International Journal of Learning Reformation in Elementary Education
Vol. 4, No. 01, pp. 27-38
journal.iistr.org/index.php/IJLREE
DOI: 10.56741/ijlree.v4i01.793

Exploring the Impact of the Merdeka Curriculum on Mathematics Education in Elementary Schools

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ARTICLE INFO

Article history
Received 18 December 2024
Revised 24 March 2025
Accepted 26 March 2025

ABSTRACT

This study aimed to analyze the implementation of the Merdeka Curriculum in mathematics learning at SDN Tegalsari (a state elementary school) during the 2024/2025 academic year using a qualitative descriptive method. The research focused on the planning, implementation, and evaluation of the curriculum, with subjects including the principal, vice principal for curriculum affairs, mathematics teachers, and students selected through purposive sampling. Data were collected through observations, interviews, and documentation, and analyzed using the interactive model of Miles & Huberman, which consisted of data reduction, data presentation, and conclusion drawing. The results indicated that the planning phase involved socialization, teacher training, the development of teaching materials, and the provision of facilities and infrastructure. The implementation emphasized project-based learning to strengthen the Profile of Pancasila Students, using a problem-solving approach to enhance students' critical and creative thinking skills. The evaluation was conducted through diagnostic, formative, and summative assessments to measure the effectiveness of learning. This study highlighted the importance of school support in implementing the curriculum, including continuous teacher training and the optimization of learning facilities. Regular evaluations allowed schools to make strategic improvements to better meet students' needs and enhance overall education quality.

Keywords
Educational Research
Elementary School
Mathematics Learning
Merdeka Curriculum

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Introduction

Education in Indonesia has long been under scrutiny for its conventional approach, which tends to focus solely on academic outcomes [1]. The outdated paradigm that views children as "blank slates" has led to learning practices that pressure students to merely chase grades. As a result, education often loses its essential purpose of building character, fostering critical thinking skills, and nurturing each child's potential in line with their nature. Ki Hajar Dewantara's educational philosophy emphasizes that education should guide children according to their nature, enabling them to achieve ultimate happiness and well-being [2]. Within this philosophy, educators are likened to farmers nurturing plants, recognizing each child's uniqueness and individual learning style. This philosophy underpins the creation of enjoyable, student-centered, and contextually relevant education [3].

The emergence of the Merdeka Belajar (Freedom to Learn) program by the Ministry of Education and Culture has been a breath of fresh air in efforts to revolutionize Indonesia's education system. This program aims not only to improve the quality of education but also to tailor learning to the potential, needs, and characteristics of students [4]. A central aspect of Merdeka Belajar is the implementation of the Merdeka Curriculum, which is more flexible and provides room for educators to innovate. Under this curriculum, teachers act as facilitators, encouraging active, independent, and enjoyable learning for students. This approach aligns with the development of the Pancasila Student Profile, which consists of six key elements: faith and devotion, global diversity, collaboration, independence, creativity, and critical thinking [5].

This curriculum is also rooted in Ki Hajar Dewantara's philosophy, emphasizing the importance of education that aligns with the "nature of the environment" and the "nature of the times" [6]. The nature of the environment refers to positive cultural influences that help shape students' moral character, while the nature of the times requires education to evolve with technological and informational advancements. Education that focuses solely on theory without adapting to contemporary developments risks failing to equip younger generations with 21st-century skills [7]. Therefore, implementing the curriculum must accommodate the demands of the times while preserving cultural values as a filter against negative influences.

In the context of mathematics education, significant challenges persist. Mathematics is often perceived as a difficult, boring, and intimidating subject by students [8]. This perception stems from monotonous teaching methods that fail to address students' needs and characteristics. However, mathematics should emphasize reasoning and problem-solving processes to enhance students' critical thinking skills. Innovative, enjoyable, and student-centered approaches to mathematics instruction are essential to changing this negative perception [9]. Teachers play a central role as facilitators in creating active, creative, and collaborative learning environments where students can enjoy and engage with mathematics more effectively.

SD Negeri Tegalsari in Kulon Progo Regency is one institution adopting this curriculum to address challenges in mathematics education. Previously, many students at this school struggled to understand mathematical concepts taught through conventional methods. This situation motivated the school to seek innovative solutions through the implementation of the program. With the flexibility to design learning methods tailored to students' needs, teachers have the opportunity to explore creative strategies for teaching mathematics.

This program aims to create a more conducive and enjoyable learning atmosphere. Teachers are no longer solely focused on achieving grades but emphasize learning processes that foster critical thinking, creativity, and student confidence. The project-based approach to strengthening the Pancasila Student Profile in the curriculum also serves as a method to connect mathematical concepts with real-world situations, helping students understand the relevance of mathematics in everyday life [10]. Through this approach, mathematics education at the school is expected to build deeper conceptual understanding while sparking students' interest in learning.

The role of teachers as learning leaders in the Merdeka Curriculum is also key to the program's success. Teachers' competence in designing and implementing effective learning strategies will determine the quality of the curriculum's implementation [11]. Teachers are required to be innovative in developing methods, media, and assessments suited to students' characteristics. Additionally, collaboration among teachers, students, and parents is crucial in creating an educational ecosystem that supports the success of this program.

This study aims to analyze the implementation of the curriculum in mathematics learning. The primary focus is to examine how the curriculum is integrated into mathematics learning and its impact on students' understanding and motivation. By understanding the program's implementation, the study seeks to identify effective strategies that other schools can replicate to improve the quality of mathematics education. This research also aims to provide insights into the challenges and solutions encountered during the implementation of the curriculum, ensuring the program's future optimization.

Literature Review

A. Merdeka Curriculum

Merdeka Curriculum is an educational policy in Indonesia aimed at providing schools and teachers with the freedom to design and implement learning processes tailored to the needs of students [12]. According to Ferdaus & Novita [13], this curriculum emphasizes a flexible approach that prioritizes competency-based learning, character building, and the enhancement of literacy and numeracy skills. At the elementary school level, the curriculum offers flexibility in selecting teaching tools, enabling teachers to create more contextual learning experiences aligned with students' potential and interests. This approach is exemplified by the Pancasila Student Profile,

which serves as a guide for the desired character and competencies, as well as the implementation of differentiated learning methods to accommodate the diverse abilities of students.

The curriculum implementation in elementary schools also focuses on more active and collaborative approaches, such as utilizing Project-Based Learning (PjBL) to integrate various subjects into a single theme relevant to everyday life [14]. This approach not only enhances students' critical and creative thinking skills but also fosters social skills through teamwork. According to Yogyanto et al. [15], the Merdeka Curriculum has had a positive impact on students' learning motivation and teachers' creativity in designing more innovative lessons. Nevertheless, challenges persist in its implementation, including teacher readiness, resource availability, and a comprehensive understanding of the curriculum's concepts. Addressing these challenges is crucial to ensure the effective adoption and optimization of the curriculum in schools.

B. Mathematics Learning

Mathematics education in elementary schools plays a crucial role in establishing a foundational understanding of numeracy concepts and problem-solving skills that students will use in their daily lives and future education [16]. According to constructivist theory, mathematics instruction should be designed to encourage students to actively construct their own knowledge through direct experiences [17]. Teachers are expected not only to deliver procedural material but also to foster conceptual understanding through contextual and problem-based approaches. Instructional models such as Realistic Mathematics Education (RME) and Problem-Based Learning (PBL) are often employed to help students connect mathematical concepts to real-world situations, facilitating comprehension and boosting learning motivation [16][18].

In practice, mathematics education at the elementary level also emphasizes the development of students' logical, critical, and creative thinking skills. Research Dahal et al. [19] indicates that the use of manipulative media, math games, and educational technology can enhance students' interest in and understanding of mathematical concepts. Additionally, a differentiated approach to mathematics instruction allows teachers to address the diverse learning abilities of students, ensuring that each individual achieves the targeted competencies [20]. However, challenges persist in implementing such approaches, including limited resources, inadequate teacher understanding of innovative methods, and the prevalence of conventional teaching practices that remain focused on rote procedural memorization.

Material And Methods

This research employs a qualitative descriptive method to accurately portray the phenomena and occurrences observed throughout the research activities [21]. The focus of this study is to analyze the planning, implementation, and evaluation of the implementation of the Merdeka Curriculum during the first semester of the 2024/2025 academic year. The research subjects include the school principal, the vice principal in charge of the curriculum, mathematics

teachers, and students, selected through purposive sampling. Data collection was conducted through observation, interviews, and documentation. Observations involved direct monitoring of mathematics teaching and learning activities in the classroom and other school programs. Structured interviews aimed to gather in-depth information regarding the planning, implementation, curriculum evaluation, and school programs. Documentation was used to obtain secondary data, such as curriculum documents, teaching tools, government policies, and previous research findings. Data analysis was conducted using the interactive analysis model proposed by Miles & Huberman [22], which includes data reduction, data display, and conclusion drawing. Data validity was ensured through source triangulation, by comparing data from multiple sources to ensure consistency and reliability of the information.

Results

A. Planning the Implementation of the Merdeka Curriculum

According to Burg et al. [23], planning is a process aimed at determining future objectives and establishing the necessary steps to achieve those objectives. In this context, planning is not merely about setting goals but also includes strategic steps to ensure the realization of those goals. Yeo et al. [24] further explains that planning involves connecting the current state with the desired future state, encompassing aspects such as objectives, programs, allocation, and available resources. In other words, planning is a systematic phase that links the present condition with the intended outcomes through the effective use of resources.

Based on the data collected, the planning for the curriculum implementation was carried out through several strategic steps. First, the school conducted socialization and training sessions related to the curriculum, organized through workshops held by the curriculum development team. These activities involved the school principal and teachers as the main participants to ensure a thorough understanding of the essence of the new curriculum. Second, the planning phase included an in-depth discussion of the learning outcomes and the learning objectives framework. Additionally, the school prepared teaching modules and project modules to strengthen the Pancasila Student Profile as part of a systematic and contextual implementation.

The planning process also involved forming a curriculum development team comprising first-grade and fourth-grade teachers [25]. This team was responsible for designing and coordinating various learning components in accordance with the demands of the curriculum. Beyond human resource aspects, the school also paid attention to the availability of infrastructure to support curriculum implementation. Learning media were prepared optimally to enhance the effectiveness and innovation of the learning process, aligned with the principles of the curriculum [26].

Tarso et al. [6] highlights that the scope of curriculum implementation planning encompasses three key aspects. First, the availability of curriculum support documents, such as implementation

guidelines, procedures, and operational protocols. Second, planning related to socialization efforts to improve teachers' and educators' understanding of the concept and application of the Merdeka Curriculum. Third, supporting plans involving the readiness of human resources and infrastructure as crucial elements for the successful implementation of the curriculum in schools. With comprehensive and well-prepared planning, the curriculum implementation at this school is expected to proceed effectively and achieve the desired educational objectives.

B. Implementation of the Merdeka Curriculum

Implementation is the concrete activity derived from the planning that has been formulated to achieve specific goals [27]. In the implementation process, the existing plan is translated into concrete actions using strategies, techniques, and available resources. This is carried out within a predetermined timeframe to ensure the intended objectives are optimally achieved. In the context of education, the implementation of the Merdeka Curriculum represents a critical step that requires in-depth understanding from various stakeholders, particularly teachers [28]. Teachers act as the primary executors in the field, responsible for applying curriculum plans in classroom learning activities. To achieve optimal outcomes, curriculum implementation must be executed effectively and focus on enhancing the quality of the teaching and learning process.

In the curriculum implementation, several key aspects require attention. One of these is the learning phases, which are divided into three phases at the elementary school level. Phase A includes grades 1 and 2, Phase B covers grades 3 and 4, while Phase C encompasses grades 5 and 6. This phase division aims to ensure that the learning process aligns with the developmental stages of students at each grade level. Furthermore, learning outcomes replace the Core Competencies and Basic Competencies from the 2013 Curriculum. Learning outcomes are general and outline the competencies students must achieve in each phase, serving as the foundation for formulating learning objectives.

Learning objectives are derived from the general learning outcomes. These objectives are elaborated more specifically into the material that students will be taught and are expected to understand during the learning process [29]. Subsequently, a sequence of learning objectives is developed as the steps students need to take to achieve the learning outcomes. With systematic planning, teachers can design structured and outcome-oriented learning [30]. This sequence can be likened to a roadmap guiding students through the learning process, from grasping basic material to mastering more complex concepts.

Teaching modules are essential components in implementing the Merdeka Curriculum [31]. These modules contain learning scenarios, including subject identity, learning steps, media, and evaluation techniques to be used. Additionally, the modules are supplemented with instructional materials that support students' understanding of the concepts being taught. At this school, for instance, mathematics learning is enriched with projects to reinforce the Pancasila Student Profile.

These projects aim to develop students' skills through themes relevant to real life, such as entrepreneurship, enabling students to connect mathematical concepts with their surrounding world.

Learning emphasizes student-centered learning. Teachers act as facilitators, helping students link prior knowledge to new information gained through the learning process. This approach allows students to actively engage, collaborate, and independently complete learning tasks. Furthermore, teachers who embody the values of "teacher drivers" creativity, collaboration, and reflection can foster a democratic and enjoyable learning atmosphere. Through this approach, students not only gain new knowledge but also develop critical and creative thinking skills.

One instructional model implemented is problem-solving-based learning. In this approach, students are presented with problems they must solve independently or in groups. Teachers act as facilitators, guiding students in understanding the problems, devising solutions, and evaluating the outcomes. This process aligns with Polya's problem-solving steps: understanding the problem, planning a solution, executing the plan, and evaluating the results. Through problem-solving, students are trained to think critically, logically, and systematically in addressing the challenges presented [32].

In the curriculum implementation, instructional media play a crucial role in supporting student comprehension, particularly in mathematics [33], [34]. For example, when teaching geometry concepts, teachers use concrete objects found around the classroom as learning aids. This use of concrete media aligns with Piaget's theory, which states that children aged 7–11 years are in the concrete operational stage. At this stage, students find it easier to understand abstract concepts when linked to tangible objects. Hence, utilizing relevant media helps students build a deeper understanding of the material being taught.

Assessment is another critical aspect of implementing the Merdeka Curriculum [35]. Evaluation is conducted through diagnostic, formative, and summative assessments. Diagnostic assessments are used to identify students' learning needs before the teaching process begins. Formative assessments aim to improve and enhance learning during the process, while summative assessments measure the extent to which students have achieved the learning outcomes at the end of the teaching process. Additionally, reflection with students is an integral part of evaluation to ensure their understanding of the material learned and to provide feedback for teachers to improve teaching methods.

The curriculum implementation at the school demonstrates that mathematics learning not only aims to understand concepts but also develops critical, creative, and collaborative thinking skills. Through the Pancasila Student Profile strengthening projects, students are encouraged to solve real-life problems encountered in daily life [36]. For instance, in entrepreneurship projects,

students learn to calculate profits, manage capital, and present their project results. Thus, mathematics learning becomes more contextual and meaningful for students.

The success of implementing the Merdeka Curriculum depends heavily on teachers' competencies in designing, delivering, and evaluating learning. Teachers with strong pedagogical and professional skills are capable of applying various teaching strategies and methods tailored to students' needs. Additionally, support from the school and a conducive learning environment further strengthens the implementation process. With positive changes in teaching practices, the curriculum is expected to provide significant benefits in improving the quality of education and preparing students to face future challenges.

C. Evaluation of the Implementation of the Merdeka Curriculum

Evaluation is an essential phase in the learning process aimed at obtaining information about the results of the learning implementation. According to Astiwi & Siswanto [37], the purpose of evaluation is to gather information about the outcomes of the learning activities, which can then be used as a basis for making decisions and formulating future policies. Evaluation provides a clear and credible picture of the implementation of teaching and its impact on achieving the established goals. In this context, evaluation aims not only to measure success but also to assess whether the learning process is progressing according to the planning that was previously laid out.

According to Markatos & Mousavi [38], evaluation plays a role in control and quality assurance based on specific criteria. Evaluation also serves as a form of accountability for the decisions made concerning the learning process. This evaluation not only measures the final outcome but is also a crucial tool for determining whether the curriculum implementation aligns with the expectations and objectives set forth. Thus, evaluation becomes an essential means for improving the quality of teaching and ensuring continuous improvement.

The evaluation of the curriculum implementation at studied school is carried out systematically. The principal, together with the teaching team, directly monitors the ongoing learning process. Based on interviews and observations, the evaluation process is not only carried out at the student level but also involves all components of the teaching process, including the role of teachers in implementing the Merdeka Curriculum. Regular meetings between teachers also serve as a platform for sharing experiences and evaluating the curriculum's implementation. Through this process, challenges and difficulties encountered can be identified and solved collaboratively.

In evaluating student learning outcomes, the school uses various types of assessments, such as diagnostic, formative, and summative assessments. Diagnostic assessments are conducted to understand the students' initial condition, formative assessments to monitor progress during the learning process, and summative assessments to measure the final achievements of students. The

results of these evaluations provide valuable information to examine the correlation between learning objectives and the achievements that have been made. This evaluation also helps the school plan subsequent actions to improve the quality of teaching.

However, despite the systematic evaluation efforts, the implementation of the Merdeka Curriculum still faces some challenges. One challenge identified is the limited knowledge of teachers regarding the implementation of the Pancasila Student Profile strengthening project. Grade 1 teachers, for instance, feel confused when designing project activities that integrate mathematics learning. This indicates the need for enhanced teacher training and capacity-building to support a more effective curriculum implementation [39].

Another challenge is the limited time available for mathematics lessons, especially in Grade 1. Mathematics lessons in Grade 1 are allocated only 2x35 minutes per session, but in practice, this time is insufficient to optimize mathematics learning, which requires repeated practice for students to master arithmetic skills properly. This often results in reduced time for other subjects after mathematics lessons.

To address these challenges, teachers have made efforts to improve the curriculum implementation by engaging in guided discussions with other schools that have already implemented this curriculum. These discussions provide teachers with a platform to share best practices, particularly regarding the implementation of the Pancasila Student Profile strengthening project that can be integrated with mathematics content. Furthermore, to address time limitations, teachers have innovated by providing additional time outside regular school hours, such as holding daily mathematics practice sessions even on days when there are no mathematics lessons. These innovations are expected to enhance the quality of teaching and maximize the achievement of learning objectives.

Conclusion

Based on the results and discussion of the research, it can be concluded that the implementation of the Merdeka Curriculum in Mathematics learning at Tegalsari State Elementary School has been well-executed, as reflected in the planning, which includes human resources and essential documents such as learning outcomes, learning objectives, the flow of learning objectives, teaching modules, the Pancasila Student Profile strengthening project module, and supporting learning facilities like teacher and student books and appropriate learning media that align with the established plan. During the implementation phase, teachers successfully designed effective lessons, created teaching modules, managed the learning process, and evaluated it effectively. Furthermore, the evaluation of the curriculum implementation was carried out effectively through monitoring and evaluation meetings conducted by the principal and teachers, with the results being used to make decisions and take further actions to address emerging issues. Challenges were addressed through various efforts, enabling the smooth

continuation of the curriculum implementation , although more thorough preparation and planning are needed to prevent future obstacles. Additionally, sharing best practices among teachers and with those from other schools should be encouraged to optimize the curriculum's implementation. The leadership of the principal and cooperation among various parties are essential to support the curriculum's success, along with the improvement of learning facilities and infrastructure to ensure effective learning outcomes.

Conflict of Interest

The authors declare that there is no conflict of interest.

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