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# A SYSTEMATIC LITERATURE REVIEW: DIFFERENTIATED LEARNING IN IMPLEMENTING THE MERDEKA CURRICULUM IN MATHEMATICS EDUCATION

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#### Abstract

Differentiated learning is a hot topic in education today. In the Merdeka curriculum, teachers must use differentiated learning in the classroom. Therefore, it is important to understand how differentiated learning is implemented in mathematics subjects. This descriptive qualitative research uses a Systematic Literature Review (SLR) approach. The Systematic Literature Review research procedure refers to eight steps with three main stages: Planning the review, Conducting the review, and Reporting the review. The literature sources of this research used various articles from Google Scholar, Springer, Taylor & Francis, Elsevier, and ScienceDirect. The results show that implementing differentiated learning positively affects students' mathematics academic achievement; besides that, differentiated learning increases self-efficacy, self-confidence, and motivation in learning mathematics, which can support the achievement of mathematics subject objectives. Differentiated learning effectively provides direct learning opportunities tailored to the conditions, learning styles, characters, and deficiencies of students in learning.

**Keywords**: Differentiated Learning, Merdeka Curriculum, Mathematics Education.

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### **INTRODUCTION**

Mathematics education is an important and mandatory subject at every level of education. Through mathematics education, it trains students' thinking skills in applying and connecting mathematical concepts to solve various problems in real-life situations. To support the mathematics learning process, educators must be able to utilize a variety of models, strategies, and learning methods tailored to the content and characteristics of learners regulated by the applicable education curriculum.

Today's Merdeka curriculum used by educational units in Indonesia is competency-oriented. The Merdeka curriculum provides freedom and autonomy to educators in the learning process from a system that complicates and limits the space for educators and students (Kemendikbud, 2022; Daga, 2021; Mustaghfiroh, 2020). The Merdeka curriculum uses a learning system based on a specific project (Project Based Learning) so that the Merdeka curriculum can be more flexible and focus on essential material to create a learning culture that is innovative, not restrictive, and by the needs of students (Fajri et al., 2023; Fahlevi, 2022; Sopiansyah et al., 2021).

This flexibility simplifies learning, and educators can design learning based on students' abilities (Achmad et al., 2022). According to Alhafiz (2022), each learner has a different tendency to receive knowledge or learning, and educators must be able to meet all the differences in students in terms of their learning styles in the learning process (Afriani et al., 2024). This paradigm is called differentiated learning.

Differentiated learning is a hot topic in education today. Differentiation is a teaching philosophy rooted in a deep respect for students, recognizing their differences, and a drive to help all students thrive (Smale-Jacobse et al., 2019). Differentiated learning is 21st-century teaching and learning in viewing each learner as unique and having different needs, learning styles, and handling in the learning process so that a variety of learning models are needed to accommodate diversity so that learning objectives are achieved (Ferlianti et al., 2022; Wahyuningsari et al., 2022; Nawati et al., 2023). Differentiated learning aims to optimize child development and meet the learning needs of each child (Puspitasari & Darsinah, 2023). Differentiated learning can also include recognizing diverse knowledge and responding in ways that value those differences and use them to engage learners in classroom work (Mills et al., 2014).

In addition, there are five basic principles related to differentiated learning (Tomlinson & Moon, 2014), namely (1) the learning environment includes the physical environment of the school and the classroom where learners spend their learning time at school; (2) quality curriculum, which is a quality curriculum that has clear goals so that teachers can know what to aim for at the end of learning; (3) continuous assessment, which is an assessment at the beginning of learning before discussing a learning topic; (4) responsive teaching, which is

through formative assessment teachers can find out what they lack in guiding learners to understand the content of the lesson. After knowing these things, the teacher must respond and change his teaching according to the needs of the learners in his class; (5) leadership and routine in the classroom, namely Leadership here is defined as how the teacher can lead his learners to be able to follow learning in a conducive learning climate and situation, through class agreements that have been determined together. Through differentiated learning, the learning process of educators becomes more varied because they carry out learning using various strategies, approaches, and learning models. The purpose of differentiated learning is so that students can understand mathematics subject matter more efficiently (Febriana et al., 2023).

However, educators in education units have not been able to design differentiated learning when implementing the Merdeka curriculum, especially in mathematics education lessons that can truly be tailored to students' unique and diverse needs, skills, requests, and learning styles. Therefore, educators need to understand the implementation of differentiated learning in teaching and learning activities, especially in mathematics education subjects. Based on this description, this study aims to describe the implementation of differentiated learning in the Merdeka curriculum in mathematics education.

#### **METHODS**

This descriptive qualitative study uses a Systematic Literature Review (SLR) research approach. This method involves collecting, analyzing, and critically appraising data from various studies. SLR aims to describe, analyze, and synthesize existing literature to inform decision-making and test hypotheses to develop new theories (Xiao & Watson, 2019; Moher et al., 2009).

In this study, we chose SLR because it suits our purpose to identify the implementation of differentiated learning in the Merdeka curriculum in mathematics education by previous researchers and reveal the implementation process in the classroom. The findings will allow us to draw conclusions and make informed decisions regarding future research.

This SLR research procedure refers to eight steps with three main stages: Planning the review, Conducting the review, and Reporting the review, presented in the following figure (Brereton et al., 2007; Xiao & Watson, 2019).

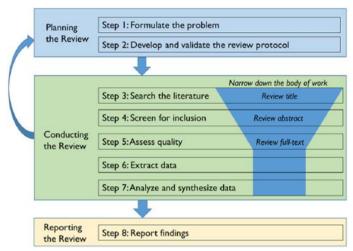


Figure 1: Systematic Literature Review Process

## Planning the review

The researcher formulated the problem and developed the research protocol, which included (1) the selection of appropriate keywords to identify relevant literature; (2) the determination of databases such as Google Scholar, Springer, Taylor & Francis, Elsevier, and ScienceDirect; (3) establishing inclusion and exclusion criteria to ensure that the identified literature was relevant to the review.

# Conducting the review

Review stages include literature search, inclusion screening, data extraction, data analysis and synthesis, and review reporting. Literature can be searched through Google Scholar, Scopus, and Springer databases with the keywords "Differentiated Learning" and " Merdeka Curriculum," "Differentiated Learning" and "Mathematics Education," "Differentiated Learning" and "Merdeka Curriculum" and "Mathematics Education," "Differentiated Learning" and "Merdeka Curriculum" and "Mathematics." Researchers limited publications to the range of 2010-2024.

## Reporting the review

After all stages have been completed, the last step taken by the researcher is to make a descriptive article review report.

#### RESULTS AND DISCUSSION

Differentiated learning gives teachers the autonomy to use time flexibly, apply various learning strategies, and become partners with learners in designing learning environments that can support the learning process (Tomlinson, 2017); it is recognized as effective learning, especially to achieve maximum cognitive learning outcomes (Variation et al., 2021). Differentiated learning requires teachers to proactively plan varied approaches to what learners need to learn, how they will learn it, and how they will demonstrate what they have learned in

order to increase the likelihood that each learner will learn as much as they can and as efficiently as possible (Tomlinson, 2013; Sumranwanich et al., 2016).

The following are some selected literature articles related to this research topic:

Table 1. article data and research results

Code	Title	Author & Year	Results
A1	Developed Differentiation		There was a significant increase in students' math achievement scores in classes where the learning process was designed according to the differentiation approach. This situation shows that differentiated curriculum activities and learning based on elaboration, creative thinking, and multiple intelligences can improve students' academic achievement. In addition, it was seen that changes based on creativity strategies in content, process, product, and learning environment improved students' academic achievement.
A2	•	Hubbard & Livy (2021)	This research highlights the Mathematical Knowledge for Teaching needed to lead differentiated learning planning sessions under the categories of Common content knowledge, Specialized content knowledge, Knowledge at the mathematical horizon, Knowledge of content and students, Knowledge of content and teaching, Knowledge of Curriculum, in developing a shared understanding of differentiated learning in mathematics.
A3	,	Febriana, et al (2023)	Implement learning methods or techniques to the situation, conditions, and student problems. The form of differentiated learning carried out by mathematics teachers consists of three stages, namely: (1) the planning stage, the teacher prepares everything that supports differentiated learning; (2) the implementation stage, the teacher implements the learning that has been designed at the planning stage; and (3) the reflection stage, the teacher evaluates the learning process that has been carried out at the initial stage, both in terms of the learning methods used and in terms of the material presented. Differentiated learning is tailored to school conditions and student abilities; one school may be different from another but have the same goals, and differentiated learning must include content, process, and product differentiation.
A4	•	Fitri, et al (2024)	Learning in the self-contained curriculum uses differentiated learning. This differentiated learning maps children's abilities provides multiple ways to acquire content and develop ideas and optimizes learning work and assessment measures so that all children in a class with diverse abilities can learn every day.

A5	Teaching practices for	Hackenberg,	Five practices that teachers can do in teaching
	differentiating mathematics instruction	et al (2021)	mathematics using a differentiated learning approach are:
	for middle school students		1. Using research-based knowledge about students' mathematical thinking.
			<ol> <li>Provide purposeful choices and different paths.</li> <li>Ask responsively during group work.</li> </ol>
			4. Pay attention to small group functions.
			5. Conduct whole-class discussions with different thinkers.
A6	Analisis Penerapan Pembelajaran Berdiferensiasi Dalam Implementasi Kurikulum Merdeka Pada Pembelajaran Matematika Di SD Negeri 1 Imbanagara Raya	Syamsudi (2023)	The application of differentiated learning in elementary mathematics subjects is considered very effective; this is shown in the increase in understanding of each indicator that has been tested; differentiated learning is also considered more interesting than other learning because, in the differentiated learning process, the process is presented with many learning media that suit the learning style needs of each student, so that students are more interested in following the learning process.
A7	Persepsi Siswa Terhadap Pembelajaran Matematika Berdiferensiasi Pada Kurikulum Merdeka	Pujiastuti,	The results of the study concluded that. Specific strategies in differentiated learning mostly use process differentiation, showing that differentiated mathematics learning positively impacts students' cognitive abilities. In addition, students experienced increased cognitive abilities after implementing differentiated learning at school.
A8	Implementasi Pembelajaran Berdiferensiasi Dalam Kurikulum Merdeka	Ramadan,	The implementation of differentiated learning is carried out based on the principles of differentiated learning, which include: 1) learning environment, namely seeing how the student's learning environment is or seeing how the student's classroom environment is, 2) continuous assessment, namely measuring the extent of student readiness in learning, 3) responsive learning, namely how teachers can understand various kinds of student characters and student deficiencies in learning, and 4) class routine, namely how the results of student learning with the leadership of the class teacher, which has been carried out well. This research concludes that differentiated learning focuses on students, so it is feasible to implement it in a Merdeka curriculum.

Implementing differentiated learning in the Merdeka curriculum is suitable for all learners. It positively influences learners, although teachers need more time to organize differentiated learning activities. In the learning process, teachers must be able to divide and place students into heterogeneous groups based on students' mathematical abilities.

Differentiated learning improves student learning, self-efficacy, and confidence in learning (Stavrou & Koutselini, 2016), but also students' math learning achievement increases,

and students are more motivated through differentiated learning (Awofala & Lawani, 2020). The key to successful differentiated learning is placing students in small groups and adapting teaching to suit the needs of differently-abled groups (Geel et al., 2019). Differentiated learning is an approach/strategy that can effectively meet the needs of diverse learners and provide them with hands-on learning opportunities, leading to improved learner achievement (Valiandes & Neophytou, 2018; Parsons et al., 2018; Muthomi & Mbugua, 2014).

Differentiated learning supports the academic activities of mathematics lessons in teaching the process elements of mathematics learning, which include mathematical reasoning and proof, mathematical problem solving, communication, mathematical representation, and mathematical connections. Permendikbud (2022) states that mathematics subjects aim for students to have the ability, among others: (1) mathematical understanding and procedural skills; (2) mathematical reasoning and proof; (3) mathematical problem solving; (4) mathematical communication and representation; (5) mathematical connections, and; (6) mathematical disposition.

Differentiated learning in mathematics also encourages learner engagement and interaction among classmates. So, the implementation of differentiated learning has a lot of positive impacts, such as the learning process becoming more diverse and making teachers creative in designing the learning process in class that is tailored to the conditions, characters, and deficiencies of students in learning. In math lessons, it also has a positive impact on improving students' academic achievement. However, there are also negative effects resulting from the implementation of differentiated learning by teachers, which mainly stem from the lack of time, support, and workload associated with the products of differentiated learning (Pozas et al., 2023).

Although differentiated teaching is well known, teachers still struggle to understand how it should be implemented in their classrooms (Casteren et al., 2017). Teachers' difficulties implementing differentiated learning involve customizing activities and materials according to students' skills, abilities, and learning profiles and conducting formative and regular diagnostic assessments to support student achievement (Gaitas & Martins, 2017). Thus, it is necessary to develop a broader understanding of planning models that adequately support teachers in effectively planning differentiated learning in mathematics (Hubbard & Livy, 2021).

## **CONCLUSION**

Seeing the positive impact of differentiated learning, teachers need to be able to design learning activities with various models, approaches, strategies, and methods while still paying attention to the relationship with the lesson content to be taught so that learning objectives can be achieved optimally. In addition, teachers can create differentiated enrichment. It is

recommended that a differentiated approach be developed periodically so that teachers and students can gain experience.

Thus, the developed differentiation approach can be easily used in lessons, and teachers can enrich the lessons to make them clearer. Then, seeing teachers' difficulties in adjusting learning activities and material content in the implementation of differentiated learning, it is important to provide differentiation skills training in teacher professional development programs such as how to design learning tasks, design performance assessments, sequence learning tasks, design supportive information, and design procedural information and practice parts of tasks in differentiated learning.

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