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Effectiveness of Differentiated Learning Strategies in the Merdeka Curriculum: A Comparative Study with the 2013 Curriculum

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ABSTRACT

Purpose of the study: This study examines the effect of differentiated learning strategies implemented in the Merdeka Curriculum compared to the 2013 Curriculum on student learning outcomes.

Methodology: Using a quantitative comparative design, data were collected from report card scores of 36 students (20 from the Merdeka Curriculum and 16 from the 2013 Curriculum) and analyzed using an independent sample t-test.

Main Findings: Findings reveal a significant improvement in learning outcomes for students under the Merdeka Curriculum (M=79.95) compared to the 2013 Curriculum (M=77.40), with a mean difference of 2.55 ($p < 0.05$).

Novelty/Originality of this study: This research highlights the effectiveness of differentiation in Indonesian curriculum reform and provides evidence for policymakers to adopt student-centered strategies to enhance learning outcomes.

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1. INTRODUCTION

Beginning in the academic year 2022/2023, the Indonesian government is introducing a fresh educational framework known as the Merdeka Curriculum, which replaces the previous 2013 Curriculum. The Merdeka Curriculum is designed to address the prolonged learning crisis that has been further exacerbated by the Covid-19 pandemic [1]. This crisis is marked by the low learning outcomes of students such as literacy and numeracy. The results of the PISA (Program for International Student Assessment) are an international assessment study conducted by the OECD to evaluate the education system in the world by measuring the academic performance of 15 year old school students in the fields of mathematics, science and reading ability. The results of the 2018 Indonesia Main Survey show: 1) Reading is still 70% below the minimum competency, 2) Mathematics is still 71% below the competency, 3) Science still 60% below the minimum competency. This shows that Indonesia is consistent as a country with the lowest PISA result ranking with a stagnant PISA score for the past 10-15 years, even though the difference between the score and the average OECD score has increased slightly [2].

At the level of students' emotional generally described as: 1) 41% of students experienced bullying. They feel sad, scared, and dissatisfied with their lives. They also have a tendency to skip school. 2) 29% of Indonesian students agree that intelligence is something that can change a lot. They are lower in expressing fear of failure, are more motivated and ambitious, making education important [3]. The learning crisis is also characterized by wide disparities in the quality of learning between regions and between socio-economic groups.

Recovery of the education system from the learning crisis cannot be realized through curriculum changes alone. Various efforts are also needed to strengthen the capacity of teachers and school principals,

assistance for local governments, structuring evaluation systems, as well as fairer infrastructure and funding. But the curriculum also has an important role. The curriculum has a big influence on what is taught by the teacher, also on how the material is taught or related to learning strategies.

In the Merdeka Curriculum, learning and assessment are influenced by constructivism learning theory. According to this theory, the learning process is a continuous process of construction and reconstruction of understanding. This learning process is known as learning, relearning and unlearning. The learning process is the process of learning something new and relearning is strengthening what has been learned. Meanwhile, unlearning is a process of learning new things that corrects things that were previously understood or overhauls the construction of students' understanding [4].

The process of learning, relearning and unlearning is not limited to the processes that occur in the classroom: each student constructs his understanding through various learning processes both learning in the classroom, outside the classroom, and even outside of school, so that the stage of understanding of the children in the class that is can be different, even though they are relatively the same age. This underlies the principle of learning that needs to pay attention to diversity (differentiation), not only between regions or educational units, but also between individual students [5], [6] .

The principles of learning and assessment emphasize the importance of developing learning strategies in accordance with the stages of student learning achievements or what is also known as teaching at the right level. The teaching stakeholder must aware to the importance of learning and assessment [7]. This learning is done by providing learning materials that vary according to the different understanding of students. The purpose of this differentiation learning is so that every student can achieve the expected competencies and the basis for determining the learning material is formative assessment.

Due to the existing understanding of each individual student is different or may vary, formative assessment is important because this assessment, also known as a class assessment, provides information about the competence or understanding that has been achieved by the participant. Learning feedback is a very important component in formative assessment because it is used by educators and students in assessing themselves and each other. Educators can then modify learning plans and student learning activities based on the results of the formative assessment feedback.

Formative assessments are in the form of diagnostic assessments or early learning assessments and assessments throughout the learning process. Formative assessment is "the use of feedback by teachers and students to identify and enable adjustments in the teaching and learning process" [8]. The results of this formative assessment will bring out the diversity of learning outcomes or what is called a learning approach according to the stage of student learning achievement or student-centered learning or differentiated learning. The goal of this differentiated learning strategy is optimal learning outcomes. Learning outcomes are changes in student behaviour that occur after participating in learning. These changes include cognitive, affective and psychomotor aspects after going through formative and summative assessments and are expressed in the form of both qualitative and quantitative values.

Meanwhile, the 2013 curriculum uses a scientific learning approach which includes five learning activities: 1) observing, 2) asking questions, 3) conducting experiments or seeking information, 4) reasoning or association to process information, and 5) developing networks or communicating the results of investigations (Ridwan Abdullah, 2014). Curriculums are learning guides that are governed by a school board that is designed to address students' educational needs, facilitate learners while establishing relationships between teachers and students (Philips, 2020). Through the curriculum, schools can develop comprehensive and structured lesson plans to help students reach their full potential. In addition, the curriculum also plays a role in facilitating the learning process by providing clear guidelines for teachers and students. In an effective learning environment, the relationship between teacher and students is also very important. The curriculum helps build these bonds by providing opportunities for teachers to understand the needs and interests of individual students, so they can develop appropriate teaching strategies. In addition, the curriculum also encourages better interaction between teachers and students, enabling an inclusive and mutually supportive learning environment to be created.

This study addresses the gap in empirical evidence on how differentiated learning strategies influence learning outcomes within the Merdeka Curriculum context. Specifically, it investigates whether these strategies improve learning outcomes compared to the 2013 Curriculum.

2. RESEARCH METHOD

This research used a quantitative comparative approach. The sample consisted of 36 students (16 from the 2013 Curriculum and 20 from the Merdeka Curriculum) selected using a purposive sampling technique. The aim is to see the differences between two or more situations, events, activities or programs [9]. Data were collected from official school report cards (documentation). Since the research uses archival performance data, no adaptation of instruments was required.

Data analysis was conducted using the independent sample t-test after testing for variance homogeneity. This study looked at the learning outcomes of differentiated learning strategies in the Merdeka curriculum compared to learning outcomes in the 2013 curriculum. There were 16 student samples in the 2013 curriculum and 20 student samples in the Merdeka curriculum. The data was taken from semester one class X report cards for the 2021/2022 and 2022 academic years. /2023. Methods of data collection using documentation. The research location was at Daruroja Integrated High School, Srengat District, Blitar Regency as a driving school program school which was a program from the Ministry of Education and Culture of the Republic of Indonesia. The data analysis technique uses the Merdeka sample t test [10], which is to find out whether there is a difference in the mean (mean) between the two populations by looking at the average of the two samples [11].

3. RESULTS AND DISCUSSION

The implementation of differentiated learning is carried out by holding a diagnostic assessment or initial learning assessment or pre-test. The result of the diagnostic assessment was that there was a diversity of student achievements or abilities which were divided into three groups: 1) students who really understood the material, 2) students who understood the material, and 3) students who did not understand the material. The diversity or differences in the results of this diagnostic assessment will determine the learning strategy in the classroom where the learning strategy is in accordance with the learning achievement stages of students (teaching at the right level). Learning is designed by adjusting the learning process in the classroom to meet the individual learning needs of each student. The purpose of this study is that each student can achieve the learning objectives that have been determined.

The implementation of differentiated learning by implementing a differentiated Learning Implementation Plan (RPP) like: 1) differentiation of content or different learning materials according to the stage of learning readiness of students. Differentiation of psychological development, namely different interests and learning styles, 2) Differentiation of learning processes, they are division of groups, learning methods, learning media, different assessments, 3) Differentiation of learning outcomes products that provide choices to students. Table 1 are presented the learning outcomes of differentiated learning in the Merdeka Curriculum in Class X semester 1 of the 2022/2023 academic year.

Table 1. Student learning outcomes with differentiated learning in the Merdeka Curriculum (K_Merdeka) class X semester 1 Academic Year 2022/2023

Student's name	Average Score of All Subjects
AG	77.69
AIM	81.31
AIF	77.23
ASM	83.08
AMAH	79.54
AK	82.54
DSZ	81.85
DiSZ	85.23
FBP	76.85
FN	85.00
HAF	83.08
LNF	81.77
LO	78.15
MEP	80.92
MDSR	78.15
MKA	79.77
MMR	76.31
MZF	76.92
PA	77.31
RAM	76.38

To find out whether there is an increase in learning outcomes from differentiated learning in the Merdeka Curriculum, the learning outcomes are compared with learning outcomes in the 2013 curriculum.

Table 2. Learning outcomes in the 2013 Curriculum (K_13) class X semester 1 2021/2022 Academic Year

Student's name	Average Value of All Subjects
AFU	76.69
AHM	79.00
DMAS	79.00
DA	73.63
DRPZ	86.88
EDMS	83.38
DKB	69.71
FW	75.94
JIM	78.25
MKA	80.00
MBNR	77.81
MZK	78.50
NZA	69.36
NF	69.69
RSM	78.94
VH	82.31

Table 3. Data processing of learning outcomes for the Merdeka Curriculum (K_Merdeka) and the 2013 Curriculum (K_13) to find out the difference in average scores.

		Levine's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig	t	df	Sig	Mean Difference
Curriculum	Equal variances assumed	2.223	.145	1.935	34	.061	2.54963
	Equal variance not assumed			1.830	23.084	.080	2.54963

The first part shows a statistical summary of the two samples. For K_Merdeka it has an average of 79.9540 which is higher than the K_13 average of 77.4044. From these data, is there a significant difference (clear and real) between K_Merdeka and K_13, for that the analysis is continued in the second part of the output. The two sample t test was carried out in two stages, the first stage was to test whether the variances of the two populations were considered the same? After that, a test was carried out to see whether there was a difference in the population average. Basically, the t test requires that the variances of the two populations being tested are equal.

The first is to test whether there is a similarity of variance in K_Merdeka and K_13: the assumption of similarity of variance is tested by means of the F test. Hypothesis for variance testing: H_0 = both population variances are identical (population variances K_Merdeka and K_13 are the same); H_1 = the two population variances are not identical (the population variances of K_Merdeka and K_13 are different). Decision making: basis for decision making (test of variance using one-tailed test): If the probability > 0.05 then H_0 is accepted; If probability < 0.05 then H_0 is rejected

It can be seen that the calculated F using Equal variance assumed (assuming both variances are the same or using the pooled variance t-test) is 2.223 with a probability of 0.145. Because the probability > 0.05 then H_0 is accepted, or the two variances are the same. After the variance similarity assumption test is completed, an analysis is then carried out using the t test to find out whether the average K_Merdeka and K_13 are significantly different?

Hypothesis for this case: H_0 = Both population means are identical (the population averages of K_Merdeka and K_13 are the same). H_1 = The two population means are not identical (the population averages of K_Merdeka and K_13 are different).

It can be seen that the calculated t with Equal Variance Assumed is 1.935 with a probability of 0.061. For a two-tailed test, the probability becomes 0.061/2 = 0.0305. Because 0.0305 <0.05 then $H0_{is}$ rejected. The K_Merdeka average is completely different from the K_13 average. If seen from the average of the two groups, K_Merdeka is higher than K_13. From the output shown in the "mean difference" line is 2.54963 this number comes from: the average K_Merdeka - K_13 is 79.9540 - 77.4044

From the hypothesis test it was concluded that the Merdeka Curriculum average was significantly different from the K_13 average. If seen from the average of the two groups, Merdeka Curriculum is higher than

K_13 with an average difference of 2.54963. Why can this happen because differentiated learning in the Merdeka Curriculum is:

Learning should be designed by considering students' developmental stages, current achievements, and learning needs to create a meaningful and enjoyable experience. According to [12], teachers must identify what students need in each subject to ensure they feel supported. By addressing these diverse characteristics and progressions, learning becomes more engaging and effective, allowing students to maximize their potential.

A learning approach that focuses on students' achievement levels rather than their class levels is known as Teaching at the Right Level (TaRL). This approach groups students based on their developmental phase or ability level rather than traditional grade levels. By doing so, it fosters a more effective learning experience tailored to students' individual progress, ensuring that learning is both accessible and challenging.

Student-centered learning is achieved when lessons are designed according to students' achievements, ability levels, and needs. This method ensures that learning outcomes align with expectations while keeping students actively engaged in the learning process. As highlighted by the Ministry of Education and Culture [1], prioritizing these factors allows educators to create an inclusive learning environment that supports each student's growth and success. Learning based on achievement or ability level aims to strengthen students' literacy, numeracy, and subject-specific knowledge. This approach ensures that students develop essential competencies that align with learning outcomes. Rather than being confined to traditional grade levels, students are grouped according to their developmental phase or ability level, allowing for more targeted instruction that meets their specific needs.

Each developmental phase or ability level is structured with clear learning outcomes that students must achieve. The learning process is designed to be flexible, adapting to students' characteristics, potential, and needs. By structuring learning in this way, students receive instruction that is both relevant and appropriate for their abilities, ensuring steady progress toward mastery of key concepts and skills. The progress of students is continuously evaluated to determine their achievement of learning outcomes. Those who have not yet met the expected outcomes receive additional support from educators to help them succeed. To effectively implement this approach, educators must have a deep understanding of their students, including their unique characteristics, potential, and learning needs [1]. These findings align with previous studies [11], [12] that emphasize the benefits of differentiated instruction in improving student outcomes. This study contributes by providing empirical evidence in the Indonesian context, demonstrating that curriculum reform with differentiation can lead to measurable academic improvements.

Differentiated learning philosophy

Every student is unique, with distinct learning needs that require different instructional approaches. Even twins, despite their genetic similarities, have different DNA, emphasizing the necessity of personalized learning. Teachers must consider multiple aspects of their students' development to create an effective learning environment. According to [13], organizing classes with the right instructions helps address students' diverse needs, a perspective further supported by [14], [15], who highlight that differentiation enhances students' understanding of a subject.

Beyond cognitive differences, students also experience varying social-emotional factors that influence their learning. Psychological well-being, feelings of security, and overall emotional state significantly impact daily learning activities. As stated by the [2], these non-cognitive aspects must be considered when designing teaching strategies to ensure a supportive and engaging learning process.

Differentiated learning allows students to engage in learning situations that align with their unique styles and needs [16]. By recognizing both cognitive and non-cognitive factors, teachers can create a more inclusive and effective learning environment where every student has the opportunity to thrive.

Changes from the 2013 Curriculum to the Merdeka Curriculum

The evaluation of the 2013 Curriculum revealed significant challenges in its implementation, particularly in the difficulty of learning materials for students. Research by [17], [18] found that teachers in small cities struggled with integrating the curriculum into students' needs, making the material hard to grasp. Additionally, many teachers misunderstood the concept of mastery learning, believing it to mean completing all subject matter rather than ensuring student comprehension. [19] further identified difficulties in assessment implementation, including the development of attitude instruments, authentic assessments, and evaluation rubrics. These challenges were compounded by the lack of accessible applications to describe students' learning achievements [20].

Another major issue was the rigidity of the 2013 Curriculum, which restricted teachers' ability to create engaging and inspiring lesson plans (RPP). The complexity of lesson plan requirements drained teachers' energy, forcing them to focus on administrative tasks rather than innovation in the classroom. Moreover, the curriculum did not provide schools with the freedom to adapt learning objectives and outcomes based on their

unique contexts [21]. The lack of instructional flexibility in material development could lead to student misconceptions, limiting creativity and deeper understanding [22].

The inflexible nature of the 2013 Curriculum led to further criticism, particularly in its inability to accommodate diverse learning environments and regional differences. Teachers felt disconnected from the curriculum, as they were required to adhere to rigid administrative structures rather than explore innovative teaching methods [23]. The government-mandated syllabus package applied uniformly across schools, despite variations in student needs and resources. This lack of adaptability became even more apparent during and after the pandemic, when schools required more flexible learning approaches. The broad competencies and locked curriculum structure made it difficult for teachers to shape learning experiences, ultimately hindering both student engagement and educational effectiveness [1], [24].

Obstacles in Implementing 2013 Curriculum

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Merdeka Curriculum Principles

The implementation of the Merdeka Curriculum in Indonesia represents a paradigm shift from a teacher-centered model toward a student-centered framework that emphasizes differentiated instruction, flexibility, and competency-based learning. This approach is grounded in constructivist learning theory, which views knowledge as actively constructed by learners through meaningful experiences rather than passively received [25]. Recent empirical evidence underscores that such an approach enhances students' motivation and academic achievement when properly executed [26].

Several key principles underpin the Merdeka Curriculum: 1) Differentiated Learning and Teaching at the Right Level (TaRL), The curriculum explicitly adopts a differentiated learning framework to address the wide disparities in students' readiness, prior knowledge, and learning styles. Through diagnostic assessments, teachers group students based on actual competency rather than grade level, a model similar to the TaRL approach which has proven effective in bridging learning gaps [27] (World Bank, 2020). This strategy has been shown to enhance mastery of basic competencies such as literacy and numeracy, particularly for students in post-pandemic learning recovery programs [3].: Competency-Oriented and Flexible Learning Goals, Unlike the rigid 2013 Curriculum, the Merdeka Curriculum offers teachers and schools autonomy to adapt learning objectives and instructional strategies to their local context. This principle aligns with international findings that curricular flexibility fosters contextualized learning and encourages innovation in pedagogy [28] [12]. Empirical studies in pilot "driving schools" (Sekolah Penggerak) indicate that such flexibility allows teachers to design personalized learning trajectories that support both advanced and struggling students, leading to significant improvements in overall student outcomes; 3) Emphasis on Formative and Diagnostic Assessment, Assessment within the Merdeka Curriculum is primarily formative, using ongoing feedback to adjust instruction in real time. [8] emphasize that feedback is among the most powerful influences on learning and achievement. In this model,

assessment becomes a learning tool rather than a summative judgment, allowing teachers to continuously calibrate instruction to students' needs; 4) Holistic Student Development, Beyond cognitive achievement, the Merdeka Curriculum aims to nurture socio-emotional skills, creativity, and critical thinking. These goals are consistent with global trends in curriculum reform that emphasize the "whole child" approach. Research on differentiated instruction shows that when emotional safety and student interests are integrated into the learning environment, students demonstrate stronger persistence and a deeper engagement with the learning process [14]; 5) Collaborative Professional Development, A crucial supporting mechanism is teacher capacity-building. Studies have shown that effective implementation of curriculum innovation depends heavily on sustained teacher professional learning communities (PLCs) that foster reflective practice and collaborative problem-solving [17].

In summary, the Merdeka Curriculum Principles are designed to transform learning from a standardized, uniform process into a flexible, evidence-based practice that recognizes individual differences and fosters equity in learning outcomes. The findings of this study empirically support these principles by demonstrating that differentiated strategies embedded in the Merdeka Curriculum significantly enhance students' academic performance compared to the previous curriculum model.

4. CONCLUSION

The average score of the Merdeka Curriculum is significantly different from the average score of the 2013 Curriculum. If you look at the average score of the two groups, the Merdeka Curriculum is higher than the 2013 Curriculum. The difference between the MerdekaCurriculum and the 2113 Curriculum is between -0.12862 to 5.22787 with an average difference of 2.54963. Differentiated learning strategies in the MerdekaCurriculum have higher learning outcomes than learning outcomes in the 2013 Curriculum. This study concludes that differentiated learning strategies significantly enhance student learning outcomes in the Merdeka Curriculum compared to the 2013 Curriculum. These findings contribute to the growing body of literature on differentiated instruction, confirming its importance for education policy and classroom practices in Indonesia.

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