LITERATURE REVIEW: DIFFERENTIAL LEARNING TO IMPROVE STUDENT MATHEMATICAL LITERACY

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ABSTRACT

In the age of differential learning today, good mathematical literacy is required. Teachers need to understand how to apply effective differential learning and how to monitor students' mathematical literacy during the learning process. This literature review aims to get an idea of how the effectiveness of learning differentiates against the mathematical literacy of students. A literature review was done by collecting various other research articles from 2020 to 2024 using Google Scholar. The author obtained 13 articles using the search keyword "differentiated learning" and 63 articles using the search term "mathematical literature". From the articles obtained through the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method, which consists of four stages, namely identification, screening, and eligibility, and included, 11 articles were derived that match the purposes of the literature review. Based on the analysis of the review literature, the authors concluded that differentiation approaches could be integrated into learning models such as Problem-Based Learning (PBL), Discovery Learning, and Project Based Learning (PjBL) by considering student learning styles and needs. In differential learning, the use of learning models in the classroom has proved to have a significant impact on students' mathematical literacy.

Keywords: Differentiated Learning, Mathematical Literacy

INTRODUCTION

Effective mathematical learning requires good literacy. Mathematical literacy is the ability of students to create, apply, and interpret mathematics in a variety of contexts, including mathematical reasoning and the use of concepts, processes, and facts to describe and predict phenomena (Lestari & Effendi, 2022). In addition, mathematical literacy includes the ability to read, write, and speak about mathematics concepts well (Zahrah, 2024). Therefore, students' mathematical literacy has a significant impact on their success in learning mathematics (Ratnaya et al., 2024). For this reason, in the teaching and learning process, teachers have complete control in fostering students' mathematical literacy.

Teachers' efforts to improve their understanding of mathematical concepts and students' ability to write critically and creatively are one of them by using differential learning. Differential learning has been found to be effective in improving student mathematical literacy (Defitriani, 2018). Differentiation in teaching refers to providing learning experiences and paying attention to individual differences of

students in accordance with the needs of students (Sarnoto, 2024). Differentiated learning plays an essential role in improving the effectiveness and efficiency of teaching so that the needs and abilities of students are met (Mastuti et al., 2022). Differential learning has been proven to drive an improvement in students' mathematical literacy (Defitriani, 2018). In its application, differentiation can be done by dividing students into several groups according to their characteristics, as well as providing variation in the way of teaching and the resulting product (Triandani & Fajrin, 2024).

However, many teachers still have difficulties in applying differential learning in the classroom as a result of the strategic knowledge they have, difficulty in determining student needs, and time management in learning (Ria & Kurniati, 2023; Umayrah & Wahyudin, 2024; Widyawati & Rachmadyanti, 2023). The results of Azizah et al. (2023) show that teachers need help in applying differential learning from the time and class management side. At the beginning of learning, the teacher performs a diagnostic assessment, preparing different teaching materials according to the student's learning needs. Teachers need to understand how to implement effective differentiation strategies and monitor student literacy throughout the learning process.

For that reason, researchers felt motivated to do a literature review on differential learning to improve mathematical literacy. The researchers analyzed the gathering of data on differential learning, mathematical literacy, educational levels, countries, and submitted materials. The researchers expect the results of the analysis to make a meaningful contribution to developing effective and responsive learning to the needs of the learners. The problem formula in this literature review is the effectiveness of differential learning versus student mathematical literacy. Thus, this research will study effective differentiation strategies and find information on how teachers can use them in practice. It also digs out how differentiation can help teachers monitor student literacy and improve student success.

METHODS

The method in writing this article uses a literature review, carried out in an organized manner using steps or procedures through the method of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which consists of four stages, namely identification, screening, eligibility, and included (Selcuk, 2019). (1) Identification and gathering information by searching the Google Scholar database for scientific research publications using relevant keywords and concepts typically used in Indonesian. The articles obtained during the identification process were then filtered or screened; (2) Screening, after the identification process, the articles were filtered or screened based on how well their content explained student learning outcomes and activities; (3) Eligibility, finally, the eligibility procedure or feasibility test was completed. In this stage, the filtered articles were examined to ensure their suitability and adherence to standards for conducting a literature review. (4) The last stage includes

the data collection and selection of data items. The established inclusion criteria were considered during this eligibility process. Table 1 provides an overview of the inclusion criteria.

Table 1. Literature Search Criteria

Criteria	Inklusi
Population	Students in primary school, preschool, and secondary school
Article Type	Not only in abstract form, but in full text articles
Year of Publication	Research published from 2020 – 2024
Language	Articles written in Indonesian

The research process began with the selection of articles relevant to the researched topic. The scientific articles used as research materials were sourced from national journals published within the last four years, from 2020 to 2024. In the initial stage of article selection, the researcher obtained 76 articles. Thirteen articles were found using the keyword "differentiated instruction," and 63 articles were found using the keyword "mathematical literacy."

Then, the researcher reselected articles whose titles needed to be more relevant to the topic being discussed. A total of 34 scientific articles were selected after this process. Next, an eligibility assessment was conducted, resulting in 11 articles: 5 articles using the keyword "differentiated instruction" and six articles using the keyword "mathematical literacy" that met the researcher's needs for the literature review. This process is illustrated in Figure 1.
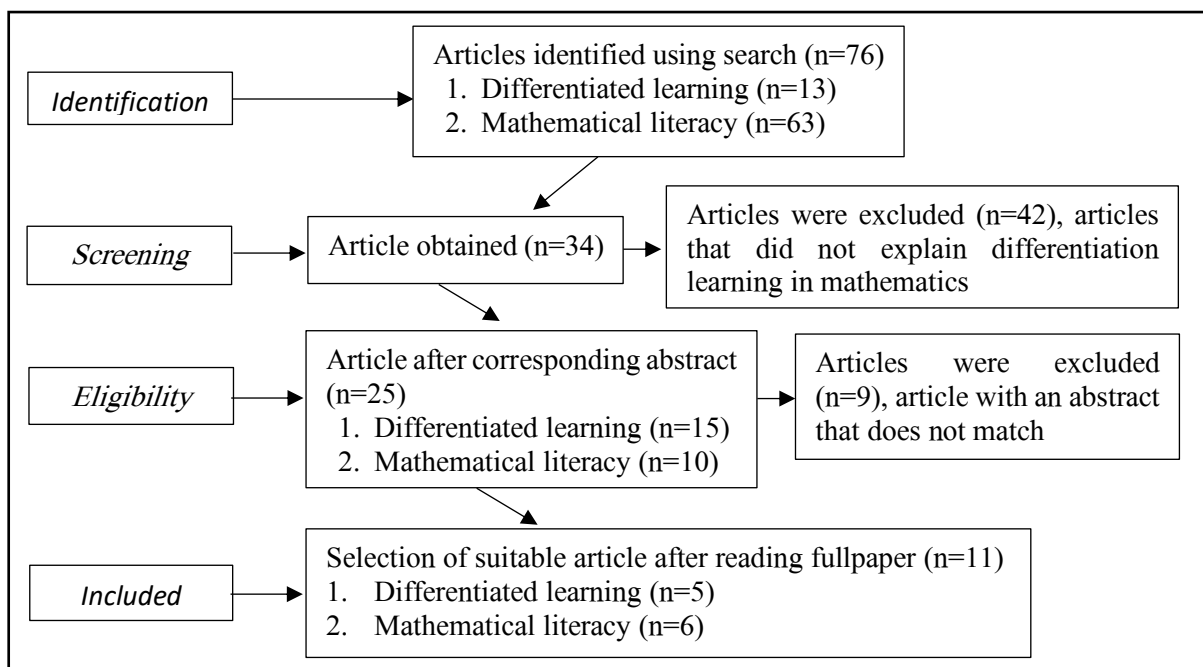

Figure 1. Literature Search Process

After obtaining 11 articles, consisting of 5 articles using the keyword "differentiated instruction", presented in Table 2 and 6 articles using the keyword "mathematical literacy", presented in Table 3,

these articles were then analyzed. The primary purpose of this analysis is to ensure diversity in research years, titles, methodologies, and research findings.

FINDINGS

The analysis of the data collected from a number of articles on differentiated instruction and mathematical literacy obtained:

Table 2. Search Analysis for "Differentiated Learning"

NO	Researcher and Year	Title	Sample	Subject	Country	Research Results
1.	(Kamal, 2021)	"Implementasi Pembelajaran Berdiferensiasi dalam Upaya Meningkatkan Aktivitas dan Hasil Belajar Matematika Siswa Kelas XI MIPA SMA Negeri 8 Barabai."	Senior High School	Mathematics	Indonesian	Research results show that the application of differential learning can improve the mathematical activity and learning outcomes of XI grade students of MIPA at State High School 8 Barabai in the 2021/2022 school year.
2.	(Laia et al., 2022)	"Pengaruh Strategi Pembelajaran Berdiferensiasi terhadap Hasil Belajar Peserta Didik SMA 1 Lahusa."	Senior High School	Physics	Indonesia	Differentiated Learning Strategies can increase motivation, engagement and learning outcomes.
3.	(Nazilatun & Purnomo, 2023)	"Pengaruh Pembelajaran Berdiferensiasi terhadap Hasil Belajar Matematika Siswa Sekolah Dasar."	Elementary School	Mathematics	Indonesian	Application of differential learning can improve the knowledge of elementary school students.
4.	(Khabibah et al., 2023)	"Upaya Meningkatkan Hasil Belajar Matematika Materi Pecahan	Elementary School	Mathematics	Indonesian	Differential learning can improve student learning outcomes in

		Kelas IVA melalui Pembelajaran Berdiferensiasi."				fragmentary material.
5.	(Sutrianto & Asyhar, 2023)	"Penerapan Pembelajaran Diferensiasi untuk Meningkatkan Hasil Belajar Matematika Siswa Kelas XII SMA Xaverius 1 Jambi Tahun Pelajaran 2023/2024 (Implementasi Kurikulum Merdeka."	Senior High School	Mathematics	Indonesian	The application of differential learning can improve the mathematical learning outcomes of XII grade high school students Xavier 1 Jambi.

Based on the analysis of data in Table 2 on differential learning, researchers obtained article data from the country of Indonesia, with the subject studied mostly being mathematical subjects. In addition, the researchers also obtained the highest percentage of samples at the high school level of 60%. Type of research using qualitative research techniques. Most studies use test instruments to assess student learning achievements, while some articles apply observation sheets to understand student learning styles and interests in the context of differential learning. Teachers conducting differential learning should pay attention to the needs of students, including aspects of student interests, readiness, and student learning profile (Faiz et al., 2022; Sarie, 2022; Wahyuningsari et al., 2022). Differential learning has been shown to improve learning outcomes in Cycle II, a significant improvement compared to Cycle I, with an average of 96.55% in Cycle II achieving KKM (Suwartiningsih, 2021). In accordance with Sutrianto & Asyhar (2023) stated that differential learning can boost learning outcomes by meeting the Learning Objective Compliance Criteria (CCTC) in the second cycle there are 86.11% of students met the CCTC.

Based on the five articles contained in Table 2, researchers can conclude that efforts to develop mathematical learning outcomes and student involvement can be carried out by applying appropriate differentiation learning.

Table 3. Analysis of the search for "Mathematical Literacy"

NO	Researcher and Year	Title	Sample	Subject	Country	Research Results
1.	(Tabun et al., 2020)	"Kemampuan Literasi Matematis Siswa pada Pembelajaran Model Problem Based Learning (PBL)."	Junior High School	Mathematics	Indonesian	Students in PBL classes have higher levels of mathematical literacy than students in non-PBL classes.
2.	(Widianti & Hidayati, 2021)	"Analisis Kemampuan Literasi Matematis Siswa SMP pada Materi Segitiga dan Segiempat."	Junior High School	Mathematics	Indonesian	The results of the study show that the mathematical literacy of high school students on triangle and square matter is still low if they don't get the learning model Problem Based Learning.
3.	(Rismen et al., 2022)	"Kemampuan Literasi Matematika Ditinjau dari Gaya Belajar."	Junior High School	Mathematics	Indonesian	Students tend to have more mathematical literacy and have a visual learning style.
4.	(Lestari & Effendi, 2022)	"Analisis Kemampuan Literasi Matematis Siswa SMP pada Materi Bangun Datar."	Junior High School	Mathematics	Indonesian	Student's mathematical literacy is still relatively low.
5.	(Sholikin et al., 2022)	"Penerapan Teori Belajar Bermakna untuk Meningkatkan Literasi Matematis Siswa Kelas X."	Senior High School	Mathematics	Indonesian	The application of meaningful learning theory can advance students' mathematical literacy.
6.	(Kiawati et al., 2023)	"Penerapan Model Pembelajaran Berbasis Masalah untuk Meningkatkan Kemampuan	Junior High School	Mathematics	Indonesian	Students who follow the problem-based learning model have a higher level of mathematical

Literasi Matematis Siswa."	literacy compared to traditional learning methods. This approach has proven to be more effective in increasing students' mathematical literacy.

Analysis of data in Table 3 on mathematical literacy using experimental research methods. Studying mathematical literacy was the primary goal to be achieved (Sholikin et al., 2022). Students will need help in solving mathematical problems in everyday life due to the minimum mathematics literacy of students. Previous research has shown that the mathematical literacy of high school students in solving matters is still below average or can be said to be relatively low (Ate & Lede, 2022; Fointuna et al., 2019; Lestari & Effendi, 2022). Thus, there is a need for teachers to make efforts in the learning process in the classroom with the aim of improving students' mathematical literacy.

Based on Table 2 and Table 3 above, differential learning to improve mathematical literacy needs to be adapted to the learning needs of students and can be applied at all levels from primary school to high school.

CONCLUSION AND SUGGESTION

Differentiated instruction can be integrated into learning models such as Problem-Based Learning (PBL), Discovery Learning, and Project-Based Learning (PjBL), considering students' learning styles and needs. The learning model greatly influences students' mathematical literacy. It has been proven that the presence of a learning model in the classroom significantly impacts students' mathematical literacy. In other words, students' mathematical literacy is better compared to classes that do not utilize a learning model. This is because students still need to be able to express conclusions and justify their interpretations.

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