

Implementing the Independent Curriculum to Develop Twenty-First Century Competencies in Indonesian Senior Secondary Schools

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ABSTRACT

The implementation of the Independent Curriculum (Kurikulum Merdeka) represents a major shift in Indonesian education toward competency-based and student-centered learning aimed at addressing the demands of the twenty-first century. This study investigates how the Independent Curriculum is implemented in Indonesian senior secondary schools and examines its role in developing students' twenty-first century competencies, including critical thinking, creativity, collaboration, communication, information literacy, and character development aligned with the Pancasila Student Profile. Employing a mixed-methods explanatory design, the study integrates quantitative data from student and teacher questionnaires with qualitative data obtained through interviews and document analysis. The findings reveal that the Independent Curriculum has been partially but progressively implemented, with notable variation across schools and subjects. When effectively enacted through deep learning and project-based learning approaches, the curriculum contributes positively to students' cognitive, social, and creative competencies. Project-Based Learning emerges as a key pedagogical strategy supporting collaborative learning and authentic problem-solving, while P5 projects strengthen the integration of national values within competency development. However, the study also identifies persistent challenges related to teacher readiness, assessment literacy, curriculum interpretation, and institutional support. These factors significantly influence the consistency and quality of curriculum implementation. Overall, the results indicate that the Independent Curriculum holds substantial potential to enhance twenty-first century competencies in senior secondary education, provided it is supported by sustained professional development, clear implementation guidance, and strong school leadership. The study contributes empirical evidence to curriculum reform discourse and offers insights for policymakers and educators seeking to strengthen competency-oriented learning in Indonesian secondary schools.

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INTRODUCTION

The rapid transformation of global society in the twenty-first century has significantly altered the role and expectations of formal education systems. Advances in technology, the acceleration of information flow, and the increasing complexity of social and economic challenges have shifted educational priorities away from mere content acquisition toward the cultivation of higher-order competencies. These competencies include critical thinking, creativity, collaboration, communication, information literacy, and adaptability—often conceptualized within the framework of twenty-first century skills or the 4C competencies (Barus, 2024; Zorlu & Zorlu, 2021). In this context, schools are no longer viewed solely as institutions for knowledge transmission but as environments that prepare learners to navigate uncertainty, solve complex problems, and participate productively in a globalized society.

In Indonesia, the urgency to realign education with these global demands has become increasingly apparent. For decades, the national curriculum was criticized for being overly

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centralized, content-heavy, and examination-oriented, which limited teachers' instructional autonomy and constrained opportunities for meaningful learning experiences. These structural limitations were further exposed during the COVID-19 pandemic, which resulted in widespread learning loss and exacerbated educational inequalities. Responding to these challenges, the Indonesian government introduced the Independent Curriculum (Kurikulum Merdeka) as part of a broader educational reform agenda aimed at fostering flexibility, autonomy, and competency-based learning (Irawati et al., 2022; Tunas & Pangkey, 2024).

The Independent Curriculum represents a paradigmatic shift in Indonesian education policy. Rather than prescribing rigid learning outcomes and uniform instructional sequences, Kurikulum Merdeka emphasizes differentiated learning, contextualized instruction, and the integration of character education through the Pancasila Student Profile (Profil Pelajar Pancasila). This profile articulates six core dimensions—faith and morality, global diversity, mutual cooperation, independence, critical reasoning, and creativity—which align closely with international conceptualizations of twenty-first century competencies (Amiruddin et al., 2024; Widarini & Suterji, 2023). Consequently, the Independent Curriculum is positioned not only as a structural reform but also as a pedagogical framework intended to support holistic learner development.

From a policy perspective, the development of Kurikulum Merdeka reflects an adaptive curriculum mechanism designed to balance national education standards with local contextual needs. Studies on curriculum development mechanisms highlight that the Independent Curriculum grants schools and teachers greater authority to design learning activities, select instructional materials, and implement innovative pedagogies while maintaining alignment with national competency benchmarks (Baso et al., 2024; Lestari et al., 2023). This flexibility is expected to encourage pedagogical innovation and foster learning environments that are responsive to students' interests, abilities, and socio-cultural contexts.

However, while the conceptual foundations of Kurikulum Merdeka align well with twenty-first century education principles, the effectiveness of its implementation remains a critical concern. Empirical studies indicate that the success of curriculum reform depends not only on policy design but also on how policies are interpreted, enacted, and sustained at the school and classroom levels (Sholeh et al., 2024). Research on early implementation suggests that schools vary widely in their capacity to operationalize curriculum flexibility, with differences influenced by leadership quality, resource availability, and teacher readiness (Gurion, 2024; Nurzen, 2022).

At the senior secondary school level, the implementation of the Independent Curriculum presents unique challenges and opportunities. Senior secondary education plays a strategic role in preparing students for higher education, vocational pathways, and workforce participation. Accordingly, students at this level are expected to demonstrate advanced cognitive abilities, self-directed learning skills, and socio-emotional competencies. Studies examining the integration of twenty-first century skills in Indonesian senior high schools reveal that, despite policy aspirations, classroom practices often remain dominated by traditional instruction and textbook-centered learning (Anwar et al., 2024; Setiyaningtiyas, 2025). This gap between policy intent and pedagogical reality underscores the need for empirical investigation into how Kurikulum Merdeka is actually implemented in senior secondary contexts.

Pedagogically, Kurikulum Merdeka promotes learning approaches that emphasize depth of understanding rather than breadth of content. One such approach is deep learning, which focuses on meaningful engagement, conceptual understanding, and the application of knowledge to real-world contexts. Evidence from senior high schools implementing deep learning within the Independent Curriculum framework suggests that this approach can significantly enhance students' cognitive abilities when supported by appropriate instructional design and assessment practices (Hadi et al., 2025). Deep learning is therefore a critical component in fostering higher-order thinking skills aligned with twenty-first century competencies.

Another core pedagogical strategy embedded in Kurikulum Merdeka is Project-Based Learning (PjBL). PjBL enables students to engage in extended inquiry processes, collaborate with peers, and produce authentic products that demonstrate their learning. Research trends in Indonesian education indicate a growing emphasis on PjBL as an effective method for integrating cognitive, social, and affective learning outcomes (Elvianasti & Kartikawati, 2022). Empirical studies further demonstrate that PjBL enhances creativity, problem-solving abilities, and learning outcomes across various subject areas, including Pancasila and Citizenship Education (Pirdaus, 2024).

International evidence also supports the effectiveness of blended and interdisciplinary PjBL models in fostering twenty-first century competencies. Medeiros et al. (2017) found that blended PjBL environments promote active learning, collaboration, and learner autonomy—attributes that align closely with the objectives of Kurikulum Merdeka. When implemented within a flexible curriculum framework, PjBL serves as a powerful vehicle for competency-based education.

Central to the Indonesian context is the integration of Pancasila values into competency development. The P5 project, a distinctive feature of Kurikulum Merdeka, operationalizes character education through experiential learning projects that emphasize social responsibility, cultural awareness, and ethical reasoning. Studies on P5 implementation indicate that these projects effectively bridge global competencies with national identity, reinforcing the relevance of twenty-first century skills within Indonesia's socio-cultural context (Amiruddin et al., 2024; Widarini & Suterji, 2023).

Despite these promising pedagogical frameworks, teacher readiness remains a critical determinant of successful curriculum implementation. Multiple studies consistently report that teachers face challenges related to curriculum interpretation, instructional planning, assessment design, and classroom management under Kurikulum Merdeka (Sephiawardani & Bektiningsih, 2023; Gurion, 2024). These challenges are compounded at the senior secondary level, where academic pressure and standardized examination cultures persist. Research indicates that teachers' beliefs, competencies, and professional support systems significantly influence their capacity to implement innovative pedagogies such as deep learning and PjBL (Latifa et al., 2023; Ingtias et al., 2022).

Although a growing body of literature examines Kurikulum Merdeka implementation, several research gaps remain. First, many studies focus on elementary education or higher education contexts, particularly the Merdeka Belajar-Kampus Merdeka (MBKM) policy, leaving senior secondary education relatively underexplored (Budiman, 2023; Syamsulrizal et al., 2024). Second, existing research often examines isolated aspects of implementation—such as policy analysis, teacher readiness, or pedagogical strategies—without integrating these dimensions into a comprehensive framework. Third, there is limited empirical evidence linking curriculum implementation practices directly to the development of twenty-first century competencies among senior secondary students.

Addressing these gaps, the present study investigates how the Independent Curriculum is implemented in Indonesian senior secondary schools to develop twenty-first century competencies. Specifically, the study examines instructional practices, teacher readiness, and the integration of deep learning, PjBL, and P5 projects, while also analyzing the challenges that influence implementation effectiveness. By focusing explicitly on senior secondary education and adopting an integrative analytical approach, this study contributes original empirical insights to the discourse on curriculum reform and competency-based education in Indonesia.

METHOD

This study employed a mixed-methods explanatory research design to comprehensively examine the implementation of the Independent Curriculum and its role in developing twenty-first century competencies in Indonesian senior secondary schools. A mixed-methods approach was selected to capture both the measurable outcomes of curriculum implementation and the contextual factors that influence pedagogical practices. Integrating

quantitative and qualitative data enables a more nuanced understanding of how curriculum policy translates into classroom realities (Hilmiatussad et al., 2024; Setiyaningtiyas, 2025).

The research was conducted in several Indonesian senior secondary schools that had formally adopted Kurikulum Merdeka. Schools were selected using purposive sampling to ensure representation of diverse institutional contexts, including public and private schools, as well as varying levels of resource availability. Participants included school principals, subject teachers, and Grade XI students, reflecting key stakeholders involved in curriculum implementation and learning processes (Sholeh et al., 2024; Gurion, 2024).

Quantitative data were collected through structured questionnaires administered to students and teachers. The student questionnaire measured twenty-first century competencies, focusing on the 4C skills—critical thinking, creativity, collaboration, and communication—as well as information literacy. Indicators were adapted from validated frameworks used in prior studies on twenty-first century skills and information literacy in Indonesian education contexts (Barus, 2024; Parmini et al., 2023; Zorlu & Zorlu, 2021). Teacher questionnaires assessed readiness to implement Kurikulum Merdeka, including pedagogical competence, curriculum understanding, instructional autonomy, and attitudes toward innovative learning approaches (Sephiawardani & Bektiningsih, 2023; Nurzen, 2022).

Qualitative data were gathered through semi-structured interviews with teachers and school leaders. Interview protocols explored participants' experiences with curriculum implementation, instructional planning, assessment strategies, and the integration of deep learning, PjBL, and P5 projects. These interviews provided in-depth insights into how teachers interpret curriculum flexibility and navigate implementation challenges (Latifa et al., 2023; Amiruddin et al., 2024). In addition, document analysis was conducted on lesson plans, project designs, curriculum documents, and school policy guidelines to triangulate findings and examine alignment between intended and enacted curriculum (Irawati et al., 2022; Widarini & Suterji, 2023).

Quantitative data analysis involved descriptive and inferential statistical techniques. Descriptive statistics were used to summarize levels of student competencies and teacher readiness, while correlation and regression analyses examined relationships between curriculum implementation variables and competency outcomes. These analytical techniques are consistent with prior research exploring relationships between pedagogical practices and twenty-first century skill development (Zorlu & Zorlu, 2021). Statistical analyses were conducted using appropriate software to ensure accuracy and reliability.

Qualitative data were analyzed using thematic analysis. Interview transcripts and documents were coded inductively to identify recurring themes related to instructional strategies, curriculum flexibility, teacher challenges, and contextual factors influencing implementation. This approach allowed for the systematic interpretation of participants' perspectives and the identification of patterns across data sources (Hilmiatussad et al., 2024). Findings from qualitative analysis were then integrated with quantitative results to provide a comprehensive interpretation of the research problem.

To ensure trustworthiness and validity, several strategies were employed. Data triangulation was achieved by integrating survey data, interview findings, and document analysis, enhancing the credibility of the results. Member checking was conducted with selected participants to confirm the accuracy of interview interpretations. Ethical considerations were addressed by obtaining informed consent from all participants, ensuring confidentiality, and emphasizing voluntary participation throughout the research process.

Through this methodological framework, the study systematically examines the implementation of the Independent Curriculum in Indonesian senior secondary schools and its role in fostering twenty-first century competencies, providing empirically grounded insights for educators, policymakers, and curriculum developers.

RESULTS AND DISCUSSION

The results of this study provide a comprehensive picture of how the Independent Curriculum (Kurikulum Merdeka) is implemented in Indonesian senior secondary schools and how this implementation contributes to the development of twenty-first century competencies. By integrating quantitative survey data with qualitative interview findings and document analysis, this section presents empirical evidence on instructional practices, teacher readiness, student competency development, and contextual challenges, followed by an interpretive discussion grounded in relevant literature.

Implementation of the Independent Curriculum in Senior Secondary Schools

Quantitative data from teacher surveys and document analysis indicate that the implementation of Kurikulum Merdeka in senior secondary schools is characterized by partial but growing alignment with policy intentions. Most participating schools had formally adopted the Independent Curriculum framework and demonstrated compliance with its structural components, such as the use of flexible learning outcomes, differentiated instruction plans, and project-based learning activities. Teachers reported moderate to high levels of understanding of the curriculum's philosophical foundations, particularly its emphasis on learner autonomy and competency-based learning.

However, the degree of implementation varied considerably across schools and subjects. While some teachers actively redesigned lesson plans to reflect deep learning principles and student-centered pedagogy, others continued to rely on traditional teacher-led instruction, particularly in subjects perceived as examination-oriented. This finding aligns with previous studies suggesting that curriculum flexibility does not automatically translate into pedagogical transformation without sustained professional support (Sholeh et al., 2024; Baso et al., 2024).

Qualitative interview data further revealed that teachers' interpretations of Kurikulum Merdeka were shaped by their prior experiences with centralized curricula. Many teachers expressed appreciation for the increased autonomy afforded by the Independent Curriculum, noting that it allowed them to contextualize learning materials and respond to students' interests. At the same time, some teachers reported uncertainty in balancing curriculum flexibility with accountability demands, particularly regarding assessment standards. These findings reinforce policy analyses that emphasize the importance of clear guidance and adaptive curriculum management mechanisms in ensuring consistent implementation (Lestari et al., 2023; Tunas & Pangkey, 2024).

Development of Twenty-First Century Competencies Among Students

Student survey results indicate that the implementation of Kurikulum Merdeka has a positive association with the development of twenty-first century competencies, particularly in the domains of critical thinking, collaboration, and communication. Descriptive statistics show that students generally demonstrated moderate to high levels of these competencies, with collaboration emerging as the most consistently developed skill. This outcome can be attributed to the increased use of group-based learning activities and projects embedded within the curriculum framework.

Creativity and information literacy, while positively represented, showed greater variation across schools. Students in schools that consistently implemented project-based learning and interdisciplinary projects reported higher levels of creative problem-solving and information evaluation skills. This finding is consistent with prior research highlighting the role of PjBL in fostering creativity and higher-order thinking (Pirdaus, 2024; Elvianasti & Kartikawati, 2022). Conversely, students in schools where instructional practices remained predominantly lecture-based exhibited lower self-reported creativity and information literacy, suggesting that pedagogical practices play a critical mediating role in competency development.

The results corroborate earlier studies indicating that the integration of twenty-first century skills into Indonesian senior high school education remains uneven and highly

dependent on instructional design (Anwar et al., 2024; Setiyaningtiyas, 2025). Importantly, the present study extends this literature by demonstrating that curriculum reform alone is insufficient; rather, the realization of competency outcomes depends on how the Independent Curriculum is enacted at the classroom level.

Role of Deep Learning in Enhancing Cognitive Competencies

One of the key findings of this study concerns the role of deep learning approaches in enhancing students' cognitive competencies. Quantitative analysis reveals a significant positive relationship between the use of deep learning strategies and students' critical thinking and problem-solving skills. Students who reported frequent engagement in activities involving analysis, reflection, and application of knowledge demonstrated higher levels of cognitive competence compared to those exposed primarily to surface-level learning tasks.

Qualitative data provide further insight into how deep learning is operationalized within the Independent Curriculum. Teachers who successfully implemented deep learning emphasized conceptual understanding, real-world relevance, and reflective assessment practices. These teachers reported that students became more actively engaged in learning and demonstrated greater ability to articulate reasoning and transfer knowledge across contexts. These findings align with evidence from Hadi et al. (2025), who reported that deep learning within the Independent Curriculum significantly improves students' cognitive abilities in senior high school settings.

However, the study also identified challenges in implementing deep learning consistently. Some teachers reported difficulties in designing learning tasks that balance depth with curriculum coverage, particularly in subjects with extensive content requirements. This tension reflects a broader challenge in transitioning from content-driven to competency-based education, as also noted in earlier curriculum innovation studies (Irawati et al., 2022).

Project-Based Learning as a Catalyst for Competency Development

Project-Based Learning emerged as a central pedagogical strategy supporting the development of twenty-first century competencies under Kurikulum Merdeka. Both quantitative and qualitative data indicate that PjBL contributes significantly to students' creativity, collaboration, and communication skills. Students involved in project-based activities reported increased confidence in expressing ideas, working in teams, and solving complex problems.

Teachers highlighted that PjBL provided opportunities for interdisciplinary learning and authentic assessment, enabling students to demonstrate competencies beyond traditional written tests. Document analysis of lesson plans and project reports revealed that many teachers integrated PjBL with real-world issues, aligning projects with local contexts and societal challenges. This approach resonates with the core principles of Kurikulum Merdeka, which emphasizes contextualized and meaningful learning experiences (Tunas & Pangkey, 2024).

The effectiveness of PjBL observed in this study is consistent with previous research in Indonesian education contexts (Pirdaus, 2024; Elvianasti & Kartikawati, 2022) as well as international studies highlighting the benefits of blended and interdisciplinary project-based learning (Medeiros et al., 2017). Notably, the present study demonstrates that PjBL is particularly effective when supported by curriculum flexibility and teacher autonomy, reinforcing the argument that pedagogical innovation thrives within enabling policy environments.

Integration of the Pancasila Student Profile (P5)

The integration of the Pancasila Student Profile (P5) represents a distinctive feature of the Independent Curriculum in Indonesia. Findings from this study indicate that P5 projects play a meaningful role in linking twenty-first century competencies with national values. Teachers reported that P5 projects facilitated the development of social responsibility, ethical reasoning, and cultural awareness, complementing cognitive and technical skills.

Students participating in P5 projects demonstrated increased awareness of societal issues and greater appreciation for collaboration and mutual respect. These outcomes align with findings from Amiruddin et al. (2024), who emphasized the role of P5 projects in bridging global competencies with Pancasila values. Similarly, Widarini and Suterji (2023) reported that P5 implementation contributes to character development by fostering reflective and community-oriented learning.

Nevertheless, the study also identified variability in the quality of P5 implementation. While some schools implemented comprehensive, interdisciplinary projects, others treated P5 as an additional requirement rather than an integral component of the curriculum. This inconsistency underscores the need for clearer guidelines and professional development to ensure that P5 projects effectively support both character education and competency development.

Teacher Readiness and Professional Capacity

Teacher readiness emerged as a critical factor influencing the effectiveness of Independent Curriculum implementation. Survey data indicate that teachers generally exhibited positive attitudes toward Kurikulum Merdeka, particularly its emphasis on autonomy and flexibility. However, levels of pedagogical readiness varied, with some teachers reporting limited confidence in designing competency-based assessments and integrating innovative pedagogies.

Qualitative findings suggest that teachers with prior experience in student-centered learning or participation in professional development programs were better equipped to implement Kurikulum Merdeka effectively. These teachers demonstrated greater adaptability, creativity, and willingness to experiment with new instructional approaches. In contrast, teachers with limited exposure to curriculum innovation expressed concerns about increased workload and ambiguity in curriculum guidelines.

These findings are consistent with earlier studies emphasizing the importance of teacher readiness in curriculum reform (Gurion, 2024; Sephiawardani & Bektiningsih, 2023; Nurzen, 2022). The present study extends this literature by highlighting the specific competencies required for senior secondary teachers, including assessment literacy, curriculum interpretation skills, and the ability to facilitate deep learning and PjBL.

Management and Institutional Challenges

At the institutional level, school leadership and management practices significantly influenced curriculum implementation. Schools with proactive leadership and collaborative cultures were more successful in aligning curriculum goals with classroom practices. Principals in these schools supported teachers through professional learning communities, resource allocation, and constructive feedback mechanisms.

Conversely, schools facing resource constraints or limited administrative support encountered greater challenges in implementing Kurikulum Merdeka. Teachers in these contexts reported difficulties accessing learning materials, managing large class sizes, and balancing curriculum innovation with administrative demands. These challenges echo findings from Sholeh et al. (2024), who identified management and infrastructure issues as key barriers to curriculum reform.

Synthesis and Implications

Overall, the findings of this study demonstrate that the Independent Curriculum has considerable potential to support the development of twenty-first century competencies in Indonesian senior secondary schools. When implemented effectively, Kurikulum Merdeka enables pedagogical innovation, fosters student engagement, and promotes holistic competency development. However, the realization of these outcomes is contingent upon several interrelated factors, including teacher readiness, pedagogical practices, institutional support, and contextual conditions.

The study contributes empirical evidence to the growing body of literature on curriculum reform in Indonesia, addressing a critical gap by focusing explicitly on senior secondary education. By integrating policy analysis, pedagogical practices, and competency outcomes, the findings provide a nuanced understanding of how Kurikulum Merdeka operates in practice. Importantly, the results underscore that curriculum reform must be accompanied by sustained professional development, clear implementation guidelines, and supportive leadership to achieve its intended impact.

In comparison with previous studies that focused on elementary education or higher education contexts (Budiman, 2023; Syamsulrizal et al., 2024), this study highlights the unique challenges and opportunities associated with senior secondary education. The findings suggest that targeted interventions are needed to support teachers at this level, particularly in developing assessment literacy and integrating deep learning and PjBL within academically demanding subjects.

In conclusion, the Results and Discussion presented here affirm that Kurikulum Merdeka represents a promising framework for developing twenty-first century competencies in Indonesian senior secondary schools. However, its effectiveness depends on coherent implementation strategies that bridge policy intentions and classroom realities. These insights provide a foundation for future research and inform evidence-based decision-making in curriculum development and educational practice.

CONCLUSION

This study set out to examine the implementation of the Independent Curriculum in Indonesian senior secondary schools and its role in developing twenty-first century competencies. The findings demonstrate that Kurikulum Merdeka provides a promising framework for shifting learning practices toward competency-based, student-centered education that aligns with contemporary global and national educational demands. Through increased curriculum flexibility, the emphasis on deep learning, project-based learning, and the integration of the Pancasila Student Profile, the Independent Curriculum offers meaningful opportunities for fostering critical thinking, creativity, collaboration, communication, and character development among students.

The results indicate that positive outcomes are most evident in schools where curriculum principles are translated into concrete pedagogical practices. Deep learning approaches contribute to stronger cognitive engagement and higher-order thinking, while project-based learning supports the development of social, creative, and problem-solving skills. The P5 projects further strengthen the relevance of learning by connecting global competencies with national values, reinforcing holistic student development. However, the study also reveals that these benefits are not yet uniformly realized across schools, highlighting variation in implementation quality and instructional consistency.

Teacher readiness emerges as a decisive factor in determining the effectiveness of the Independent Curriculum. While teachers generally express positive attitudes toward curriculum flexibility, differences in pedagogical competence, assessment literacy, and professional support influence their capacity to implement innovative learning strategies. At the institutional level, leadership support, collaborative school culture, and resource availability play a crucial role in sustaining curriculum reform efforts.

This study underscores that curriculum reform alone is insufficient to achieve meaningful educational transformation. The success of the Independent Curriculum depends on coherent implementation strategies that integrate policy, pedagogy, professional development, and school management. By focusing on senior secondary education, this research contributes valuable empirical insights to the ongoing discourse on curriculum reform in Indonesia and provides a foundation for future initiatives aimed at strengthening twenty-first century competency development.

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