role are external factors influencing students' mathematics learning difficulties. Several articles revealed that teacher-centered learning, a lack of variety, and minimal use of learning media make it difficult for students to understand abstract mathematical concepts. This lack of active and interactive learning results in low student engagement in the learning process.

In addition, the learning environment and external support were also found to influence mathematics learning difficulties, although not as significantly as cognitive and affective factors. Several articles report that a less conducive learning environment, limited home learning support, and minimal interaction in online learning exacerbate students' difficulties in understanding mathematics.

Overall, the review of 20 articles indicates that students' mathematics learning difficulties are influenced by a combination of cognitive, affective, pedagogical, and environmental factors. These

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findings provide an empirical indication that efforts to address mathematics learning difficulties require an integrated approach, as reflected in the trends in the reviewed research findings.

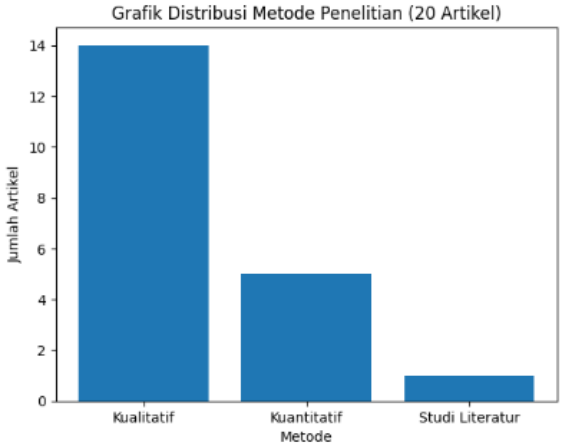


Figure 3. Distribution Graph of Research Methods

The distribution of research methods in Figure 3 shows that studies on mathematics learning difficulties are dominated by qualitative approaches, accounting for 14 of the 20 articles reviewed. This approach generally uses descriptive designs, case studies, observations, and interviews to explore students' learning experiences, conceptual barriers, and the context of mathematics learning in the classroom.

In addition, five articles used descriptive quantitative methods, focusing on measuring students' levels of learning difficulty, learning interest, and interpretive abilities regarding specific mathematics material. Meanwhile, one article used a literature review method, aiming to synthesize previous research findings related to mathematics learning difficulties.

This distribution indicates that research on mathematics learning difficulties in the past five years has been largely understood as a contextual and complex phenomenon, necessitating a qualitative approach to comprehensively capture the dynamics of student learning. However, the presence of quantitative research provides empirical support for existing qualitative findings.

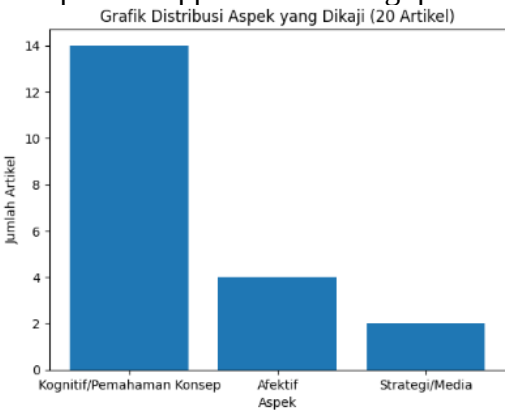


Figure 4. Distribution Graph of Measured Aspects

The graph in Figure 4 shows that cognitive aspects and understanding of mathematical concepts are the primary focus of research, with 14 of the 20 articles highlighting poor conceptual mastery as the dominant cause of mathematics learning difficulties. These difficulties include an inability

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to grasp basic concepts, procedural errors, and difficulty linking mathematical concepts to contextual problems and word problems.

Furthermore, four articles emphasized affective aspects, such as low interest and motivation to learn, negative attitudes toward mathematics, and mathematics anxiety. These findings suggest that students' emotional states and attitudes play a significant role in determining their engagement and success in learning mathematics.

Meanwhile, two articles examined aspects of learning strategies and media use, highlighting the role of teachers, teaching methods, and the limitations of learning media in influencing students' learning difficulties. Although fewer in number, these pedagogical aspects still contribute significantly to students' understanding of abstract mathematical concepts.

Overall, the distribution of the aspects studied confirms that research on mathematics learning difficulties focuses more on students' internal factors, especially cognitive aspects, but still recognizes the importance of affective and pedagogical factors as an inseparable part of the mathematics learning process.

## DISCUSSION

Based on a review of 20 scientific articles published in the last five years, it can be identified that mathematics learning difficulties are a complex and multidimensional phenomenon. Based on research findings regarding the factors causing students' difficulties in learning mathematics, all reviewed studies consistently identified a relationship between internal and external factors. The most dominant internal factors are weak conceptual and cognitive understanding. Most articles emphasize that weak understanding of mathematical concepts is the main cause of learning difficulties. Zuliani and Rini (2021) stated that *"difficulties in learning mathematics are characterized by repeated conceptual and procedural errors*." This is reinforced by Faiha and Sapitri (2023) , who stated that students experience difficulties because *they "have not yet mastered the basic concepts as a prerequisite for understanding subsequent material* ." Research by Sinaga et al. (2025) also showed that students with high abilities still experience difficulties when faced with word problems, due to *"a lack of contextual understanding in linking the problem to relevant mathematical concepts* ." These findings indicate that learning difficulties are not always related to intelligence level, but rather to the quality of conceptual understanding.

In addition to cognitive aspects, affective factors also emerge as significant causes of difficulties in learning mathematics. Low motivation and interest in learning, negative attitudes toward mathematics, and mathematics anxiety are reported to contribute significantly to low student engagement in the learning process. Handayani et al. (2021) emphasized that *"low motivation and interest in learning significantly influence students' difficulties in understanding mathematics material*." Similarly, Satria et al. (2024) stated that "math anxiety hinders students' logical thinking and problem-solving abilities . "

Lubis and Quratul Ain (2022) found that negative attitudes toward mathematics lead students to be passive and avoid learning challenges, thus exacerbating their difficulties. This finding suggests that emotional aspects play a crucial role in successful mathematics learning.

The findings further provide an overview of the implications of factors for improving the mathematics learning process. The results of the literature synthesis indicate that learning strategies and the role of teachers have a very important influence. Many studies highlight that teacher-centered learning emphasizes memorization of formulas, and the minimal use of concrete and contextual learning media, which tends to exacerbate student difficulties. Sepriyanti et al. (2024) stated that *"learning strategies that are not varied and teacher-centered cause students to*

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*have difficulty understanding mathematical concepts in depth*. " Learning that emphasizes memorization of procedures without understanding concepts is considered less effective. Therefore, the direct implication of these findings is the need to implement more varied learning strategies, oriented towards conceptual understanding, and linking mathematical material to real situations to make it more meaningful for students.

Astuti et al. (2023) stated that *"the lack of active and interactive learning makes students less engaged in the mathematics learning process*." This results in low comprehension and increased learning difficulties. Furthermore, Novitasari and Fathoni (2022) emphasized the importance of learning media by stating that *"the lack of use of concrete learning media makes it difficult for students to understand abstract mathematical concepts* ." These findings reinforce the importance of learning innovation to reduce mathematics learning difficulties.

Furthermore, the use of learning media and innovative approaches also has important implications for overcoming difficulties in learning mathematics. Visual media, concrete teaching aids, and problem-based learning have been reported to help students grasp abstract concepts more easily. Therefore, improving the learning process depends not only on the material taught, but also on how that material is delivered and co-constructed with students in a supportive learning environment.

Learning environment factors and family support are also important findings in several studies. Raida et al. (2022) stated that "a less supportive family environment and minimal learning assistance at home contribute to students' difficulties in learning mathematics." Farhan (2023) corroborated these findings by stating that learning difficulties are influenced by *"less conducive learning environments both at school and at home*." In the context of online learning, Rismawati (2021) revealed that *"online mathematics learning during the pandemic exacerbated students' difficulties due to low interaction and limited understanding of the material* ." These findings suggest that changes in the learning system also impact students' levels of difficulty.

Thus, it can be concluded that the problem formulations of previous research collectively form a complementary conceptual framework, ranging from the identification of conceptual difficulties, affective factors, to the influence of learning strategies and environments. Synthesis of these various problem formulations confirms that mathematics learning difficulties are a multifactorial phenomenon. Therefore, the results of this SLR not only summarize the empirical findings of previous research but also integrate the direction and focus of previous research problem formulations into a more comprehensive understanding of students' mathematics learning difficulties.

## CONCLUSION

Based on a systematic literature review of 20 relevant scientific articles, it can be concluded that students' difficulties in learning mathematics are a complex problem influenced by various interrelated factors. Cognitive factors, particularly a weak understanding of mathematical concepts, are the primary cause of students' learning difficulties, which are often characterized by procedural errors and an inability to relate mathematical concepts to contextual problems. Furthermore, affective factors such as low learning motivation, negative attitudes toward mathematics, and mathematics anxiety also exacerbate students' difficulties.

Externally, a lack of varied learning strategies, teacher-centered learning, limited use of instructional media, and minimal interaction in the learning process are significant factors in increasing mathematics learning difficulties. Support from the learning environment, both from family and school, also plays a crucial role in determining students' success in mathematics

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learning. These findings confirm that mathematics learning difficulties are not solely caused by individual student abilities, but are also influenced by the quality of instruction and the learning environment.

Therefore, efforts to address mathematics learning difficulties need to be comprehensive, addressing cognitive, affective, and pedagogical aspects in an integrated manner. Further research is recommended to develop and test innovative learning models and classroom-based interventions focused on improving conceptual understanding and motivation to learn mathematics at various levels of education.

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