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Mathematics Learning Management: Kurikulum Merdeka at Islamic School

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ABSTRACT

This study aims to analyze the management of mathematics instruction under the Merdeka Curriculum at Madrasah Aliyah Al-Manshur Popongan, Klaten Regency, during the 2024/2025 academic year. A descriptive qualitative approach was employed, utilizing data collection techniques such as in-depth interviews and direct observations of the vice principal of curriculum and mathematics teachers, along with an analysis of relevant documents. The findings indicate that: (1) lesson planning is conducted systematically through the development of flexible and adaptive modules, although the integration of technology remains a challenge; (2) instructional implementation employs a differentiated approach with an emphasis on contextual projects, yet is hindered by regulations that restrict the use of digital tools; and (3) learning evaluation is oriented toward formative assessment, although technological limitations constrain the variety of assessment methods. The results highlight the importance of enhancing technological infrastructure and providing targeted teacher training to ensure the effective implementation of the Merdeka Curriculum and to improve educational quality in the madrasah.

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Educational Technology; Merdeka Curriculum; Educational Management; Mathematics; Differentiated Instruction.

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Introduction

The change in the education paradigm in Indonesia entered a new phase with the implementation of the Kurikulum merdeka, which emphasises competency-based learning, differentiation, and student-centred learning. The Kurikulum merdeka is designed to provide greater flexibility to education units in organizing learning according to student characteristics and needs (Tunas & Pangkey, 2024). 21st century education must be able to facilitate personalised learning so that each student can develop optimally (Mansyur et al., 2024). The success of curriculum change is highly dependent on changes in teaching practices at the classroom level, especially in adapting learning approaches to student needs (Sitika et al., 2023). Therefore, in the field of Mathematics, adaptive and innovative learning management is a must to support the successful implementation of Kurikulum merdeka.

In this context, effective Mathematics learning requires systematic planning to build students' conceptual understanding (Pane, 2023). Clarity of learning objectives and structured classroom management can significantly improve the achievement of learning

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outcomes (Putri & Has, 2021). A well-managed learning environment plays an important role in improving knowledge transfer and students' problem-solving skills (Iskandar et al., 2024). In addition, student-centred learning approaches and the use of innovative methods encourage active engagement in the learning process. Thus, strengthening Mathematics learning management within the framework of the Kurikulum merdeka is a key factor in achieving national education goals that are more adaptive, relevant, and transformative. Previous researchers have shown that the integration of technology in learning is very important to improve the effectiveness of education. According to (Malikah et al., 2022), The implementation of the Kurikulum merdeka is highly dependent on the integration of technology, projects, and effective curriculum management. According to (D. Lutfiana, 2022) Mathematics lesson planning can be prepared through the deliberation of mathematics subject teachers (MGMPM) at the school level and is guided by the operational curriculum of the education unit (KOSP). At the planning stage, collaboration between teachers is very important in designing learning that suits the needs of students. In the implementation, technology is needed to support a better and more innovative learning process. (Nisa, 2023) states that the use of ICT as learning tools and resources will help the learning process. Thus, technology not only increases accessibility, but also interactivity in learning, which makes the learning process more interesting for students.

This is in line with the opinion of Rosa et al., (2024) that innovation in learning models and strategies can increase student engagement and critical thinking skills. Project-based learning encourages students to solve problems relevant to everyday life (Tito, 2024). This approach can improve students' understanding of concepts and skills in dealing with real-world situations. According to Yuliani et al., (2024) evaluation is an important part of learning that is carried out to assess student achievement of predetermined competencies. the success of the Kurikulum merdeka reflects the integration of technology, projects, and curriculum management that can effectively prepare students to face challenges in the 21st century. the incorporation of technology in the teaching and learning process can significantly improve student learning outcomes.

MA Al-Manshur Popongan faces major challenges in implementing the Kurikulum merdeka, which affects three main aspects: planning, implementation, and evaluation of mathematics learning. MA Al-Manshur only has one computer laboratory for digital learning, and this limited facility severely hampers lesson planning, which should utilise technology to create interactive and contextualised learning experiences, making it difficult for teachers to design teaching modules that effectively integrate technology. During lesson implementation, the regulation that prohibits students from bringing electronic devices makes it difficult for teachers to use digital applications and platforms that can help students understand mathematical concepts better. As a result, teaching methods are less varied and students are less engaged in the learning process. At the evaluation stage, the lack of facilities and technology also has a negative impact. Evaluation activities that should include project-based assessment and the use of technology are hampered, making it difficult for teachers to measure student achievement and development as a whole. These limitations not only restrict students' opportunities to develop critical and collaborative skills, but also hinder the improvement of the quality of education in madrasahs.

This research will analyse the implementation of Kurikulum merdeka in mathematics learning at MA Al-Manshur Popongan. The informants of this research are the head of curriculum and teachers with in-depth interviews and observations. This research refers

to existing literature, by exploring the implementation of the Kurikulum merdeka in mathematics learning such as; 1) How is mathematics learning planning in the kurikulum merdeka at MA Al-Manshur Popongan, 2) What is the form of implementation of the Kurikulum merdeka in mathematics learning applied at MA Al-Manshur Popongan, and 3) How is the evaluation of mathematics learning in the Kurikulum merdeka at MA Al-Manshur Popongan. The objectives of conducting research related to supervision and supervision are; 1) Describe planning mathematics learning in the kurikulum merdeka at MA Al-Manshur Popongan, 2) Describing the form of implementation of the Kurikulum merdeka in mathematics learning applied at MA Al-Manshur Popongan, and 3) Describing the form of evaluation of mathematics learning in the Kurikulum merdeka at MA Al-Manshur Popongan.

This research makes a useful contribution to the development of education, especially in the implementation of Kurikulum merdeka in mathematics learning at MA Al-Manshur Popongan. The theoretical benefit of this research is that it can enrich the literature related to the implementation of Kurikulum merdeka in mathematics learning, so that it can add valuable insights. For further researchers, it can be used as a reference to explore the form of implementation in the implementation of the Kurikulum merdeka in existing mathematics learning. Practical benefits, this research can be useful for various parties. For mathematics teachers, this research can be an evaluation material so that mathematics learning based on the Kurikulum merdeka runs optimally and understands the characteristics of each student. For the head of curriculum, this research can be used as a reference in curriculum development, especially in mathematics learning. For school principals, this research can be used in making decisions related to strengthening the implementation of the Kurikulum merdeka. For students, learning mathematics is meaningful and effective by creating a more comfortable and enjoyable learning atmosphere.

Method

This research uses a descriptive qualitative approach. Descriptive research is research that tries to describe a symptom, event, event that is happening now descriptive research focuses on actual problems as they are at the time of the research (Dermawan et al., 2023). Qualitative research is a type of research used to research on natural conditions, where the researcher is the key instrument, data collection techniques are triangulated, data analysis is inductive, and qualitative research results emphasize meaning rather than generalisation (Safrudin et al., 2023). Qualitative research is descriptive research with a tendency to use analysis (Nasution, 2023). A qualitative approach is selected to provide a deep understanding of the implementation dynamics of the Merdeka Curriculum, which involve social interactions, institutional culture, and contextual challenges within the school environment.

In this case, the researcher seeks to explore information thoroughly about the planning, implementation, and evaluation of mathematics learning in the kurikulum merdeka at MA Al-Manshur Popongan. The data collection technique used in this research is through in-depth interviews and observations with the vice principal for curriculum and teachers, as the main implementer of the curriculum. The interviews were semi-structured, allowing flexibility in digging deeper information according to the dynamics in the field. The interview process began with the preparation of an interview guideline containing the main questions based on the research focus. Each interview session was conducted face-to-face, with an average duration of between 45 and 60 minutes.

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Data obtained from interviews and observations were analysed using thematic analysis techniques. This analysis began with transcribing all interviews verbatim and compiling observation notes in the form of descriptive narratives. Next, the researcher read all the data repeatedly to understand the context and meaning. The next process was to conduct an initial codification by labelling relevant parts of the data. The codes were then grouped into initial themes, which were further reviewed to ensure representativeness to the overall data. Once the final themes were established, each theme was clearly defined and named. The results of the analysis are presented in the form of descriptive narratives supplemented with direct quotes from informants to strengthen the findings. To maintain the validity of the data, this study used source and method triangulation techniques, namely by comparing the results of interviews and observations to ensure the consistency and validity of the information obtained. In this case, interviews were conducted to analyse the duties of the deputy head of the madrasa for curriculum and teachers regarding the planning, implementation and evaluation of mathematics learning in the kurikulum merdeka at MA Al- Manshur Popongan.

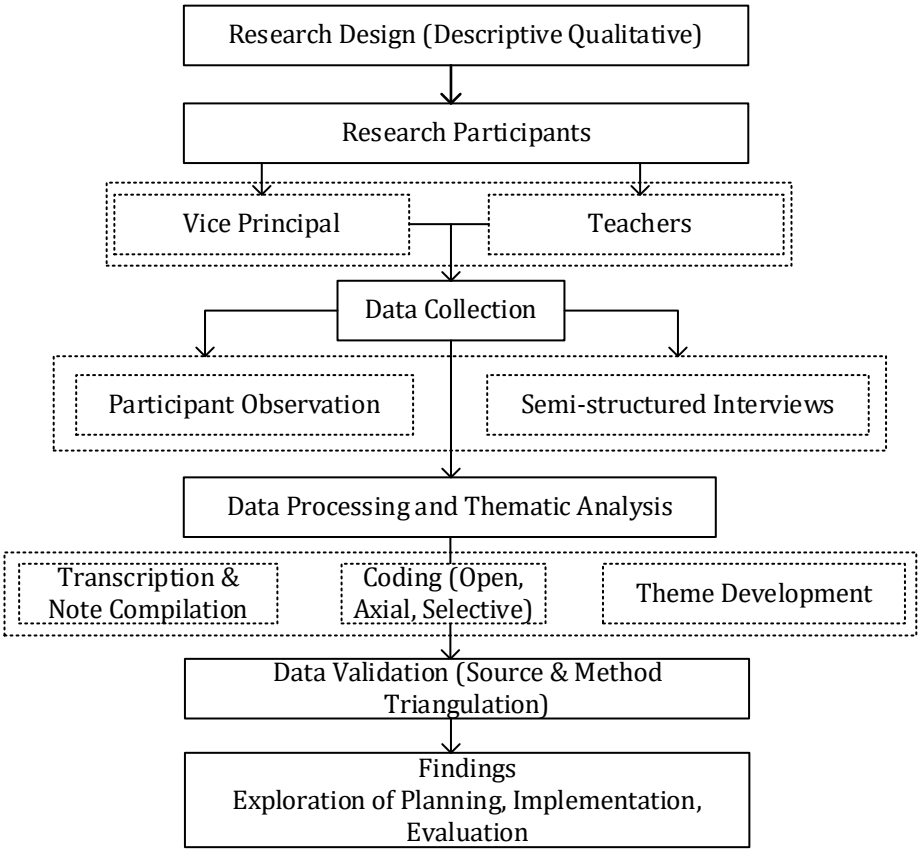

Figure. 1 Research Methods Flow Chart
Source: Research Methodology Development

Findings

This research employed a qualitative descriptive approach with a single case study design, focusing on the implementation of mathematics learning in the Kurikulum Merdeka at MA Al-Manshur Popongan. Data were obtained through semi-structured interviews, classroom observations, and documentation analysis, and were analyzed thematically. The findings highlight three key aspects of the curriculum implementation process: planning,

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instructional practice, and evaluation strategies carried out by the curriculum vice principal and mathematics teachers.

Planning for Mathematics Learning in the Kurikulum merdeka at MA Al-Manshur Popongan

The findings indicate a clear emphasis on collaborative and flexible planning among mathematics teachers at MA Al-Manshur Popongan in implementing the Kurikulum Merdeka. All participants highlighted the importance of aligning teaching modules with the Learning Achievement (CP) and Learning Objective Flow (ATP) frameworks. Open coding revealed key sub-themes such as module flexibility, student-centered planning, and curriculum alignment. Axial coding further demonstrated a connection between adaptive planning and student autonomy in learning. However, technological limitations emerged as a significant challenge affecting the planning process. The institutional policy prohibiting students from bringing electronic devices restricts access to digital learning resources, requiring teachers to innovate with printed materials. One informant, the vice principal for curriculum, stated:

Theme 1: Curriculum-Aligned and Flexible Planning

"We prepare teaching modules by considering students' needs, so they can learn independently and actively to achieve the predetermined learning objectives." (Interview, 2025).

Meanwhile, a mathematics teacher added:

"We want to utilize technology more extensively, but with the existing rules, students cannot access many digital learning sources. This forces us to be more creative in designing the materials." (Interview, 2025)

These findings suggest that while planning is robust and student-focused, technological constraints necessitate greater creativity and adaptation in material development.

Implementation of Mathematics Learning

The implementation of Kurikulum Merdeka in grades X and XI at MA Al-Manshur Popongan reflects a differentiated learning approach that emphasizes contextualized projects aligned with students' daily lives. Teachers strive to address individual student needs by integrating real-life applications into their lessons. Open coding identified sub-themes such as project-based learning, student engagement, and contextual relevance. Axial coding revealed a strong connection between contextualized projects and increased student activity and motivation. The vice principal for curriculum explained:

"In grades X and XI, we focus more on projects that are integrated with daily life so that it can help students be more active in learning." (Interview, 2025).

Despite these efforts, technological constraints pose significant challenges. The school's policy prohibiting student use of digital devices limits the integration of interactive digital tools. One mathematics teacher shared:

"We have to be more creative in developing learning materials because students cannot use digital devices. This is a challenge for us, especially in adapting learning that should be more interactive." (Interview, 2025)

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This highlights the reliance on printed materials and the need for creative design to maintain student interest. Furthermore, limitations hinder collaborative learning through digital platforms, reducing opportunities for peer interaction.

Formative Assessment Focused on Learning Processes

Evaluation within the curriculum focuses on formative assessments aimed at understanding students' learning processes rather than solely final results. Open coding surfaced key sub-themes such as observation, portfolio assessment, and project evaluation. Axial coding showed that formative assessment practices enable teachers to gain deeper insights into students' development. A mathematics teacher noted:

"We not only assess the final result, but also the thinking process and students' engagement to understand their development." (Interview, 2025).

Nevertheless, the lack of access to digital assessment tools restricts the variety and interactivity of evaluation methods. One teacher remarked:

"Without access to digital tools, we cannot implement more varied technology-based assessments. We are forced to use traditional methods which may be less interesting for students." (Interview, 2025)

This situation demands increased teacher creativity to design relevant and effective evaluations within existing constraints.

Teachers' Creativity and Collaboration as Key to Overcoming Constraints

These findings reveal that, although technological limitations challenge both the implementation and evaluation of mathematics learning, teacher creativity and collaborative efforts remain central to curriculum success. The support of school leadership further strengthens these adaptive strategies. This dynamic fosters pedagogical innovation, ensuring that learning objectives are met despite resource limitations.

Analytical Summary

Overall, the findings indicate that the implementation of the Kurikulum Merdeka at MA Al-Manshur Popongan demonstrates a well-adapted approach despite significant technological limitations. Teachers actively employ differentiated and contextualized teaching methods, emphasizing project-based learning that integrates real-life applications to engage students effectively. The planning process is collaborative, involving curriculum-focused discussions among teachers and guided by flexible teaching modules aligned with learning outcomes.

However, restrictions on students' use of digital devices pose challenges, requiring teachers to innovate through the development of attractive printed materials and conventional evaluation methods. Evaluation practices prioritize formative assessments that assess not only final outcomes but also students' thinking processes and engagement. The technological constraints limit the diversity of assessment techniques, pushing educators to exercise creativity in maintaining relevance and effectiveness.

Crucially, the success of curriculum implementation hinges on strong collaboration among teachers and the supportive leadership of the madrasah's administration. These factors collectively foster an environment that encourages innovation and resilience, enabling effective adaptation to contextual challenges within the school setting.

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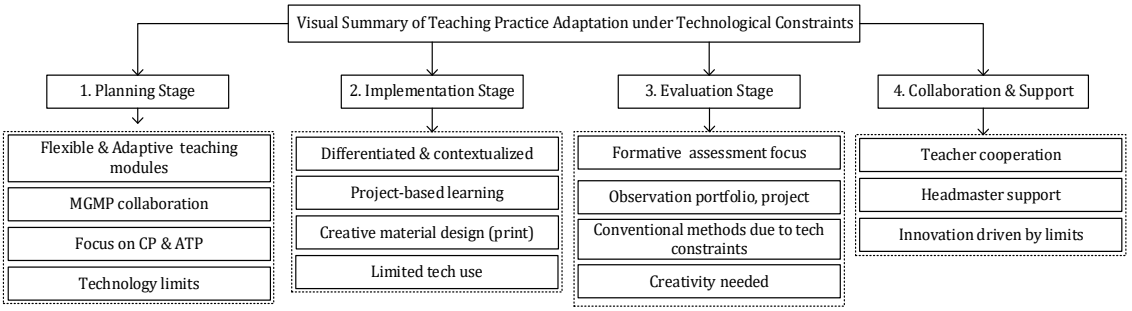

Figure 2. Thematic Diagram: Implementation of Mathematics Learning in Kurikulum Merdeka
Source: Author's data analysis, 2025

Based on the thematic diagram, the findings can be interpreted as showing an interconnected process of curriculum implementation at MA Al-Manshur Popongan, comprising three core stages: planning, implementation, and evaluation. Each stage is influenced by technological limitations, which in turn drive innovation and adaptation by teachers. Planning emphasizes curriculum alignment and student-centered design; implementation focuses on contextual and differentiated learning methods; and evaluation relies on formative techniques adapted to low-tech conditions. These elements form a cyclical process supported by collaboration and leadership, ensuring that learning remains effective and relevant despite infrastructural constraints.

Discussion

Planning for Mathematics Learning in the Kurikulum Merdeka at MA Al-Manshur Popongan

Based on the results of interviews with informants regarding learning planning in the Kurikulum merdeka at MA Al-Manshur Popongan, learning planning in the Kurikulum merdeka must be prepared based on the Operational Curriculum for Education Units (KOSP) that has been determined by each education unit (D. Lutfiana, 2022). Therefore, curriculum planners and developers need to conduct careful analysis, then develop lesson plans by determining the right model, arranging learning strategies, and implementing them into the Teaching and Learning Process (PBM) (Muzharifah et al., 2023). Maths teachers at MA Al-Manshur Popongan focus their planning on Learning Outcomes (CP) and Flow of Learning Objectives (ATP) in accordance with the characteristics of the curriculum. This planning process is carried out through the Subject Teacher Meeting (MGMP) and remains guided by the applicable curriculum guidelines.

Planning learning is a very important part of curriculum planning, because learning activities have a direct influence on students, even greater than the curriculum itself (Nasution et al., 2023). In mathematics, it is known that planning is a process that involves thinking and determining activities or programmes that will be carried out in the future to achieve certain goals (Firmansya et al., 2024). At MA Al-Manshur Popongan in planning for mathematics subjects, the preparation of teaching modules is carried out flexibly and adaptively. To implement the Kurikulum merdeka optimally, mathematics teachers at MA Al-Manshur Popongan need good planning, starting from choosing a learning model to preparing the appropriate teaching modules. In making the teaching module, teachers consider the needs of students so that they can learn independently, actively, and be able

to achieve learning objectives and in accordance with the established curriculum.

The Kurikulum merdeka was developed as a curriculum framework that is more flexible, while focusing on essential material and the development of learners' characters and competencies (Septiani, 2022). According to Sulistyani, 2023 in (Melati et al., 2024) One of the main features of the Merdeka Curriculum is to encourage students' perseverance in developing soft skills and character in accordance with the Pancasila Graduate Profile. The project-based learning design is structured in stages, starting from problem identification through contextual questions or problems that refer to the values of the Pancasila Student Profile (Rachmawati et al., 2022). In its application, mathematics teachers at MA Al-Manshur Popongan face obstacles in using technology that should be able to support the learning process so that students are more independent, active in thinking, and creative. This limited access to technology encourages teachers to be more creative in developing learning materials, although the use of printed media in the form of teaching modules is considered less attractive than interactive digital media. This condition shows the importance of innovation in designing teaching materials that remain relevant, interesting, and in accordance with the needs of students, despite the existing situations and limitations.

Implementation of Mathematics Learning in the Kurikulum merdeka at MA-Al Manshur Popongan

The Kurikulum merdeka is known as the concept of Merdeka learning, teachers provide opportunities for learners to innovate and encourage creative thinking (Alfath, 2022).). In accordance with the Pancasila learner profile, the kurikulum merdeka was created to give freedom to students, teachers, and educational institutions to innovate in order to encourage lifelong learning. Building effective learning with various characteristics of learners with various possibilities and teachers only being the driving force. MA Al-Manshur Popongan has implemented the Kurikulum merdeka in its learning process. The concept of implementing Kurikulum merdeka involves three main stages: planning, implementation, and assessment (Lutfiana, 2024). In implementing the Kurikulum merdeka, also known as Merdeka learning, students are given freedom and the teacher is only a facilitator.

The Kurikulum merdeka at MA Al-Manshur Popongan is only implemented in class X and class XI with a differentiated learning approach. In Differentiated learning, the teacher presents material by emphasising students' willingness, interest, and learning (Gusteti, 2022). With various characteristics of students, mathematics teachers at MA Al-Manshur Popongan have tried to pay attention to the individual needs of students by using contextual methods. By building on the knowledge that participants have from the results of interaction and experience. Abstract ideas in mathematics often appear in problems in everyday life. Teachers The role of facilitator includes providing learning experiences that support the development of cognitive, emotional, and psychomotor talents (Anwar et al., 2023).

MA Al-Manshur Popongan in implementing mathematics learning in the Kurikulum merdeka, students are required to be active in the process of teaching and learning activities. One of the implementations of the Kurikulum merdeka implemented is the Projek Penguatan Profil Pelajar Pancasila (P5). This project aims to develop students' understanding, attitudes, and behaviour in practicing Pancasila values as the foundation of national and state life (Diana, dkk, 2024). The implementation of the P5 programme in Senior High School has a very significant positive impact in shaping the character and

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skills of students, where not only learning theory but students can also practice directly with the projects given (Melati et al., 2024). The implementation of this project-based curriculum requires software. In this case, MA Al- Manshur Popongan has obstacles, namely technological limitations, causing teachers to look for alternatives in delivering material, such as using printed worksheets which must be attractively designed to attract student interest.

Evaluation of Mathematics Learning in the Kurikulum merdeka at MA Al-Manshur Popongan

Learning evaluation in the Kurikulum merdeka at MA Al-Manshur Popongan shows a paradigm shift from the traditional evaluation model oriented towards final results to a formative approach that is more centred on the student learning process. Formative evaluation serves to improve the quality of learning through continuous feedback (Asworo et al., 2024). Assessment should be used to support learning, not just to classify students (Soulisa et al., 2022). In line with this, formative assessment should focus attention on the learning process and student growth (Azaria et al., 2024). This principle is reflected in the evaluation practices implemented by mathematics teachers, which focus on monitoring students' overall development through various assessment methods such as observation, portfolios and contextualised projects. One of the mathematics teachers at MA Al-Manshur Popongan stated that in implementing the Kurikulum merdeka, they no longer simply assess students' academic achievements based on final grades, but also observe the thinking process, involvement in learning, and students' efforts in understanding mathematical concepts. According to Anderson and Krathwohl, the revision of Bloom's taxonomy emphasises the importance of evaluating higher-order thinking processes (Amelia, 2024). Effective evaluation should include students' cognitive, social, and emotional dimensions (Soulisa et al., 2022). Furthermore, monitoring the learning process is at the core of assessment that can improve academic achievement (Mubarok et al., 2024). This is in line with the objectives of Kurikulum merdeka, which prioritises competency- and character-based learning, where the learning process is considered as important as the results obtained.

This evaluation practice shows that teachers are trying to build a learning atmosphere that is more reflective and adaptive to students' needs. Through portfolio and project-based assessment, students are encouraged to be more active, creative, and able to integrate mathematical knowledge with real-life contexts. Portfolios provide a comprehensive picture of students' abilities in various aspects (Rifai et al., 2024). Authentic tasks such as projects make evaluation more meaningful and relevant (Taliak et al., 2024). In addition, authentic assessments allow students to demonstrate their competence in a real context (Purnamatati & Madani, 2023). This kind of evaluation also strengthens critical thinking, collaborative and problem-solving skills that are crucial in facing the challenges of the modern world.

However, the implementation of formative evaluation in mathematics learning faces some significant obstacles, especially related to the limitations in the utilisation of technology. The main obstacles in technology integration are accessibility and user readiness (Qur'aini & Firdaus, 2024). Teachers revealed that access to digital platforms, online evaluation applications, or other technological tools is still very limited. The digital divide exacerbates inequalities in education quality (Sinambela et al., 2024). The successful use of technology in education is highly dependent on the social and institutional context (Suyuti et al., 2023). In addition, limited training and technical support for teachers also slow down the adoption of technology in formative evaluation. As a result, the implementation of

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evaluation still relies heavily on conventional methods that are less responsive to individualised learning needs.

As a result of these limitations, mathematics teachers at MA Al-Manshur Popongan rely heavily on conventional evaluation methods such as manual written tests, paper-based individual assignments and physical portfolio collection. The digital natives generation is more responsive to technology-based learning methods (Triyunita et al., 2025). The use of multimedia in learning increases student motivation and understanding (Wahyudi et al., 2023). Meanwhile, technology based learning can improve learning outcomes if applied effectively (Suyuti et al., 2023). Although these methods still endeavour to prioritise formative principles, this limitation has the potential to reduce the level of student engagement, especially for those who are more interested in digital media and technology-based learning. This suggests a gap between students' learning preferences and the evaluation approaches used.

Despite these obstacles, teachers still show creativity and innovation in adapting assessment methods to remain in line with the spirit of Kurikulum merdeka. They try to optimise existing resources and develop diverse evaluation instruments, such as process assessment rubrics, student reflection journals, and simple project-based assessments that are suitable for madrasah conditions. Assessment rubrics help students understand learning expectations and improve the quality of their work (Silvia et al., 2024). In teacher professional development and student learning, reflection is needed (Kurniasari et al., 2024). In addition, the concept of "Understanding by Design" encourages the use of various forms of assessment to achieve deep understanding (Widiasri, 2024). Overall, the evaluation of mathematics learning at MA Al-Manshur Popongan reflects a real effort to realise the principles of the Kurikulum merdeka. Despite infrastructure limitations, the spirit to assess the learning process as a whole is maintained. This shows a strong commitment from educators to transform, build a learning culture that is more inclusive, adaptive, and oriented to the development of competencies and characters participants students. Changes True education depends on collective commitment at the school level (Kaya et al., 2024). Sustainable change must be rooted in the values and moral commitment of educators (Ramadhanti et al., 2022). Meanwhile, systemic support from various stakeholders is needed to realise educational transformation (Thana & Hanipah, 2023).

Conclusion and Suggestions

Based on the data analysis, this study concludes that: (1) mathematics learning planning at MA Al-Manshur Popongan is conducted systematically through the development of flexible and adaptive teaching modules, despite facing challenges related to limited technology access; (2) the implementation of learning adopts a differentiated approach emphasizing contextual and project-based activities, though constrained by regulations limiting digital device usage; and (3) the evaluation process primarily relies on formative assessments, yet the lack of technological support restricts the diversity of assessment methods. These findings highlight the critical need for enhanced technological infrastructure and comprehensive teacher training to optimize the implementation of Kurikulum Merdeka and ultimately elevate the quality of education in madrasahs.

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