

Systematic Literature Review: Mathematical Literacy Skills in Terms of Mathematics Learning Motivation

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ABSTRACT: Mathematical literacy and motivation to learn mathematics are two important aspects of education. Mathematical literacy enables students to understand and apply mathematical concepts in everyday life, as well as think logically and solve problems. Mathematics learning motivation influences students' effort and perseverance in learning the material, improving academic interest and performance. The combination of the two is essential for educational success and the development of critical thinking skills required in the modern world. The objectives of research generally cover the following aspects Measuring Mathematics Literacy Level, Assessing Mathematics Learning Motivation, Identifying the Relationship between Mathematics Literacy and Learning Motivation, Recognizing Barriers and Challenges, Developing Effective Learning Strategies. This research uses the SLR (Systematic Literature Review) method by reviewing 16 articles. Data collection in this study was carried out by reviewing all articles related to Mathematical Literacy Ability, Learning Motivation, Mathematical Literacy Ability in terms of Learning Motivation published from 2019 to 2023. Based on the results of the study, it was found that motivation to learn mathematics plays an important role in students' mathematical literacy skills. Students with low motivation tend to learn by force, so their mathematical literacy skills are low because they tend to do problems procedurally without in-depth analysis. The implication is the need for motivational strategies, curriculum design, teacher training, literacy programs, and parental involvement.

Keywords: Mathematical Literacy; Motivation to Learn; Mathematics; SLR

INTRODUCTION

Mathematics learning is a crucial part of the curriculum in many countries, including Indonesia. However, one of the primary challenges in mathematics education is the low level of mathematical literacy among students, especially at the secondary school level. Mathematical literacy involves a deep understanding of mathematical concepts, the ability to apply mathematical knowledge in various contexts, and the capacity for critical and analytical thinking in problem-solving [1]. One common approach to improving mathematical literacy is the Scientific Approach, which emphasizes understanding mathematical concepts through exploration, discussion, and real-world application. However, the implementation of this approach often faces several obstacles that need to be addressed. Key Issues in Mathematical Literacy and Learning, Limited Understanding of Basic Concepts, Lack of Motivation and Interest, Lack of Critical Thinking Skills, Underutilization of Technology, Inadequate Resources [2, 3].

Mathematical understanding refers to the capacity to use mathematical concepts effectively in a variety of real-life contexts, playing an important role in daily decision making [4]. Mathematical skills are essential in education and daily life because they help individuals use mathematical concepts in real situations [5, 6, 7, 8, 9]. The drive to learn mathematics is key in improving mathematical literacy skills, with research showing that students' motivation levels have a major impact on their mathematical abilities [10]. The drive to learn is highly influential on educational achievement, especially in



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mathematics. Studies show that students' motivation levels differ depending on personality types, such as introverts and extroverts [9].

Mathematical literacy levels are influenced by various factors. Factors affecting math literacy include socioeconomic status, parental education level, learning habits, cognitive processes, school-related variables such as location (rural/urban), immigrant status, and economic/socio-cultural status. Studies show that teacher-centered learning, lack of practice with literacy problems, difficulty in modeling real-world problems, and lack of learning outside school hours contribute to low levels of mathematical literacy. Data mining methods such as Multi-layer Perceptron Artificial Neural Networks and Random Forest have been used to determine these factors and predict mathematical literacy outcomes, emphasizing the importance of addressing these issues to improve students' mathematical proficiency [11, 9, 12, 13].

Motivation to learn mathematics is important for improving mathematical literacy, with research showing that students' motivation strongly influences their mathematical ability, in addition to the institutional environment influencing students' motivational beliefs, affecting their self-confidence and goal orientation in mathematics subjects [14]. Academic motivation not only directs students' goals and interests, but also influences their achievement in important examinations, indicating the importance of fostering motivation in mathematics learning for the improvement of educational outcomes [15]. Motivation plays an important role in educational achievement, especially in mathematics. Research shows that students' motivation levels vary by personality type, with introverted and extroverted students showing high motivation criteria [16]. Research shows that students have varying levels of motivation in learning mathematics across different fields, where social science students tend to experience higher math anxiety but have a positive attitude towards achieving success in the subject [17].

Based on the background description, the researcher is interested in conducting a study entitled "Systematic Literature Review: Mathematical Literacy Skills in View of Mathematics Learning Motivation". The problem formulations in this study include: (1) How is the description of mathematical literacy skills of junior high school students based on the research year? (2) How is the description of mathematical literacy skills of junior high school students? (3) How is the description of learning motivation of junior high school students? (4) How is the description of mathematical literacy skills of junior high school students in terms of learning motivation?

RESEARCH METHODS

This research uses the Systematic Literature Review (SLR) method is a comprehensive summary of existing research on a particular topic, with the aim of identifying gaps, supporting decision making, and suggesting future research [18].

This research is conducted by searching for relevant articles or another term is the search process. In this study, data were obtained from literature studies using the Dimensions database. The keywords are mathematical literacy skills, learning motivation, and mathematical literacy skills in terms of learning motivation. The articles collected in this study are articles published from 2019 to 2023.

The inclusion criteria in this SLR are: (1) articles published from 2019 to 2023; (2) The type of article must be a journal and is a research on mathematics education and learning; (3) articles must be openly accessible; (4) Articles are searched using the keywords literacy skills, mathematical literacy skills and learning motivation.

Articles were grouped by year of publication, literacy skills criteria, mathematical literacy skills and learning motivation. The population of this study includes all studies on literacy skills, mathematical literacy skills and learning motivation that have been published in various scientific journal publishers. Based on the identification results, researchers obtained 16 relevant articles. Data analysis techniques used by researchers include grouping, analyzing, and summarizing data.

RESULT AND DISCUSSION

The results of relevant articles, further categorized based on the year of research can be seen in Table 1. Table 1 can be seen that from 2019 to 2023 there are 16 relevant articles. Articles about students' literacy skills were found in 6 articles, learning motivation was found in 9 articles, and mathematical literacy skills in terms of learning motivation was found in 1 article. This shows that mathematical literacy skills and students' learning motivation are still low.

TABLE 1. Based on the year of research

No	No Year of Research	Criteria		
		Mathematical Literacy Ability	Learning Motivation	Mathematical Literacy Ability in terms of Learning Motivation
1	2019	2	2	
2	2020	2	1	
3	2021	1	1	
4	2022		3	1
5	2023	1	2	

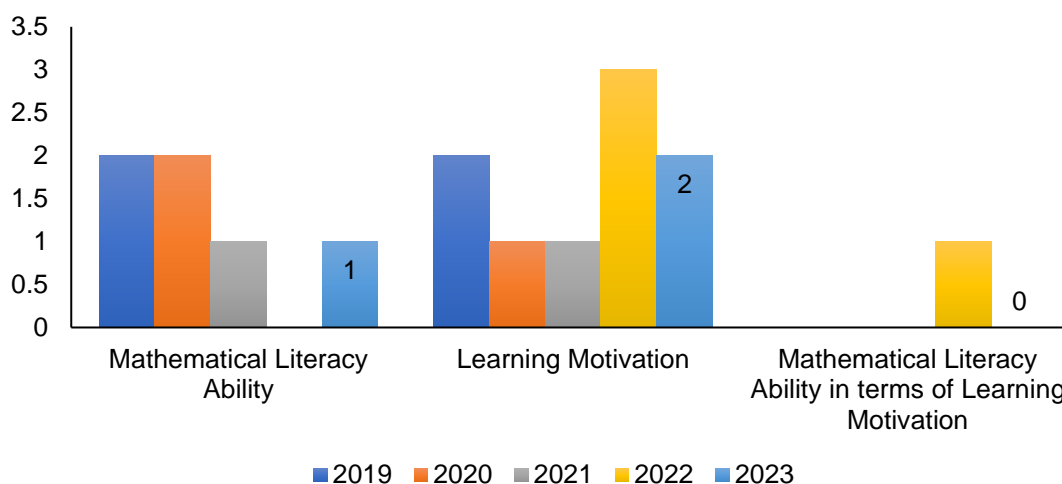


FIGURE 1. Distribution of articles based on the year of research

Based on data from Figure 1, many studies were conducted in 2022, namely on student learning motivation. In addition, research on learning motivation is conducted every year from 2019 to 2023. This shows that student learning motivation is still low.

Research on mathematical literacy skills.

Some research articles on mathematical literacy that have been analyzed can be seen in Table 2.

TABLE 2. Mathematical Literacy Research

Research title	Research result	References
Level Of Mathematical Literacy Skills Of Junior High School Students In Solving Pisa Questions Solving In Terms Of Mathematical Ability	Mathematical literacy skills in students are viewed from high, medium, and low mathematical abilities.	[19]
Analysis Of Mathematical Literacy Skills Of Junior High School Students In Working On Pisa Uncertainty And Data Content Questions	This study aims to describe students' KLM in working on PISA uncertainty and data content questions. This research is a descriptive research with a qualitative approach. The data came from the results of students' KLM test answers and interviews. Data collection methods using documentation, test administration and interviews. The instruments used were KLM test of PISA uncertainty and data content as many as 6 questions consisting of level 1 to level 6 and interview sheets. Based on the results of data analysis, the results show that students have difficulty in working on KLM questions consisting of communication skills,	[8]

Research title	Research result	References
	representation, mathematization, problem solving strategies, reasoning and argumentation skills.	
Students' Mathematical Literacy Ability in Problem Based Learning Model Learning (PBL)	Students' mathematical literacy skills in PBL model learning are better than students in learning without PBL model.	[20]
Analysis Of Students' Mathematical Literacy Skills In Terms Of The Character Of Learning Independence In Algebra Material	Factors affecting mathematical literacy in terms of learning independence include: difficulty understanding problems and converting everyday problems to mathematical models, inability to operate algebra, and errors in calculations. Lack of understanding of the problem causes difficulties in planning strategies, using formulas, and evaluating problems appropriately. Interviews show a lack of focus during learning, fear of asking questions when they don't understand, and lack of awareness of repeating material causes information not to be maximally received, hindering problem solving.	[21]
Effectiveness of Problem Posing Learning Model in View of Mathematical Literacy Ability of Junior High School Students on Algebraic Materials	The increase in mathematical literacy skills is moderate. So, the problem posing learning model is effective in improving students' mathematical literacy.	[22]
Analysis of Interaction between Adobe Flash CS6-assisted RME Learning and Mathematics Initial Ability in Improving Mathematical Literacy Mathematical Literacy	There was no interaction effect between RME and conventional learning on mathematical literacy. However, students with Adobe Flash CS6-assisted RME experienced higher literacy improvement compared to conventional learning.	[23]

Research on Learning Motivation

Several research articles on learning motivation that have been analyzed can be seen in Table 3.

TABLE 3. Learning Motivation Research

Research title	Research result	References
Development of Gamified Math E-Module Based Problem-Based Learning to Increase Learning Motivation	This study developed and tested a problem-based math gamification e-module to increase learning motivation of 37 students of SMP Negeri 1 Sawangan. Using the ADDIE model, this e-module proved to be highly valid, practical, and effective, increasing students' learning motivation by 8.5% and learning outcomes from 22.5% pretest to 77.4% posttest. This e-module is suitable for use.	[24]
The Influence Of Motivation And Learning Independence On Students' Ability To Understand Mathematical Concepts During The Covid Pandemic - 19	This study measures the effect of motivation and learning independence on mathematics understanding during the COVID-19 pandemic. The sample consisted of 88 seventh grade students of public junior high school in Kemayoran. Instruments: math test (30 questions) and motivation and independence questionnaire. Results: 1) Motivation and independence together affect	[25]

Research title	Research result	References
	math comprehension (Sig. = 0.000, F_hitung = 1052.654). 2) Motivation affects math comprehension (Sig. = 0.000, t_count = 4.064). 3) Independence affects math comprehension (Sig. = 0.006, t_count = 2.843).	
The Effectiveness of Problem-based Learning Assisted with Learning Media of Batik Jombang Ethnomathematics Card in Improving Learning Motivation of Junior High School Students	This study evaluates the effectiveness of PBL with Jombang batik ethnomathematics cards to increase junior high school students' learning motivation on geometry transformation material. Method: survey with 32 students of class 7A of Al-Furqon Junior High School. Instruments: motivation questionnaire, learning outcome test. Results: PBL assisted by Jombang batik significantly increased motivation (Sig. = 0.001). Test results: 90% of students scored above 75.	[26]
The Effect of Learning Motivation on Mathematics Learning Achievement of Class VIII Students of SMPN 1 Kuala Behe	This study examines the effect of learning motivation on the mathematics achievement of 8th grade students of SMP Negeri 1 Kuala Behe in the 2018/2019 academic year. Quantitative with an ex post facto approach, involving 64 students. The results show that learning motivation significantly affects math achievement (R Square = 0.195), explaining 19.5% of the variation in student achievement.	[27]
The Implementation of The Drill Method to Increase Students' Cognitive Learning Outcomes Of Sets In A Grade 7 Class At A Junior High School In Sentani	This study evaluated the effect of drill method on mathematics learning outcomes of grade 7C students at SMP Negeri Sentani. The drill method was applied in a Classroom Action Research (PTK) with 21 students. The results showed significant improvement: 52%, 71%, and 86% of students reached the KKM in cycle I, II, and III, respectively.	[28]
The Effect of Learning Motivation on Students' Mathematics Learning Outcomes	This study evaluates the effect of learning motivation on the mathematics learning outcomes of students in grades III-V SDI Ende 11, Ende Regency. The results of the analysis showed a significant effect of learning motivation on math learning outcomes (Fcount = 14.598, Ftable = 4.20). The regression coefficient of math learning outcomes is 0.001, with R Square = 0.343, indicating that learning motivation affects math learning outcomes by 34.3%.	[29]
Improving Motivation and Learning Outcomes Using the Discussion Method in Mathematics Subjects Two Variable Linear Equations in Class VIII-B SMP Negeri 2 Grogol Kediri Regency	This study aims to improve student understanding with learning variations to avoid boredom. Using a Classroom Action Research (PTK) approach of cycles of planning, implementation, observation, and reflection. The results showed an increase in student learning motivation from 2.56 to 3.5 in cycles 1 and 2. The number of students who reached the KKM standard rose from 62.86% to 88.57% between cycles 1 and 2, with an increase of 25.71%. The discussion method is effective in improving the learning outcomes	[30]

Research title	Research result	References
	of students in class VIII-B SMP Negeri 2 Grogol on Linear Equations of Two Variables.	
The Influence of Self-Efficacy And Learning Motivation On Math Learning Independence	This study explores the influence of self-efficacy and learning motivation on math learning independence in class VIII G SMP Negeri 1 Musuk. The results show that both self-efficacy and learning motivation have a positive and significant effect on math learning independence.	[31]
The Effect of the Jigsaw Type Cooperative Learning Method in Increasing Student Interest, Motivation and Learning Completeness in Mathematics Subjects	This study aims to increase the interest, motivation, and learning completeness of mathematics students in class IX-H SMP Negeri 1 Kuningan through class action research. Conducted in the odd semester of the 2019/2020 school year involving 35 students, the results showed an increase in student interest and motivation from 27.27% to 65.91%, with an increase of 38.64%. The Jigsaw type cooperative model is effective in improving math learning.	[32]

Based on the identification and review of the articles collected, it can be concluded that there are many factors that play a role in influencing students' motivation to learn mathematics. These factors include not only the teaching methods used in the classroom, but also the learning environment, the personalized approach to students' needs, and the support provided by teachers and parents. In addition, students' motivation is also influenced by their perception of the relevance of mathematics in their daily lives, their ability to understand mathematical concepts thoroughly and the positive experiences they have during the learning process. By considering all these factors, more effective learning strategies can be designed to increase students' motivation for mathematics learning.

Mathematical Literacy in terms of Student Learning Motivation

Several research articles on mathematical literacy skills in terms of learning motivation that have been analyzed can be seen in Table 4.

TABLE 4. Research on Mathematical Literacy in terms of Learning Motivation

Research title	Research result	References
The Role of Learning Motivation on Mathematics Literacy in Class VII Students	Mathematical literacy assessment data is information about students' scores in solving mathematical literacy problems based on communication, mathematics, representation, reasoning and argument, developing strategies to solve problems, using symbolic, formal and technical language and operations, and using mathematical tools. The higher students' learning motivation, the higher their mathematical literacy outcomes, and vice versa. Therefore, to achieve good and maximum mathematical literacy results, students must have good learning motivation. The motivation that arises from students can spur them to improve their mathematical literacy outcomes.	[33]

CONCLUSION

Motivation to learn mathematics plays a very important role in improving students' ability to understand and apply mathematical concepts. This research shows that students who have strong intrinsic motivation tend to show better achievement in mathematical literacy, which includes the ability to understand, analyze and interpret mathematical information and relate it to real-world situations.

The analysis of the article highlights that students' level of learning motivation not only affects their performance in math exams or tasks, but also shapes positive attitudes towards the subject as a whole. Factors such as an internal drive to understand the material, a desire to achieve personal goals, and a sense of emotional involvement in math learning all contribute to improving students' math literacy.

Thus, it is important for educators to pay attention to and develop students' intrinsic motivation as part of the learning strategy. This can be done by creating a supportive learning environment, providing challenging yet relevant tasks, and connecting mathematical concepts with applications in everyday life. With this approach, it is expected to improve not only students' mathematical literacy skills but also their interest in learning mathematics as a whole.

SUGGESTION

Future research can go deeper into mathematics learning strategies that can effectively increase students' motivation to learn mathematics, as well as identify other factors that affect students' mathematical literacy skills more comprehensively.

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