



The Contribution of the Merdeka Curriculum in Shaping Human-Centric Skills (A Systematic Literature Review 2021-2026)

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ABSTRACT

The development of artificial intelligence has driven a shift in competency needs, moving from traditional cognitive skills toward human-centric skills: competencies that emphasize creativity, collaboration, communication, problem-solving, and emotional intelligence, which are difficult for technology to replicate. The Merdeka Curriculum is expected to prepare learners with competencies relevant to future needs. This study aims to explore the role of the Merdeka Curriculum in shaping human-centric skills through a systematic literature review (SLR). This study employed the PRISMA guidelines by searching articles indexed in the Scopus and ERIC databases published during the 2021–2026 period. Of the 112 articles identified, 31 articles met the inclusion criteria and were further analyzed. The synthesis results indicate that the Merdeka Curriculum contributes significantly to the development of human-centric skills through the implementation of the Project for Strengthening the Pancasila Student Profile (P5). The most dominantly developed dimensions are creativity and problem-solving, followed by collaboration and communication, and emotional intelligence. Nevertheless, the implementation of the Merdeka Curriculum still faces challenges related to teachers' readiness and pedagogical adaptation. On the other hand, this curriculum opens significant opportunities for creating a learning ecosystem relevant to workforce demands, technological development, and the sustainable strengthening of character education from early childhood education (PAUD) through higher education. These findings affirm that the Merdeka Curriculum holds a strategic role in preparing adaptive and competitive human resources in the era of a knowledge- and artificial intelligence-based economy.



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INTRODUCTION

The rapid development of artificial intelligence in recent years has prompted various parties to reconsider educational strategies, curricula, and pedagogies to ensure the competitiveness of the younger generation in the future job market (Lim & Lee, 2024). The advancement of artificial intelligence in automating various cognitive tasks has made human competencies, such as creativity, critical thinking, and adaptability, increasingly important to develop through education. Therefore, learning approaches need to shift from an emphasis on rote memorization toward active, interdisciplinary learning, accompanied by strengthened understanding of ethics and social sciences so that learners are able to critically analyze the implications of AI for society (George, 2023). Recent research indicates the importance of equipping students with systems thinking, interdisciplinary learning, and problem-solving under conditions of uncertainty as essential competencies for navigating the complexities of the 21st century (Khoza & Van Der Walt, 2025). This condition demands that educational institutions, from early childhood education (PAUD) through higher education, take more serious action in equipping learners with human-centric skills as graduate competencies that must be achieved, namely, abilities that are distinctly human and difficult for machines to replicate, such as creativity, the ability to collaborate, communication, problem-solving, and the effective management of emotions.

This need becomes increasingly urgent within the Indonesian context. The results of the Programme for International Student Assessment (PISA) 2022 show that Indonesia's literacy ranking rose by 5–6 positions compared to PISA 2018; however, the overall scores in all three tested domains, reading, mathematics, and science, actually declined due to the impact of the pandemic on learning (Alfaruqi & Nurwahidah, 2025). This improvement in relative ranking does not necessarily represent a substantial strengthening of Indonesian learners' human-centric skills. This condition indicates that the gap between future competency demands and students' actual achievement remains a real problem that has not been adequately resolved through previous curricular approaches. In response to this need, the Ministry of Education, Culture, Research, and Technology launched the Merdeka Curriculum as a curriculum framework that emphasizes differentiated learning, strengthening of the Pancasila Student Profile, and project-based learning through the Merdeka Belajar (Freedom to Learn) program. Conceptually, this curriculum is projected to serve as a policy instrument capable of bridging the gap between formal academic achievement and students' readiness for future competencies. This gap constitutes one of the main arguments underlying the urgency of transitioning to the Merdeka Curriculum. Various prior studies have consistently positioned the Merdeka Curriculum as a policy framework conceptually designed to strengthen 21st-century skills, including critical thinking, creativity, collaboration, and communication (Mongkau & Pangkey, 2024). Accordingly, the Merdeka Curriculum is positioned as a policy instrument that directly targets the strengthening of human-centric skills as an urgent need for Indonesia's younger generation. However, a general problem that arises is the extent to which the Merdeka Curriculum empirically contributes to the formation of human-centric skills, given its relatively recent and varied implementation across different educational levels and institutional contexts. More specifically, it remains unclear which dimensions of human-centric skills are most effectively developed through the implementation of this curriculum, as well as which factors support or hinder its effectiveness in the field.

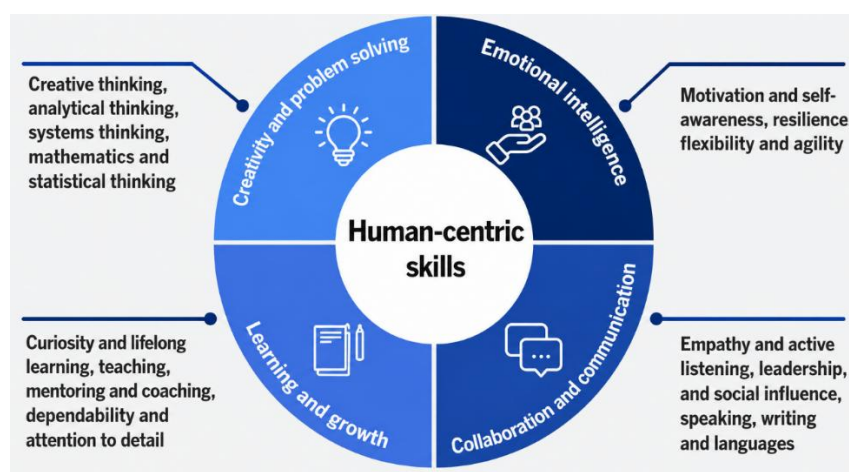


Figure 1 Human-centric skills dimensions

Conceptually, human-centric skills can be understood as an integration of higher-order cognitive dimensions (creative thinking, complex problem-solving), socio-emotional dimensions (collaboration, empathy, emotional intelligence), and communicative dimensions (communication skills) that collectively form an individual's capacity to adapt, innovate, and contribute meaningfully within work environments and social life that are increasingly disrupted by technology. The World Economic Forum, in its Future of Jobs report, consistently positions these competencies as core competencies that will be increasingly needed in the coming decade. As a policy solution, the Merdeka Curriculum offers a number of mechanisms that are theoretically relevant to the formation of human-centric skills, such as project-based learning that trains collaboration and problem-solving (Lubis et al., 2024), as well as the strengthening of the Pancasila Student Profile, which encompasses the dimensions of creativity and independent critical reasoning (Nurfalida, 2025). Although the conceptual framework of human-centric skills has been fairly well established in the international literature, research specifically examining the contribution of the Merdeka Curriculum to the formation of these competencies remains scattered and has not been systematically integrated. Most prior studies tend to

discuss the implementation of the Merdeka Curriculum in general terms or focus on a single competency dimension in isolation, without providing a comprehensive mapping of the extent to which this curriculum effectively supports the holistic formation of human-centric skills. This fragmentation of findings makes it difficult to draw comprehensive conclusions regarding the effectiveness of the Merdeka Curriculum in the context of students' readiness for future competencies.

This gap underlies the urgency and novelty of the present study. Unlike existing studies on the implementation of the Merdeka Curriculum, this article specifically targets the intersection between curriculum policy and the conceptual framework of human-centric skills through a Systematic Literature Review, which allows for a more structured, transparent, and replicable synthesis of evidence compared to conventional narrative reviews. Specifically, this study aims to conduct a Systematic Literature Review to answer the following three research questions:

1. How is the implementation of the Merdeka Curriculum described in the literature in relation to efforts to develop human-centric skills among learners?
2. Which dimensions of human-centric skills (creativity, collaboration, communication, problem-solving, emotional intelligence) are most frequently reported as being developed through the implementation of the Merdeka Curriculum?
3. What factors support or hinder the effectiveness of the Merdeka Curriculum in developing human-centric skills, based on the findings of previous studies?

By answering these three questions, this study is expected to identify emerging patterns of findings in the literature, map unresolved research gaps, and provide directions for recommendations for future research and educational policy development.

RESEARCH METHODS

This study employed the systematic literature review (SLR) method. The selected time range was 2021–2026 to capture the condition of Merdeka Curriculum implementation in the post-COVID-19 period and to ensure the recency of the data. Searches were conducted through the ERIC and Scopus databases, using a combination of Boolean search terms encompassing keyword combinations such as "Kurikulum Merdeka" (Merdeka Curriculum), "human-centric skills," "21st century skills," and their derivatives across the four pillars of soft skills. The inclusion criteria required that articles: (1) be published in English, (2) explicitly focus on the Merdeka Curriculum, and (3) discuss the development of human-centered skills or 21st-century skills through qualitative or quantitative studies, rather than literature reviews. Following the initial search, a duplicate check was performed. In the second screening phase, the eligibility of full-text versions was assessed. Articles exploring outcomes that did not fit the scope were excluded from further analysis.

RESULTS AND DISCUSSION

Table 1 Boolean search

No	Boolean search	ERIC	Scopus
1	("Kurikulum Merdeka" OR "Merdeka curriculum" OR "independent curriculum") AND ("human-centric skills" OR "human skills" OR "soft skills" OR "21st century skills") AND (contribution OR role OR impact OR effect OR implementation)	3	6
2	("Kurikulum Merdeka" OR "Merdeka curriculum") AND ("creativity" OR "problem solving" OR "emotional intelligence" OR "learning and growth" OR "collaboration" OR communication)	21	43
3	("Kurikulum Merdeka" OR "Merdeka curriculum") AND (challenge OR barrier OR opportunity OR implementation) AND ("human-centric skills" OR "soft skills" OR "21st century skills" OR creativity OR "emotional intelligence" OR collaboration))	10	23
4	("Kurikulum Merdeka" OR "Merdeka curriculum") AND ("21st century skills" OR "soft skills" OR "human-centric skills") AND (implementation OR impact OR role OR challenge)	1	5

Exclusion and Inclusion Criteria

The inclusion and exclusion criteria were organized into two stages, corresponding to the screening phases. In the first stage (title and abstract screening), articles were considered for progression to the next stage if they met all of the following criteria: (1) published in English and indexed in ERIC or Scopus within the 2021–2026 range; (2) the title, abstract, or keywords explicitly referred to the Merdeka Curriculum (or variations of the term); and (3) the topic related to the development of human-centric skills/soft skills as reflected in the keywords listed in Table 1. Articles were excluded at this stage if they were editorials, opinion pieces, book reviews, or conference abstracts without full text. In the second stage (full-text screening), the full text of articles that passed the first stage was retrieved and assessed for eligibility based on the following criteria: (1) the title or abstract explicitly mentioned the Merdeka Curriculum; and (2) the study involved a qualitative or quantitative examination of Merdeka Curriculum implementation that substantively related to at least one dimension of human-centric skills (creativity and problem-solving, emotional skills, lifelong learning, or collaboration and communication), rather than being a literature review or other type of review. Articles were excluded at this stage if: (a) they discussed the implementation of the Merdeka Curriculum in general terms without addressing human-centric skills aspects; (b) the outcomes explored did not correspond to the four pillars of human-centric skills; or (c) no relevant content was found in the abstract, results, or discussion sections after full-text examination. The search results from both databases were combined, and a duplicate check was performed to remove articles found in multiple databases; all duplicate entries were then deleted. The remaining articles were subsequently screened in stages according to the inclusion and exclusion criteria described above. The number of articles at each stage, from the initial identification of 112 articles to the final 31 articles that met all criteria and were further analyzed, is reported in the PRISMA flow diagram (Figure 2).

RESULTS AND DISCUSSION

The initial literature search across the various databases yielded a total of 112 articles. The first stage of screening involved identifying and removing duplicate articles, with 47 articles removed. Following this, an initial screening process based on the relevance of titles and abstracts was conducted on the remaining 65 articles. At this stage, 19 articles were excluded for not aligning with the focus of the study, leaving 46 articles as reports sought for retrieval. Of these, 9 articles could not be retrieved in full text (not retrieved), leaving 35 articles that proceeded to the eligibility assessment stage (assessed for eligibility).

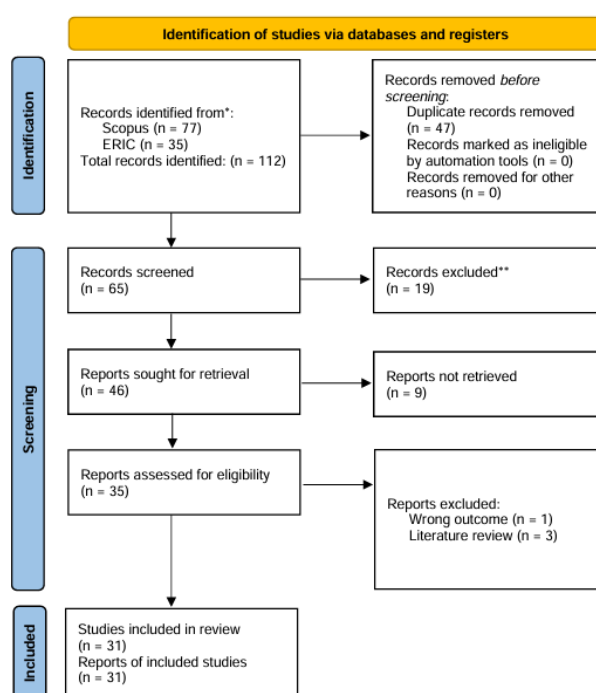


Figure 2 PRISMA diagram

Based on the full-text analysis of the 31 articles using strict inclusion and exclusion criteria, 1 article was excluded due to wrong outcome, and 3 articles were excluded for being literature reviews and bibliometric studies. The excluded article discussed the variable of communication, but within the context of structural policy information flow between bureaucracies. Therefore, a total of 31 articles were determined to meet all inclusion criteria and were selected for data extraction, in-depth review, and synthesis in this systematic literature review (SLR).



Table 2 Summary of reviewed articles

No	Research Title	Author(s)	Research Objective	Method	Summary of Findings (Human-centric skills)
1	Fostering Character Education through Community-Based Socialpreneurship Initiatives among High School Students in Banda Aceh	Nizariah, Suhendrayatna, Aulia, M., & Sulastri. (2025).	To explore character formation through socialpreneurship at the high school level.	Qualitative (descriptive-interpretive)	Real social and charity projects train emotional intelligence (empathy), collaboration, creativity, and problem-solving.
2	Acculturation of religious values in early childhood: Central Sulawesi Educational Institutions	Masdul, M. R., Pajariantio, H., Rajindra, R., Ahmad, J., Kuliawati, K., & Rahmawati, R. (2024).	To explore the inculcation of religious values in early childhood education (PAUD).	Qualitative (Discovering Cultural Themes)	The theme of play accommodates collaboration and communication skills, facilitates creativity, and fosters emotional intelligence.
3	Promoting global citizenship through Kurikulum Merdeka: Indonesian primary school teachers' perspectives	Utami, N. A. B., Dewi, R., & Kusakabe, T. (2025).	To examine the principles of Global Citizenship Education through the P5 program.	Qualitative (case study)	Collaborative projects develop communication, creativity, cross-cultural appreciation, empathy, and critical thinking.
4	Communicating Gender Equality: Critical Analysis of Gendered Language in Social Science Textbooks for Alpha Generation	Purnomo, A. M., Fauziah, R. S. P., Martin, A. Y., Roestamy, M., Nita, K. S. R., & Warizal. (2025).	To analyze gender equality messages in social studies textbooks for Generation Alpha.	Mixed-methods	Gender bias in textbooks remains a challenge in shaping emotional intelligence related to social justice.
5	The role of industry to unlock the potential of the Merdeka curriculum for vocational school	Yoto, Marsono, Suyetno, A., Mawangi, P. A. N., Romadin, A., & Paryono. (2024).	To analyze the role of industry collaboration in the Merdeka Curriculum at the vocational school level.	Mixed-methods	Work ethic from industry enhances discipline, independence, inquiry, problem-solving, creativity, and close communication.
6	Implementing the Pancasila Student Profile through the Merdeka	Harjanti, F. D., Suhartono,	To examine the implementation of the Pancasila Student Profile within the framework of SDG 4.	Qualitative (exploratory)	The primary school level focuses on empathy and collaboration, while junior/senior high school levels focus on

No	Research Title	Author(s)	Research Objective	Method	Summary of Findings (Human-centric skills)
	Curriculum: A case study from Surabaya in advancing SDG 4	Ardiansyah, R., & Suryandari, S. (2026).			creativity, problem-solving, innovation, and autonomy.
7	Evaluating Analytic Rubric Quality for Assessing Pre-Service Biology Teachers' Creative Thinking Skills	Pada, A. U. T., Yulisman, H., & Melvina. (2025).	To validate an assessment rubric for creative thinking skills for pre-service teachers.	Quantitative (expert and empirical testing)	Assessment shifts toward divergent creativity assessment covering solution fluency, flexibility, originality, and practical feasibility.
8	Empowering sustainable agriculture education through hydroponic literacy: insights from Indonesia's Merdeka Curriculum	Khastini, R. O., & Maryani, N. (2025).	To explore the integration of hydroponic education literacy in secondary schools.	Mixed-methods	Hydroponic projects foster team collaboration, independent problem-solving, creativity, and students' environmental awareness.
9	Digital geometry worksheets with an agro-tourism context: A catalyst for rational thinking in generation alpha	Aisyah, N., Hapizah, Meryansumayeka, & Maat, S. M. (2026).	To develop digital mathematics (geometry) teaching materials based on an agrotourism context.	Design research	Interaction with real-world contexts is shown to train problem-solving, logical reasoning, and critical argument communication.
10	Schools' support in the implementation of the Emancipated Curriculum in secondary schools in Indonesia	Rohmah, Z., Hamamah, H., Junining, E., Ilma, A., & Rochastuti, L. A. (2024).	To investigate the forms of school leadership support provided to secondary school teachers.	Mixed-methods	The formation of independence, creativity, and critical thinking is often hindered when teachers do not receive facility and emotional support from the school.
11	Bridging musical gaps: creating educational songs with thematic learning for primary school students	Wadiyo, W., Haryono, S., Wiyoso, J., & Malarsih, M. (2024).	To examine the creation of thematic educational songs by primary school teachers to support the Merdeka Curriculum.	Qualitative case study	The use of thematic songs triggers active participation and enthusiasm (emotional intelligence), classroom harmony (collaboration), and fosters students' creativity and critical thinking.
12	Empathetic pedagogy in national history learning: A strategy for developing reflective history learning for 21st century competencies in the context of Merdeka curriculum implementation in Indonesia	Susanto, H., Sariyatun, & Djono. (2026).	To develop reflective history learning strategies for achieving 21st-century competencies within the context of the Merdeka Curriculum.	Formative research / Mixed-methods	Reflective pedagogy effectively enhances emotional intelligence (historical empathy, tolerance, bullying prevention), and trains collaboration, communication, and problem-solving.
13	Management strategies for strengthening the Indonesian Pancasila student profile to enhance character education in the 21st century	Wibisono, M. I. Y., Hariyati, N., & Nursalim, M. (2026).	To analyze school management strategies in implementing P5 for character education in vocational schools.	Qualitative multi-site case study	Systematic P5 project management trains emotional intelligence (moral commitment, empathy), learning independence and growth, as well as mutual cooperation (collaboration).

No	Research Title	Author(s)	Research Objective	Method	Summary of Findings (Human-centric skills)
14	Analysis of SOLO taxonomy-based test instruments in approaching the Merdeka curriculum	Yuanita, P., Maimunah, M., Kartini, K., & Arif, N. (2023).	To develop a SOLO taxonomy-based mathematics ability test instrument under the Merdeka Curriculum.	Formative (quantitative) research	The use of this instrument encourages higher-order analytical ability, which directly trains problem-solving, rational creativity, and analytical independence.
15	Development and Validation of a Physical Activity-Based Freedom of Movement in Kindergarten	Hidayat, A. K., Setyawati, H., Hidayatullah, F., & Hartono, M. (2024).	To develop and validate a physical activity-based freedom-of-movement learning model for kindergarten children.	Design-Based Research (DBR)	This model is shown to stimulate creativity and imagination, collaboration (playing and cooperating), as well as emotional and social-cognitive intelligence from an early age.
16	Feasibility Assessment of Merdeka Curriculum in Bahasa Indonesia Digital Textbooks for Class VII Junior High Schools	Wardani, N. E., Suwandi, S., & Ulya, C. (2023).	To assess the feasibility of digital Bahasa Indonesia textbooks for Grade VII used in the Merdeka Curriculum.	Descriptive qualitative	The textbook material is designed to directly train communication, collaboration, problem-solving, and creativity skills, and to encourage learning independence through interactive media.
17	Exploring Teachers Challenges in Implementing Literacy and STEAM in Early-Childhood Classrooms	Suharni, Mohamed, S., & Bakar, K. A. (2025).	To explore teachers' challenges in integrating literacy and STEAM in early childhood classrooms.	Qualitative case study	The STEAM framework fosters scientific inquiry, creativity, and problem-solving, but its development is often hindered by teachers' limited knowledge and facilities.
18	The Level of Teacher Creativity in Developing Digital Learning Materials on Learning Management System	Marmoah, S., Sukmawati, F., Poerwanti, J. I. S., Supianto, Yantoro, & Nafisaha, A. (2024).	To investigate primary school teachers' creativity in developing digital learning materials (LMS) and its impact on learning outcomes within the Merdeka Curriculum.	Mixed-methods	Through the LMS and related projects, students learn independently while actively participating in groups, which fosters collaboration, reasoning, and problem-solving.
19	Application of Ethno-Pragmatics Learning Strategies in Indonesian Subjects in High School: A Case Study on the Independent Curriculum	Widiasri, D. A., Gunartha, I. W., Fitri, N., & Farhan, R. S. (2023).	To apply ethno-pragmatic learning strategies in Bahasa Indonesia subjects within the Merdeka Curriculum to address learning barriers and strengthen text comprehension.	Descriptive qualitative	This strategy stimulates communication and collaboration, trains empathy through linguistic politeness, and fosters learning independence through active participation in problem-solving.
20	Needs Analysis for a STEM Discovery Learning-Based E-Module in Static Electricity	Udyaningsih, P. S., Suharno, & Budiawanti, S. (2024).	To analyze the needs for developing a STEM Discovery Learning-based e-module on static electricity.	Quantitative descriptive (survey)	The e-module is specifically designed so that students reason actively, thereby training problem-solving, critical thinking, and collaboration skills among students.
21	Enhancing 21st-Century Skills through Blended Problem-Based	Fitria, D., Asrizal, A., & Lufri, L. (2025).	To develop an ethnoscience-integrated Blended Problem-	Mixed-methods (R&D)	This model significantly enhances the pillars of creativity, critical thinking

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	Learning with Ethnoscience Integration: A Mixed-Methods Study in Indonesian Junior High Schools		Based Learning model to enhance 21st-century skills in junior high school.		(problem-solving), and communication, and fosters emotional intelligence and collaboration through local cultural content.
22	Lecturer's perception of case-based learning in higher education	Dewi, C. A., Rahayu, S., Muntholib, M., & Parlan, P. (2024).	To evaluate lecturers' perceptions of the implementation of the Case-Based Learning (CBL) strategy in higher education.	Quantitative survey	The in-depth case-analysis strategy encourages student independence and actively trains problem-solving, creativity, communication, and group collaboration skills.
23	Bridging policy and practice: Evaluating the curriculum effectiveness in fostering religious moderation and 21st-century competencies	Syam, A. S. M., & Ishak. (2025).	To evaluate the effectiveness of implementing the P5-PPRA program within the Merdeka Curriculum at madrasahs.	Mixed-methods (CIPP Evaluation)	Project-based learning (P5-PPRA) effectively instills communication, teamwork (collaboration), and problem-solving, but the formation of emotional intelligence still requires ongoing assessment.
24	Strengthening teacher competence for leading and sustaining the implementation of the Merdeka Curriculum	Kusumawati, E., Suswandari, & Umam, K. (2025).	To evaluate the impact of Merdeka Curriculum implementation on teacher competence in Indonesia.	Phenomenological qualitative	Empathy and adaptive communication from teachers create an inclusive space that supports students in exploring their creativity, critical thinking, and character growth.
25	A Correlational Study: Pedagogical and professional competence of physical education teachers in relation to the implementation of the Merdeka curriculum	Umar, Ockta, Y., & Mardesia, P. (2023).	To examine the relationship between physical education teachers' pedagogical and professional competence and the implementation of the Merdeka Curriculum.	Correlational quantitative survey	Teachers' success in facilitating student independence for creative, critical (problem-solving), and collaborative thinking is highly dependent on improving their competence in adapting the curriculum.
26	Transforming Islamic Education: The Role of Islamic Religious Education (IRE) Teacher Leaders in Designing Learning Materials at Lhokseumawe Junior High Schools	Rahmah, S., Diana, Vargheese, K. J., Fitriani, & Dayusman, E. A. (2025).	To analyze the role of PAI (Islamic Religious Education) Guru Penggerak (mobilizing teachers) in designing, adapting, and evaluating contextual learning media.	Exploratory qualitative	Integration of locally-charged media facilitates students' social interaction and empathy, but efforts to develop these skills are constrained by limited collaboration and digital literacy among teachers.
27	Transforming Music Education: Evaluating the Impact of the Merdeka Curriculum in Arts Education	Munaf, Y., Ayu, R. P., Akmal, A., Iswandi, Efi, A., &	To evaluate the impact of the Merdeka Curriculum on music arts education in junior high school in fostering creativity,	Descriptive qualitative	The flexible ensemble project approach proves highly effective in fostering creativity, problem-solving (critical thinking), and collaboration, as well as

No	Research Title	Author(s)	Research Objective	Method	Summary of Findings (Human-centric skills)
		Novaliendry, D. (2025).	critical thinking, and collaboration.		independently training students' communication.
28	Student's creative thinking based on study level, learning style, gender, and combination of the three	Musdi, E., As'ari, A. R., Harisman, Y., Syaputra, H., & Hevardani, K. A. (2024).	To investigate the comparison of students' creative thinking abilities based on study level, learning style, and gender in order to determine learning evaluation priorities.	Descriptive quantitative	Differentiated learning in the Merdeka Curriculum facilitates the formation of creativity and problem-solving skills specifically tailored to each individual's unique learning style needs.
29	Cultivating Creativity and Responsibility through the Mandalika Friday Program in the Merdeka Curriculum	Wildan, Satriawan, L. A., & Kurniawan, R. A. (2025).	To evaluate how the Mandalika Friday Program fosters students' creativity, responsibility, and entrepreneurial skills.	Qualitative case study	Cultural appreciation and entrepreneurship activities are highly effective in stimulating creative innovation, empathy (emotional intelligence), teamwork (collaboration), independence, and student responsibility.
30	Pedagogical Model Innovation Based on Ki Hajar Dewantara's Among System for History Learning in the Merdeka Curriculum	Rosanawati, I. M. R., Warty, W., Djono, D., & Purwanta, H. (2025).	To examine the integration of the Among System into the framework of the Merdeka Curriculum to foster critical thinking, collaboration, and contextual understanding of history.	Descriptive qualitative	Integration of the Among System and PjBL stimulates students' learning independence, trains critical historical analysis, and strongly requires collaboration and communication competence through group project work.
31	Instrument for Assessing Project-based Problem-solving Skills in Biotechnology: Analysis of Practicality and Effectiveness	Ningsih, K., Yuniarti, A., Faturrahman, M. A., & Hidayat, F. (2024).	To analyze the practicality and effectiveness of a project-based assessment instrument for measuring problem-solving skills in biotechnology material.	Development research (4D Model)	Project-based assessment guides students to design solutions to real-world problems, which significantly enhances analytical (problem-solving) ability, product creativity, learning autonomy/independence, and teamwork.

This study aims to identify how the implementation of the Merdeka Curriculum contributes to shaping human-centric skills. The focus of the selected literature represents a multidimensional research niche spanning various levels of education, from Early Childhood Education (PAUD) to Higher Education. Empirically, these articles examine structured practices and methods within the Merdeka Curriculum that have been shown to significantly develop learners' 21st-century competencies, particularly in the pillars of creativity, problem-solving, emotional intelligence, learning independence, as well as collaboration and communication.

Bibliometric Analysis

The results of the bibliometric analysis using VOSviewer produced a keyword network map consisting of several thematic clusters, with "merdeka curriculum" as the most dominant node, positioned centrally. The largest node size and its connectivity to all clusters indicate that the Merdeka Curriculum has been the primary focus of Indonesian educational research throughout the 2021–2026 period.

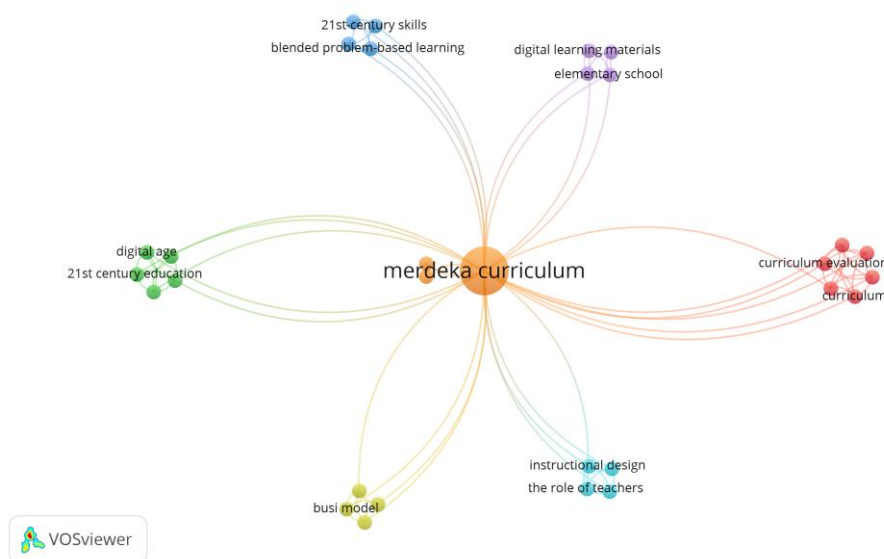


Figure 3 Network visualization

This central position indicates that various contemporary educational issues, ranging from the development of 21st-century skills, digital transformation, and learning design, to curriculum evaluation are positioned as integral parts of Merdeka Curriculum implementation. This finding suggests that the Merdeka Curriculum is not only regarded as a national education policy, but also as a strategic instrument for preparing human resources capable of facing social, economic, and technological changes in the new economic era. Previous studies have also shown that the Merdeka Curriculum is designed to promote more flexible, student-centered learning oriented toward strengthening 21st-century competencies. The first cluster reveals the interconnection between the keywords "curriculum," "curriculum evaluation," and "curriculum studies." The presence of this cluster indicates that researchers' attention remains largely directed toward aspects of the implementation and evaluation of Merdeka Curriculum policy. This can be understood given that the curriculum is still in a phase of strengthening and refining its implementation across various educational institutions. The high frequency of evaluative research indicates a need to identify policy effectiveness, school readiness, and its impact on the learning process. In other words, the research focus is not limited to learning outcomes alone, but also encompasses how the curriculum is implemented and adapted within diverse educational contexts. This finding is consistent with various studies that highlight the importance of evaluating

Merdeka Curriculum implementation as an effort to ensure the achievement of national education reform goals.

The next cluster connects the keywords "21st century education," "digital age," and "independent learning." This cluster indicates that research on the Merdeka Curriculum is closely tied to the demands of 21st-century education, which requires learners to possess independent learning abilities, adapt to technological change, and develop lifelong learning competencies. The strong relationship among these three keywords suggests that researchers view the Merdeka Curriculum as a response to the demands of the digital economy, which increasingly emphasizes flexibility, creativity, and the capacity for continuous learning. Within the context of the new economy, individual success is no longer determined solely by mastery of technical knowledge, but also by the ability to continuously learn, adapt, and innovate. Therefore, the emergence of the keyword "independent learning" indicates that the concept of freedom to learn (*kemerdekaan belajar*) serves as an important foundation in the formation of human-centric skills.

Another prominent cluster is the connection between "21st-century skills" and "blended problem-based learning." The presence of this cluster shows that the development of 21st-century skills is one of the primary focuses of research related to the Merdeka Curriculum. Twenty-first-century skills generally encompass critical thinking, creativity, communication, and collaboration, often referred to as the 4C competencies. In the VOSviewer network, the direct connection between these keywords and the main node indicates that the Merdeka Curriculum is regarded as a means of developing the competencies required for the future world of work. The use of a problem-based learning approach combined with digital learning also reflects a paradigm shift from knowledge-transfer-based learning toward learning based on real-world problem-solving. This shift is highly relevant to the demands of the new economy, which requires workers capable of adapting to problem complexity and rapidly changing work environments.

In addition, the visualization also shows a cluster consisting of the keywords "digital learning materials" and "elementary school." This cluster indicates that digital transformation in the implementation of the Merdeka Curriculum has become a research focus, even at the primary education level. The emergence of the digital teaching materials theme shows that technology is regarded not only as a learning aid, but also as a means of building learners' digital competencies from an early age. This condition indicates an awareness that digital skills constitute an important component of human-centric skills needed in the knowledge-based economy era. Accordingly, the integration of technology in the Merdeka Curriculum aims not only to improve learning effectiveness, but also to prepare learners to face an increasingly digitalized work ecosystem.

Furthermore, the cluster consisting of "instructional design" and "the role of teachers" shows that teachers still hold a central role in the successful implementation of the Merdeka Curriculum. Although this curriculum emphasizes student-centered learning, the visualization results indicate that research continues to position teachers as agents of educational transformation. Teachers are no longer positioned as the sole source of knowledge, but rather as facilitators, mentors, and designers of learning experiences that enable learners to optimally develop their potential. The close relationship between instructional design and the role of teachers indicates that the success of human-centric skills formation is significantly influenced by teachers' ability to design learning that is contextual, collaborative, and problem-solving-oriented. This finding reinforces the view that curriculum reform must be accompanied by enhanced teacher capacity in order for learning objectives to be effectively achieved.

The final cluster, containing the keywords "high school education" and "business model," indicates attention to the application of the Merdeka Curriculum at the secondary education level as a preparatory stage toward higher education and the workforce. Although this cluster is relatively small in size compared to the others, its presence shows that the issue of career readiness and learner competency development is beginning to receive research attention. This is relevant to the primary goal of the Merdeka Curriculum, which seeks to produce graduates who possess not only academic ability, but also skills that align with the needs of society and the future world of work.

The Contribution of the Merdeka Curriculum in Shaping Human-Centric Skills

Based on the synthesis of the 31 articles evaluated, the Merdeka Curriculum makes a tangible contribution to shaping human-centric skills through a paradigm shift from teacher-centered to student-centered learning. The largest contribution is derived from the implementation of Project-Based

Learning (PjBL) and the application of the Project for Strengthening the Pancasila Student Profile (P5). P5 is a project-based co-curricular activity designed to strengthen efforts to achieve competencies and character in accordance with the Pancasila student profile, which is developed based on the Graduate Competency Standards (Aulia, 2023). The values embedded within P5, such as mutual cooperation (*gotong royong*), global diversity, independence, critical reasoning, and creativity, directly represent local manifestations of the pillars of human-centric skills. Activities within P5 consist of contextual thematic projects. Learners are given greater space to collaborate, empathize with environmental or social issues in their surroundings, and seek innovative solutions that require emotional intelligence and effective communication. The constructivist approach has been shown to facilitate social interaction that fosters learners' independence and sense of empathy (Waistabarroki, 2025). This curriculum provides the flexibility that enables the integration of contextual education, such as the integration of ethnoscience (Fitria et al., 2025), agrotourism literacy (Aisyah et al., 2026), and empathetic pedagogy (Susanto et al., 2026), which compels learners to employ higher-order thinking to address real-world problems.

Pillars of Human-Centric Skills in the Implementation of the Merdeka Curriculum

To answer the second research question, all four pillars of human-centric skills were found to be comprehensively distributed across the literature, with the findings detailed as follows:

1. Creativity and Problem Solving: This pillar emerged as the most dominant. The articles consistently highlight improvements in divergent thinking (Pada et al., 2025), rational thinking for Generation Alpha (Aisyah et al., 2026), as well as the ability to seek solutions to real-world problems (Ningsih et al., 2024). The development of STEM-based digital teaching materials (Udyaningsih et al., 2024) and initiatives such as social entrepreneurship (socialpreneurship) programs further strengthen students' analytical capacity (Nizariah et al., 2025).
2. Collaboration and Communication: This pillar is strongly driven through teamwork within P5. The literature shows that from the PAUD level (playing and cooperating) through vocational high schools (SMK) and MBKM programs in higher education (case-based industry interaction), students are required to engage in assertive communication, build cooperative group interactions, and develop global citizenship awareness.
3. Emotional Intelligence: Character formation is a core value within the Pancasila Student Profile. Discussions on emotional intelligence are represented through the cultivation of empathy, religious moderation, and caring attitudes through the Jumat Mandalika program (Wildan et al., 2025), as well as anti-bullying strategies implemented through empathetic pedagogy.
4. Learning and Growth: The Merdeka Curriculum fosters independence through interactive media (Wardani et al., 2025). The literature evaluation found that the integration of local values can facilitate learners' social interaction and empathy (Rahmah et al., 2025).

Challenges and Opportunities in Implementing the Merdeka Curriculum for Strengthening Human-Centric Skills

In strengthening human-centric skills through the implementation of the Merdeka Curriculum, the literature identifies both challenges and opportunities. The primary challenge centers on teacher competency readiness (Suharni et al., 2025). Designing differentiated learning materials integrated with STEM, developing assessment instruments centered on problem-solving (formative analytical rubrics), and shifting away from conventional lecture-based methods require substantial time and support. In addition, there is a need to analyze e-module facilities and digital infrastructure to support the competencies of Generation Alpha (Purnomo et al., 2025). On the other hand, the opportunities created are highly promising. The Merdeka Curriculum has successfully opened the door to stronger collaboration between schools and industry (particularly for vocational education/SMK) in addressing real-world case studies (Yoto et al., 2024). This policy also presents opportunities for integrating local culture into teaching materials, which has proven effective in enhancing learning motivation. The alignment between student competencies and the SDGs creates an educational ecosystem that is more inclusive, relevant, and resilient to the dynamics of the digital era.

Based on the limitations of this study, several recommendations are proposed for future research. First, the literature search in this study was limited to the Scopus and ERIC databases as well

as English-language articles. Future research is recommended to expand the search to other databases (such as Web of Science) and to include Indonesian-language literature to capture a more representative implementation context. Second, most of the studies reviewed are qualitative and descriptive in nature; quantitative or mixed-methods research employing valid and reliable measurement instruments is needed to empirically measure the level of achievement of each dimension of human-centric skills as an impact of Merdeka Curriculum implementation. Third, the findings indicate that the dimensions of emotional intelligence and collaboration remain underrepresented compared to creativity and problem-solving. Future research needs to give greater attention to these two dimensions, including specific pedagogical strategies for developing them. Fourth, given that teacher readiness challenges were repeatedly identified as a hindering factor, future research is recommended to explore effective capacity-building and teacher training models to support the implementation of the Merdeka Curriculum.

CONCLUSION

The Merdeka Curriculum has proven to be a highly relevant education policy instrument for addressing the challenges of the 21st-century new economy. This curriculum is highly effective in internalizing human-centric skills into students' learning experiences. The pillars of creativity, problem-solving, collaboration, and emotional intelligence have been successfully integrated through Project-Based Learning and the Pancasila Student Profile framework. The greatest challenge in implementing the Merdeka Curriculum lies in equalizing teachers' pedagogical competencies and creating differentiated learning. On the other hand, however, the opportunities offered by this curriculum are capable of producing graduates who are not only cognitively excellent, but also possess adaptive moral and social resilience.

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