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Analysis of the Implementation of the Kurikulum Merdeka in Physics Subject Class XI SMAN 13 Semarang

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Abstract: This study aims to examine the challenges faced by educators and students in the implementation of the Kurikulum Merdeka in Physics at SMAN 13 Semarang. A descriptive qualitative method was used with purposive sampling involving three educators from the subjects of Physics, Chemistry, and Biology, and 36 students specializing in Physics from class XI phase F1. Data collection was conducted through a Likert scale questionnaire, interviews, and observations, with analysis following the Miles and Huberman model. The results reveal that although SMAN 13 Semarang possesses adequate facilities and infrastructure to support curriculum implementation, educators encounter difficulties in preparing learning administrative tasks such as teaching modules, the Pancasila Student Profile Strengthening Project (P5), and the use of IT-based learning media. Students face obstacles, including challenges during learning activities (41.7%), difficulties understanding the material (66.7%), limited variation in learning methods (25%), and low creativity of educators in managing learning (36.1%). These findings suggest a need to improve educator competence and develop more innovative learning strategies to optimize the Kurikulum Merdeka implementation.

Keywords: Implementation Kurikulum Merdeka; Physics Learning; Implementation Difficulties

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Introduction

Education serves as a vital means to develop the potential and strength of the Indonesian nation (Marneli & Anastasha, 2022). It aims to humanize individuals by facilitating learning interactions that foster intellectual, behavioral, and emotional growth (Nufus, 2020). In Indonesia, the curriculum is a fundamental component guiding educational practices and policies (Safrizal et al., 2022). The government continuously endeavors to enhance the education system through various programs, recognizing the curriculum's pivotal role in improving human intellect (Samsudin, 2019). As a structured framework, the curriculum provides systematic guidelines to achieve learning objectives and adapt to evolving societal demands (Yusrizal & Fatmawati, 2021). The concept of "Merdeka Belajar" (Freedom to Learn) reflects the national education system's goal to accommodate students' diverse skills and autonomy (Sofa, 2023). Physics, as a science emphasizing inquiry and problem-solving, aligns well with this curriculum approach, encouraging active engagement between educators and students (Iftirani, 2022). Several studies have analyzed the implementation of the Kurikulum Merdeka in Physics learning, highlighting its potential and challenges.

The learning process in Indonesia remains predominantly teacher-centered, leading to passive student engagement and limited use of student-centered learning methods (Ibrayave, 2022). Initial observations at SMAN 13 Semarang, which has implemented the Kurikulum Merdeka since 2021, indicate that Physics instruction is still centered on the teacher, restricting students' opportunities for experimentation and discovery. This approach contradicts the principles of independent learning, which aim to simplify and facilitate the teaching process by granting educators the freedom to innovate and achieve targeted learning outcomes (Hartoto, 2021). Therefore, monitoring and enhancing the physics learning process is essential to ensure that educators deliver instruction in an engaging manner that promotes better student comprehension (Wardani, 2019).

Learning goals will be achieved if educators, as facilitators, have the ability to innovate, determine learning methods, and be creative in using media. In reality, not all educators are able to innovate because they have many factors, one of which is age, lack of facilities, and infrastructure (Atston, 2021). According to research by Fifani (2023), educators experience anxiety in implementing the curriculum. The results of another study stated that one of the reasons for the implementation of the independent learning system was the availability of facilities and infrastructure, as well as the creativity of educators during the learning process (Arviansyah & Shagena, 2022).

Lestari (2023) emphasizes the importance of recognizing students' learning characteristics in the educational process. According to her research, students with an auditory learning style have not fully mastered the material, partly due to undifferentiated learning processes and assessments lacking clear identification and feedback. The implementation of the Kurikulum Merdeka in Physics learning still encounters challenges, including a lack of learner-centered approaches. Therefore, both educators and students need to understand the specific characteristics of Physics as a subject and develop related process skills to effectively address curriculum changes. Complementing this, Ibrahim (2023) reports that the Implementation of the Kurikulum Merdeka Model (IKM) in high school Physics has progressed positively through teacher participation in training and socialization of learning tools, facilitating their understanding of new concepts such as Learning Objectives (ATP) and Learning Outcomes (CP).

The implementation of the Kurikulum Merdeka has not been fully responded to by either educators or schools (Avriansyah & Shagena, 2022). The policies that accompany the Kurikulum Merdeka make educators feel difficulties in their implementation, due to the lack of educator debriefing, which can interfere with the achievement of learning goals (Safrizal et al., 2022). An ineffective teaching and learning process will reduce student learning outcomes (Dilekci, 2023). Mature readiness is needed by educators who will implement the Kurikulum Merdeka (Huang, 2019).

Several studies on the implementation of the Kurikulum Merdeka in Physics learning have identified challenges such as enhancing teachers' capacity to adapt to curriculum changes and expanding access to learning resources. These efforts have also contributed to improvements in educational quality and students' learning awareness. Atston (2021) highlights that the success of learning quality depends largely on how educators conduct the learning process, which in turn influences overall educational success. However, a clear understanding of the readiness and obstacles faced by both students and educators in this context remains limited. Therefore, this study aims to examine the readiness and difficulties of students and educators at SMAN 13 Semarang in implementing the Kurikulum Merdeka in Physics learning

Methods

This study employs a descriptive research design with a qualitative approach. Participants were selected through purposive sampling, comprising three educators from the disciplines of Physics, Chemistry, and Biology, along with 36 students from class XI phase F1 specializing in Physics at SMAN 13 Semarang. Data analysis followed the Miles and Huberman (1992) model, which involves four components: (1) data collection, (2) data reduction, (3) data presentation, and (4) conclusion drawing. Data were collected via observations, interviews, Likert scale questionnaires, and documentation. During data reduction, key information from interviews and questionnaires was identified; the Likert scale responses were analyzed by calculating percentages based on predetermined criteria, with particular focus on issues emerging from interviews.

The questionnaire was administered to 36 students to assess difficulties encountered in learning Physics under the Kurikulum Merdeka. The difficulty percentage was calculated using formula 1.

$$\mathrm{P} = \frac{\mathrm{KI}}{\mathrm{KA}} \times 100\% \qquad [1]$$

Information:
P : Difficulty percentage
KI : Amount of data obtained;
KA : Maximum ideal amount of data.

The resulting percentages were then interpreted using the rating categories outlined in Table 1 (Sugiono, 2013). Additionally, interviews with the three educators aimed to explore the challenges faced in implementing the Kurikulum Merdeka, particularly in Physics instruction.

Table 1. Percentage of Difficulty Categories Based on Sugiono (2013)

No.	P (%)	Category
1	$83 < P \leq 100$	Strongly Agree
2	$60 < P \leq 83$	Agree
3	$41 < P \leq 60$	Simply Agree
4	$22 < P \leq 41$	Lack of Consensus
5	$0 < P \leq 22$	Disagree

The third stage of data presentation is a description using a series of words into paragraphs that are summarized from the results of data reduction, with the aim of making it easier to understand the findings. The fourth stage of drawing conclusions is the answer to the formulation of the problem researched by the researcher from the results of data reduction and data presentation.

Results and Discussion

This study is a qualitative investigation aimed at providing a detailed explanation of the implementation of the Kurikulum Merdeka in physics learning at SMAN 13 Semarang. Data were collected through interviews, questionnaires, and observations involving three subject teachers of Biology, Physics, and Chemistry, as well as 36 students of Grade XI.

Data Presentation (Results) Based on interviews with the teachers, the aspect of facilities and infrastructure supporting physics learning under the Kurikulum Merdeka at SMAN 13 Semarang is categorized as very good, although some equipment requires maintenance. The completeness of these facilities sufficiently supports the proper implementation of the Kurikulum Merdeka. Field observations revealed that the stages of learning and assessment—including planning, implementation, and evaluation phases—are administratively well executed by the educators. However, there are indications that actual physics learning did not always align with the prepared administration. One contributing factor is limited available time; educators face significant administrative duties, such as PMM programs, which reduce effective teaching time. In addition, the P5 project, designed to reinforce the profile of Pancasila students, occupies a portion of learning hours despite efforts to schedule learning optimally.

Closed interviews and observations identified several challenges encountered by teachers since the curriculum's implementation in 2021. They reported difficulties primarily related to curriculum administration preparation, including teaching modules, the P5 program, and additional tasks. Challenges regarding facilities and infrastructure were minimal, though internet access remains a necessary support for learning media. Some educators relied predominantly on lecturing methods, with limited use of diverse learning strategies, indicating that learning activities were not fully interactive or student-centered. Furthermore, managing the use of cellphones as learning media posed challenges, given the Kurikulum Merdeka's emphasis on IT-based learning to address the demands of the Industrial Revolution 4.0.

From the students' perspective, questionnaire data from 36 students indicated that 15 students experienced difficulties during physics learning under the Kurikulum Merdeka. The primary source of difficulty was related to the implementation of learning activities, which students perceived as suboptimal

and ineffective in supporting the achievement of learning goals. Divergent student perceptions regarding the curriculum's implementation suggest challenges in adapting to the revised learning approach.

Regarding data analysis, interview and observational data were coded thematically and triangulated by cross-verifying findings from the three data sources to ensure credibility and trustworthiness of the results. These findings align with Rene (2023), who stated that the implementation of the Kurikulum Merdeka is hindered by limited experience, inadequate references, time management issues, and insufficient skills or expertise among educators. The difficulties faced by teachers in administrative preparations and time management highlight the need for enhanced training and ongoing guidance. Additionally, students' challenges in adjusting to the new learning processes suggest that greater support is needed to improve their understanding of the curriculum's concepts.

Nana (2017) emphasizes that successful teaching and learning processes depend on educator readiness, effective evaluation, adequate facilities, and the application of enjoyable learning methods aligned with the Ministry of Education and Culture's programs. These points correspond to the Kurikulum Merdeka's focus on relevant and innovative teaching practices to maximize students' potential (Arviansyah, 2022; Roos, 2023). However, at SMAN 13 Semarang, a gap remains between curriculum expectations and classroom practice, especially regarding diverse teaching methods and instructional time management.

Moreover, Sofa (2023) highlights the importance of comprehensive understanding not only among educators but also among students and parents for the successful implementation of the Kurikulum Merdeka. This finding underscores the necessity of a holistic approach to curriculum implementation to fully realize its intended outcomes.

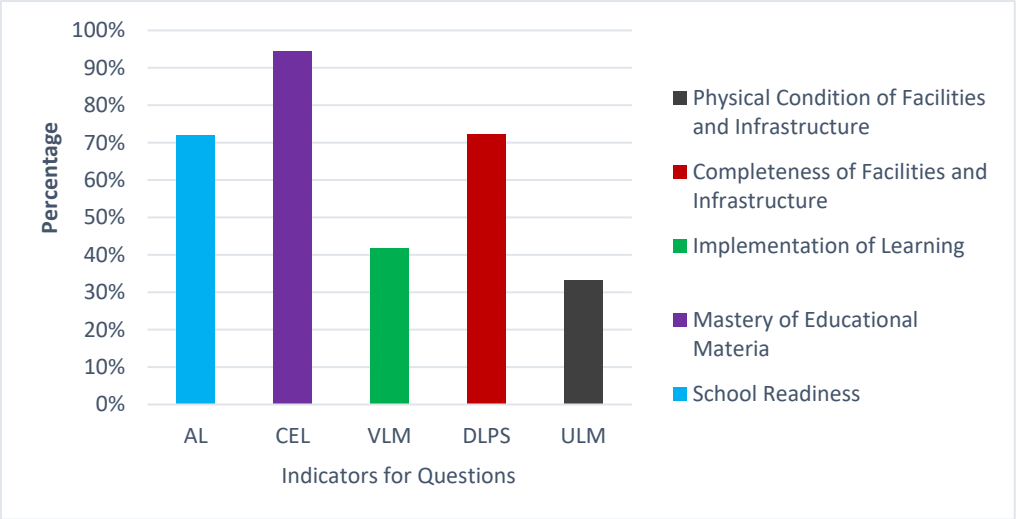

Figure 1. Factors Causing Students' Learning Difficulties in Physics

Based on the data illustrated in Figure 1, 66.67% of students perceive the process of learning physics as challenging to comprehend. This indicates a significant level of difficulty experienced during the physics learning process. One contributing factor identified by students is the instructional approach used by educators, which tends to lack variation and creativity, predominantly relying on traditional lecture methods, as shown in Figure 2.

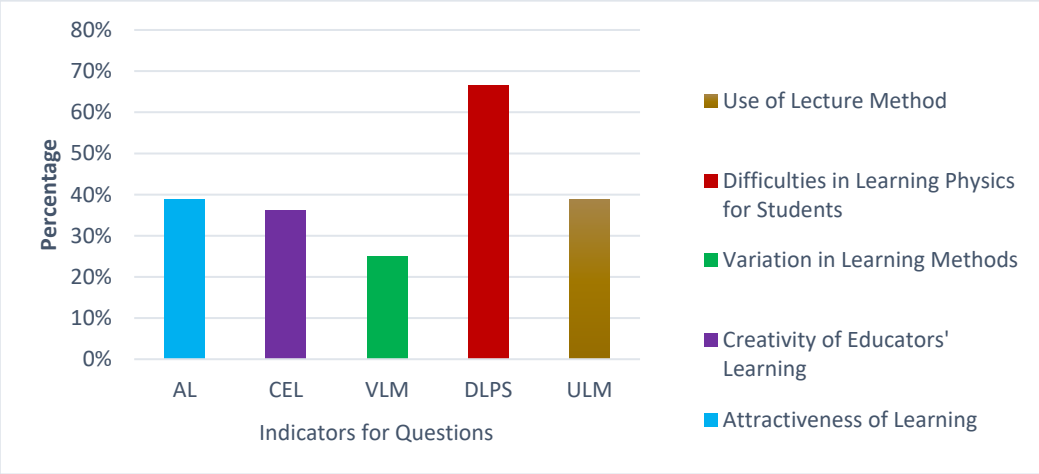

Figure 2. Types of Learning Difficulties Experienced by Students in Physics

This instructional approach does not align with the Competency Profile (CP) stipulated by the Kurikulum Merdeka, which emphasizes the development of process skills such as investigation, evaluation, analysis, and the cultivation of collaborative attitudes, in addition to mere content understanding. According to Ainia (2020), the structure of the Kurikulum Merdeka in physics education is designed around a conceptual framework that promotes flexibility, learner autonomy, and individual potential development. It is characterized by values rooted in Pancasila, aiming to create an educational environment responsive to students' needs, creativity, innovation, interests, and talents, ultimately fostering effective problem-solving skills.

Despite students' agreement on the benefits of implementing the Kurikulum Merdeka, their feedback highlights certain challenges. For instance, although the Kurikulum Merdeka facilitates a simplified conceptual structure, students report that some practical methods and exercises remain complex, particularly in advanced stages such as the P5 learning phase (further clarification on the 'P5' phase is necessary for international readers). Students suggest that physics learning would become more engaging if accompanied by more experimental activities and if classroom grouping were carefully considered to optimize concentration and peer collaboration.

In summary, it is imperative that physics learning within the framework of the Kurikulum Merdeka incorporates a well-defined learning progression supported by innovative and stimulating instructional methods. This would help address existing difficulties and align educational practices with the curriculum's goals to enhance students' conceptual understanding and skill development.

Conclusion

Based on the problem formulation and research results, it can be concluded that SMAN 13 Semarang is feasible for the implementation of the Kurikulum Merdeka. The existing facilities and infrastructure adequately support the learning process under this curriculum. However, several challenges remain, particularly for educators, who face difficulties in implementing the Kurikulum Merdeka in physics. These challenges include preparing administrative materials such as teaching modules, the P5 program, and IT-based learning media. Student difficulties at grade XI phase F in physics under this curriculum were also identified. Specifically, 41.7% of students experienced challenges in the learning process, and 66.67% reported difficulty understanding physics material, indicating a moderate level of learning difficulty. Furthermore, students noted that educators used fewer varied teaching methods (25%) and exhibited lower creativity in teaching (36.11%), which may contribute to these learning obstacles.

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