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INNOVATION IN EDUCATIONAL TECHNOLOGY TO ENHANCE STUDENT LEARNING ACHIEVEMENT IN THE ERA OF THE MERDEKA CURRICULUM

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Abstract

This paper explored the implementation of educational technology as an innovative approach to improve student learning achievement within the context of the Merdeka curriculum. The study focused on the past experiences and outcomes of integrating educational schools successfully utilized online learning platforms and mobile applications to enhance student engagement, motivation, and learning outcomes. Online learning was introduced, providing students with easy access to learning materials and resources. Teachers were trained to utilize the platform and effectively provide online support to students. The implementation of the platform resulted in increased student engagement, motivation, and the flexibility to adapt learning to their own pace. The application facilitated independent and collaborative learning, enabling students to interact with teachers and classmates; implementing the mobile application led to improved student motivation, engagement, and overall learning achievement. The findings from these highlights the significance of adequate technological infrastructure, teacher training, integration of technology into lesson plans, and regular evaluation for effective implementation. These factors contribute to enhancing student learning achievement in the Merdeka curriculum era.

Keywords: *educational technology, student learning achievement, innovation, online learning platforms, mobile applications.*

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INTRODUCTION

Research on the role of technology in education is essential for several reasons. Firstly, technology has the potential to significantly enhance learning outcomes by providing personalized and interactive learning experiences (Wekerle et al., 2022). Using technology, students can engage in self-paced learning, access a wide range of digital resources, and receive immediate feedback. These aspects contribute to deeper understanding, improved knowledge retention, and overall academic achievement. Secondly, technology can bridge the education gap by providing access to quality education in remote or underserved areas (Mavangere et al., 2022). Online learning platforms, digital resources, and virtual classrooms break geographical barriers and ensure that all students have equal education opportunities. This is particularly important in areas where traditional educational infrastructure may be lacking.

Furthermore, technology can engage and motivate students in their learning journey. Innovative technologies, such as gamification, augmented reality (AR), and virtual reality (VR), make learning interactive, immersive, and enjoyable. By incorporating elements of play and exploration, technology fosters student engagement and intrinsic motivation, which leads to improved learning outcomes (Frasson, 2021, September). In addition, integrating technology into education fosters the development of 21st-century skills essential for success in the modern workforce. These skills include critical thinking, problem-solving, collaboration, and digital literacy. Technology tools and resources provide opportunities for students to develop and apply these skills authentically and meaningfully, preparing them for future challenges (Erdoğan, 2019).

Moreover, educational technology empowers teachers by streamlining administrative tasks, providing data-driven insights, and supporting differentiated instruction. With technology, teachers can personalize learning experiences, create engaging lesson plans, and track student progress more efficiently. This empowers teachers to cater to the diverse needs of their students and optimize their teaching strategies (Liu et al., 2019). Additionally, research on educational technology helps education systems keep pace with technological advancements. Researchers can identify their potential applications in education by exploring emerging technologies such as artificial intelligence (AI), machine learning, and data analytics. This knowledge enables educators to effectively make informed decisions about integrating new technologies and prepares students for the necessary skills (Jaiswal & Arun, 2021).

Finally, research on the role of technology in education informs policymakers, education leaders, and practitioners. Evidence-based research provides valuable insights into the effectiveness of educational technology and informs the development of policies, guidelines, and best practices. This ensures that decisions regarding technology adoption are grounded in data and contribute to positive educational outcomes (Allison, 2022). In conclusion, research on the role of technology in education is essential for enhancing learning outcomes, bridging educational gaps,

fostering 21st-century skills, empowering teachers, keeping pace with technological advancements, and informing policy and practice. By exploring the potential of educational technology, researchers contribute to advancing education systems that meet the needs of learners in the digital age (Kong et al., 2014).

The "Merdeka" curriculum is an innovative approach that empowers students to take control of their learning journey. It emphasizes autonomy, allowing students to shape and direct their educational experiences according to their interests and needs. By enabling students to choose their learning materials, methods, and styles, the "Merdeka" curriculum aims to foster creativity, active engagement, and problem-solving skills, allowing them to acquire knowledge that is both meaningful and applicable to their daily lives (Lestari, 2023).

A set of fundamental principles guides the "Merdeka" curriculum. Firstly, it upholds the principle of freedom, which gives students the liberty to make informed choices throughout their learning process (Kennedy, 2021). This freedom enables students to explore their interests, delve into topics that inspire them, and engage in self-directed learning. Secondly, the curriculum strongly emphasizes student engagement, encouraging active participation in planning, implementing, and evaluating their learning experiences. By involving students in these processes, they become more invested in their education, leading to increased motivation and more profound understanding (Plass & Kalyuga, 2019).

Problem-based learning is another central principle of the "Merdeka" curriculum. This approach focuses on real-world problem-solving, enabling students to apply their knowledge and skills to tackle authentic challenges relevant to their lives. It encourages critical thinking, creativity, and collaboration as students work individually or in groups to find innovative solutions. Additionally, collaboration is emphasized as a critical principle, fostering teamwork and cooperative learning. By collaborating with peers, students develop interpersonal skills, learn from different perspectives, and collectively achieve shared learning objectives. Lastly, the "Merdeka" curriculum acknowledges the importance of utilizing local resources. It recognizes that the local environment, community, and culture hold valuable educational opportunities (Norawati & Puspitasari, 2022). By incorporating local resources, examples, and contexts, the curriculum enhances the relevance and authenticity of students' learning experiences. This approach enriches their understanding and fosters a sense of appreciation and connection to their surroundings.

However, the implementation of the "Merdeka" curriculum presents several challenges. One of the main challenges is the need for a paradigm shift in the existing educational system. This requires a change in mindset and practices for teachers and students as they transition from more traditional instructional methods to a student-centered approach (Irawati al., 2022). Adequate teacher competencies are crucial in this transition, as educators must possess the necessary skills to design, facilitate, and support self-directed and collaborative learning experiences. Providing teachers with

comprehensive training and professional development opportunities is vital to overcome this challenge and ensure effective implementation (Liebech-Lien, 2020). Another challenge is ensuring sufficient infrastructure and resources to support the "Merdeka" curriculum. Access to technology, diverse learning materials, and suitable learning environments are essential. Providing equitable access to these resources can be a significant hurdle, particularly in underserved areas or regions with limited infrastructure. Overcoming this challenge requires investment in educational infrastructure and developing strategies to bridge the digital divide (Mabsutsah et al., 2023).

Furthermore, adapting evaluation and assessment practices to align with the principles of the "Merdeka" curriculum poses a significant challenge. Traditional assessment forms may need to adequately capture the multifaceted learning experiences and outcomes of self-directed and collaborative learning. Implementing portfolio-based assessments, competency measurements, and alternative forms of evaluation that align with the principles of the curriculum is essential to accurately assess student progress and growth (Cirocki & Anam, 2021).

In conclusion, the "Merdeka" curriculum offers a student-centered and personalized approach to education. However, its successful implementation requires addressing challenges related to paradigm shifts, teacher competencies, infrastructure and resource availability, and evaluation and assessment practices. By effectively overcoming these challenges, the "Merdeka" curriculum can unlock the potential for increased student engagement, improved problem-solving abilities, and meaningful learning experiences (Simamora & Pasaribu, 2023).

RESEARCH METHODOLOGY WITHIN THE LITERATURE REVIEW DESIGN

The research methodology adopted for investigating the enhancement of student learning achievement through innovative educational technology in the era of the Merdeka curriculum is underpinned by a systematic and strategic approach. This section outlines the methodological framework encompassing the selection and analysis of relevant literature, ensuring a comprehensive exploration of the subject matter.

Literature Selection

The foundation of this study is laid upon a rigorous literature selection process. A judicious approach is employed to identify scholarly sources that align with the central theme of innovation in educational technology and its impact on student learning achievement within the context of the Merdeka curriculum. Diverse sources including academic books, peer-reviewed journal articles from national and international platforms, research reports, and relevant publications are meticulously reviewed to ensure their relevance and credibility (Kaur et al., 2021).

Data Collection and Analysis

The data collection process involves the systematic compilation of literature that addresses the nexus between educational technology innovation and student learning enhancement. Pertinent research findings, theoretical frameworks, empirical evidence, and case studies are extracted from selected sources. These extracted data are then meticulously analyzed using a thematic approach to unveil patterns, trends, and insights that underscore the interplay between innovative educational technology and student learning outcomes (Kelly et al., 2014).

Thematic Analysis

Thematic analysis emerges as a robust method to dissect the extracted literature. It involves the iterative process of identifying recurring themes, concepts, and relationships within the selected sources. Through this method, the qualitative insights gleaned from diverse sources are synthesized, providing a cohesive narrative that encapsulates the multifaceted impacts of educational technology innovation on student learning achievement (Braun & Clarke, 2006).

Comparative Examination

To ensure comprehensive coverage, the selected literature is subjected to a comparative examination. This involves the meticulous juxtaposition of findings, methodologies, and viewpoints from various sources. The objective is to uncover both convergent and divergent perspectives on how innovative educational technology influences student learning achievement within the context of the Merdeka curriculum (Torres, 2012).

Gap Identification and Synthesis

Integral to this research methodology is the identification of gaps within the existing literature. Through the synthesis of findings, the study aims to pinpoint areas where current research falls short or lacks comprehensive exploration. This gap analysis is instrumental in guiding future research directions and emphasizing the relevance of the study's objectives (Gorard & Taylor, 2002).

Conceptual Framework Development

Drawing from the synthesized literature, a robust conceptual framework is developed. This framework visually represents the complex interplay between innovative educational technology, the Merdeka curriculum, and student learning achievement. It maps the connections between key variables, highlighting the potential pathways through which technology-driven enhancements can lead to improved learning outcomes. In summary, the research methodology within the literature review design adheres to a systematic approach. Through rigorous literature selection, data collection, thematic analysis, comparative examination, gap identification, and

synthesis, this methodology aims to provide a comprehensive understanding of how innovation in educational technology can amplify student learning achievement within the era of the Merdeka curriculum.

FINDING

The Role of Technology in Education

Introduction to Educational Technology Educational technology refers to using various digital tools, software, and resources to enhance teaching and learning processes. It encompasses various technologies, including computers, mobile devices, educational software, online platforms, and multimedia resources (Raja & Nagasubramani, 2018). These technologies support and enhance traditional instructional methods, providing new opportunities for engagement, interactivity, and personalization in education. Benefits and Potential of Educational Technology in the Context of the "Merdeka" Curriculum Educational technology offer numerous benefits and potential in the context of the "Merdeka" curriculum. Firstly, it enables personalized learning experiences, allowing students to access content and resources tailored to their needs, interests, and learning styles. Technology can provide adaptive learning platforms and intelligent tutoring systems that dynamically adjust to students' progress and provide targeted support (Kupchyk & Litvinchuk, 2021).

Secondly, educational technology promotes active engagement and interactivity through interactive multimedia resources, virtual simulations, and gamified learning experiences. These tools foster student motivation, increase participation, and facilitate a deeper understanding of concepts (Zhao & McClure, 2022). Thirdly, technology facilitates collaborative learning by enabling communication, collaboration, and knowledge sharing among students within and outside the classroom. Online discussion forums, collaborative document editing, and virtual group projects are examples of how technology can enhance collaboration and promote social learning. Lastly, educational technology opens up blended and online learning opportunities, allowing students to access education remotely, overcome geographical barriers, and learn at their own pace (Medero & Albaladejo, 2020).

Challenges and Constraints in the Use of Educational Technology While educational technology offers significant potential, its implementation faces various challenges and constraints. Firstly, there may be a lack of technological infrastructure and resources, particularly in underserved areas or schools with limited budgets. Access to devices, internet connectivity, and software licenses can pose significant barriers to the effective use of educational technology (Ali, 2020). Secondly, the integration of technology requires adequate teacher training and professional development. Many educators may need more digital literacy skills and pedagogical knowledge to utilize educational technology in their instructional practices effectively. Providing comprehensive and ongoing training for teachers is crucial to overcome this challenge. Thirdly, ensuring equitable access and addressing the digital divide is

essential. Technology and internet connectivity should be accessible to all students, regardless of their socioeconomic backgrounds or geographical locations. Finally, the appropriate selection and integration of educational technology tools and resources must be considered. Educators must critically evaluate technology's quality, effectiveness, and alignment with the curriculum objectives and student needs (Drane et al., 2021). Additionally, privacy and data security concerns must be addressed to protect student's personal information and digital well-being.

In conclusion, educational technology significantly enhances teaching and learning experiences, particularly in the context of the "Merdeka" curriculum. It offers personalized learning, active engagement, collaboration, and expanded access to education. However, challenges such as limited infrastructure, teacher training, equitable access, and appropriate technology integration must be addressed to fully harness the potential benefits of educational technology in the "Merdeka" curriculum (Rohiyatussakinah, 2021).

Educational Technology Innovations to Enhance Student Learning Outcomes

Online Learning Platforms: Online learning platforms allow students to access learning materials through the Internet. Students can access materials, assignments, and learning resources flexibly in real-time or self-paced. These platforms also facilitate interaction between students and teachers through discussion forums, instant messaging, and other collaborative features (Owolabi & Bekele, 2021). Implementation. Online learning platforms offer convenience, accessibility, and the opportunity for students to engage with educational content dynamically and interactively.

Educational technology has led to the development of interactive courses and learning materials that capture students' attention and foster deeper understanding. Learning materials can be presented in various engaging formats, such as videos, animations, simulations, and interactive games. These interactive approaches enhance student engagement and enable them to interact with the content actively. By incorporating multimedia and interactive elements, students can explore concepts more effectively and apply their knowledge practically (Licorish et al., 2018). Mobile applications enable students to access learning materials conveniently through their mobile devices. These applications can employ adaptive learning algorithms to customize the learning content and challenges based on students' needs and comprehension levels. As a result, students can learn at their own pace, receive personalized feedback, and have their learning experiences tailored to their specific requirements. Adaptive mobile learning provides a flexible and personalized approach that caters to students' unique learning abilities (Zou & Li, 2015).

Mobile Applications for Collaborative Learning: Mobile applications also facilitate student collaborative learning. These applications provide features that support group work, idea sharing, and collaboration in learning tasks or projects.

Through features such as online discussions, document sharing, and progress monitoring, students can engage in collaborative learning even when they are not physically present in the exact location. Mobile applications enhance communication and collaboration, allowing students to work together effectively and learn from each other's perspectives.

Virtual reality technology enables students to experience realistic learning situations or environments in a virtual setting. VR simulations can be used across various subjects, such as science, history, and art. Students can "visit" historical places, explore the human body, or participate in scientific experiments through immersive VR experiences. These simulations provide students with a unique and engaging learning experience that enhances their understanding and retention of complex concepts (Rushton et al., 2020). Enriching Learning Materials through Augmented Reality: Augmented reality technology combines digital elements with the real world. In an educational context, AR can enhance learning materials by adding interactive and visual elements that can be viewed through smartphones or tablets. For example, students can use AR applications to view 3D models of objects, overlay digital information on real-world objects, or participate in interactive learning experiences. AR enriches learning materials by making them more engaging, interactive, and accessible, allowing students to interact with content in a multimodal and immersive manner. (Kounlaxay et al., 2021).

In summary, educational technology innovations such as online learning platforms, interactive courses and materials, mobile applications, and virtual and augmented reality have the potential to enhance student learning outcomes significantly. These technologies offer flexibility, interactivity, collaboration, and immersive experiences that cater to individual student needs, promote engagement, and foster more profound understanding. Educators can create dynamic and personalized learning environments that empower students and improve their academic achievements by incorporating these innovative approaches into education.

Educational Technology Innovations to Enhance Student Learning Outcomes

Educational technology innovations have the potential to enhance student learning outcomes significantly. One such innovation is the use of mobile learning applications. Mobile applications can be designed for adaptive learning, tailoring content to individual student needs and abilities. Using data and learning algorithms, these applications provide personalized learning materials aligning with students' comprehension levels. Real-time feedback and personalized recommendations further support students in reaching their maximum learning potential. Mobile applications also facilitate collaborative learning by offering features like discussion forums and study groups. Students can communicate, share ideas, and work together online, expanding their understanding through discussions and collective contributions toward achieving learning goals (Owolabi & Bekele, 2021).

Another impactful innovation in educational technology is integrating virtual reality (VR) and augmented reality (AR) in learning. VR technology enables students to experience immersive learning simulations in virtual environments. These simulations allow students to gain firsthand experiences in challenging real-world situations, such as exploring natural environments or conducting complex scientific experiments. VR enhances students' comprehension and practical skills by engaging them in practical scenarios. On the other hand, AR technology enriches learning materials by blending digital elements with the real world. Students can view 3D objects, visualize data, or overlay additional information onto physical objects through AR applications. This interactive and visual content deepens students' understanding of the concepts being learned (Ferguson et al., 2015).

Furthermore, learning analytics is crucial in evaluating and monitoring student progress. By collecting and analyzing learning data, teachers gain valuable insights into students' comprehension levels, progress, learning habits, and preferences. This enables teachers to provide appropriate feedback and design effective learning strategies. Learning analytics also allows for the monitoring of learning processes and interventions. Teachers can identify patterns, trends, and potential challenges students may face by analyzing data. Timely interventions and targeted support ensure students stay on track and receive the necessary assistance to achieve their learning goals.

Table 1: Educational Technology useful in Scholls

Educational Technology Innovations	**Description**
Mobile Applications in Learning	- Adaptive Mobile Learning: Tailored learning materials and real-time feedback for individual student needs
	- Collaborative Learning: Facilitating collaboration and interaction among students through online platforms
Virtual Reality and Augmented Reality	- Virtual Learning Simulations: Immersive simulations for practical experiences in a virtual environment
	- Enriching Learning Materials through AR: Adding interactive and visual content to enhance comprehension
Learning Analytics	- Collection and Analysis of Learning Data: Insights into student progress, learning habits, and Preferences
	- Monitoring Learning Processes and Interventions: Identifying challenges and providing timely support

Source: Created, 2023

These educational technology innovations, including mobile applications, virtual reality, augmented reality, and learning analytics, offer exciting opportunities to create engaging and personalized learning environments. By leveraging these

innovations, educators can empower students, promote academic achievements, and enhance overall learning outcomes.

Implementation of Educational Technology in the "Merdeka" Curriculum

Several key considerations need to be addressed to ensure the successful implementation of educational technology in the "Merdeka" curriculum. One crucial aspect is adequate preparation and establishing a robust technological infrastructure within schools. This involves ensuring reliable internet connectivity, providing access to necessary hardware and devices, and acquiring appropriate software and digital resources. These foundational elements make integrating educational technology into the curriculum easier (Pratikno et al., 2022).

In addition to infrastructure, comprehensive teacher training and competency development programs are essential. Teachers must possess the necessary knowledge and skills to incorporate educational technology into their instructional practices effectively. Training programs should cover areas such as digital literacy, pedagogical strategies for technology integration, assessment methods in a technology-enhanced environment, and the ethical use of technology. Ongoing professional development opportunities should also be offered to keep teachers updated with the latest technological advancements and innovative teaching practices (Tondeur et al., 2017).

Integrating educational technology into lesson planning requires thoughtful design and alignment with the learning objectives of the "Merdeka" curriculum. Teachers should identify appropriate technological tools and resources that align with their students' content and learning needs. This may involve selecting online learning platforms, interactive multimedia resources, educational applications, or virtual reality experiences. Technology integration should be purposeful, supporting student-centered and collaborative learning while promoting critical thinking, creativity, and problem-solving skills (Emilia & Sukyadi, 2023).

Furthermore, evaluating and monitoring the effectiveness of educational technology use is crucial. Assessment strategies aligned with the principles of self-directed learning can be employed, and learning analytics tools can be leveraged to gather data on student progress, engagement, and outcomes. Regular feedback from students and teachers should be collected to identify areas for improvement and address any challenges or barriers encountered in the implementation process (Saiyad et al., 2023). This feedback-driven approach ensures continuous improvement and optimization of educational technology integration. In conclusion, the successful implementation of educational technology in the "Merdeka" curriculum requires thorough preparation, infrastructure support, teacher training, integration into lesson planning, and ongoing evaluation. By addressing these aspects, educational technology can effectively support the goals of the "Merdeka" curriculum, enhance student learning experiences, and contribute to developing high-quality education that empowers students in their learning journey.

Table 2: Implementation consideration of technology in education

Implementation Considerations	**Description**
A. Preparation and Technological Infrastructure	- Ensuring reliable internet connectivity and access to necessary hardware and software resources - Establishing policies for technology use and data privacy and security measures
B. Teacher Training and Competency Development	- Comprehensive training programs to enhance teachers' competencies in technology integration - Covering digital literacy, pedagogical strategies, assessment methods, and ethical use of technology
C. Integration of Educational Technology in Lesson Planning	- Thoughtful design and alignment of technology tools and resources with learning objectives - Selecting online platforms, multimedia resources, applications, or virtual reality experiences
D. Evaluation and Monitoring of Technology Use	- Assessment strategies aligned with self-directed learning principles - Leveraging learning analytics tools to gather data on student progress and engagement - Collecting feedback from students and teachers to identify improvement areas and address implementation challenges.

Source: Created, 2023

Successful Implementation of Educational Technology in the "Merdeka" Curriculum

Case 1: School A and the Use of an Online Learning Platform

According to Kompas.com, the Ministry of Education, Culture, Research, and Technology (Kemendikbud Ristek) has been actively implementing the Merdeka Curriculum through the Merdeka Mengajar Platform. As of the end of 2022, more than 151,000 educational institutions in Indonesia have successfully implemented the Merdeka Curriculum. The Merdeka Mengajar Platform has made the implementation process more convenient, where registration can be done from February 6 to March 31, 2023. The registration process is carried out through the bell jar. Id account owned by the head of educational institutions via the Merdeka Mengajar Platform (Restu et al., 2022).

The Merdeka Curriculum emphasizes flexible learning and can be adjusted to suit the facilities, vision, mission of schools and the learning needs of students. It is designed to be applicable in all educational institutions and regions, regardless of their conditions. The curriculum offers diverse extracurricular learning content, allowing students time to delve into concepts and strengthen their competencies. The Merdeka Curriculum aims to provide flexibility and support for educators in creating high-quality learning experiences tailored to student's needs and the educational institution's conditions (Irawati et al., 2022).

During the launch of the 15th episode of Merdeka Belajar, Minister of Education, Culture, Research, and Technology Nadiem Makarim, encouraged educational institutions to implement the Merdeka Curriculum according to their readiness. Educational institutions have three options for implementing the curriculum: applying certain parts of the Merdeka Curriculum without replacing the current curriculum, implementing it with prepared teaching materials, or developing their teaching materials (Muhson, 2022). While the specific names of schools implementing the Merdeka Curriculum are not mentioned in the article, it highlights the significant number of educational institutions that have already embraced it. For more detailed information on specific schools implementing the curriculum, it is recommended to refer to official sources such as the Ministry of Education, Culture, Research, and Technology or local educational authorities.

Table 3: The key points about the implementation of the Merdeka Curriculum in Indonesia:

Key Points	**Description**
Number of Implementing Schools	More than 151,000 educational institutions have implemented the Merdeka Curriculum since the end of 2022.
Implementation Platform	The Merdeka Mengajar Platform is utilized for practical and convenient registration and implementation of the curriculum.
Flexibility and Adaptation	The Merdeka Curriculum can be adjusted to suit the schools' and students' facilities, vision, mission, and learning needs.
Inclusivity	The curriculum is designed to be applicable in all educational institutions across different regions, regardless of their conditions.
Diverse Intra curricular Learning Content	The curriculum offers a range of learning content to allow students ample time to understand concepts and enhance competencies.
Support for Educators	The Merdeka Curriculum provides flexibility and support for educators to create high-quality learning experiences tailored to students' needs and conditions.

Key Points	Description
Options for Implementation	Schools can choose to implement specific parts of the curriculum, utilize prepared teaching materials, or develop their materials.
Minister's Encouragement	The Minister of Education, Culture, Research, and Technology encourages educational institutions to implement readiness-based curricula.
Additional Information	For more specific information and details about schools implementing the Merdeka Curriculum, official sources such as the Ministry of Education can be referred to.

Source: Created, 2023

Implementing the Merdeka Curriculum in Indonesia has seen significant progress, with over 151,000 schools adopting the curriculum by the end of 2022. Through the Merdeka Mengajar Platform, schools can adjust the curriculum to their specific needs. The curriculum aims to provide inclusive and diverse learning experiences while supporting educators in delivering high-quality education. Continuous updates and official sources should be consulted for the latest information.

DISCUSSION

The findings regarding implementing the Merdeka Curriculum in Indonesia revealed significant progress, with over 151,000 schools adopting the curriculum by the end of 2022. The curriculum has been implemented through the Merdeka Mengajar Platform, providing practical and convenient registration and implementation processes. The flexibility of the curriculum allows schools to adjust it to their specific needs, including their facilities, vision, mission, and students' learning requirements (Hadi et al., 2023).

One unexpected finding in the discussion was the need for more specific case studies or in-depth analyses of individual schools implementing the Merdeka Curriculum. While the article provided a broad overview of the implementation process and the role of educational technology, specific examples and detailed accounts of schools' experiences would have enriched the understanding of the curriculum's impact and effectiveness. Such case studies could have shed light on the challenges faced, strategies employed, and outcomes achieved by schools in implementing the Merdeka Curriculum (Azhari & Fajri, 2022).

To gain a more comprehensive understanding of the curriculum's outcomes, challenges, and potential areas for improvement, further research should include detailed case studies and in-depth analysis of schools implementing the Merdeka Curriculum. These case studies could explore the specific strategies schools employ to integrate educational technology, the impact on student learning outcomes, the role of teacher training and support, and the overall effectiveness of the curriculum in achieving its intended goals.

Additionally, the discussion highlighted the role of technology in education and its potential to enhance teaching and learning experiences. Educational technology, such as online learning platforms, interactive courses and materials, mobile applications, and virtual and augmented reality, offers personalized learning experiences, active engagement, collaboration, and expanded access to education. These technological innovations have the potential to foster student motivation, increase participation, and deepen understanding of concepts (Zhou et al., 2023).

However, challenges and constraints in the use of educational technology were also identified. These include limited technological infrastructure and resources, the need for comprehensive teacher training and professional development, equitable access to technology, and the appropriate selection and integration of technology tools and resources. Addressing these challenges is crucial to fully harness the potential benefits of educational technology in the Merdeka Curriculum.

Furthermore, the findings emphasized the importance of thorough preparation, infrastructure support, teacher training, integration into lesson planning, and ongoing evaluation to implement educational technology in the Merdeka Curriculum successfully. Adequate technological infrastructure, including reliable internet connectivity and access to hardware and software resources, is essential. Comprehensive teacher training programs are necessary to enhance educators' competencies in technology integration. Integrating educational technology into lesson planning, aligned with curriculum objectives, promotes student-centered and collaborative learning approaches. Regular evaluation and monitoring of technology use and collecting feedback from students and teachers allow for continuous improvement and optimization (Hamilton, 2022).

CONCLUSION

In conclusion, while the findings provided a broad overview of the implementation of the Merdeka Curriculum and the role of educational technology. Addressing these aspects will contribute to successfully implementing the Merdeka Curriculum and effectively utilizing educational technology to enhance student learning outcomes. In conclusion, the findings and discussion highlight the significant role of educational technology in implementing the Merdeka Curriculum in Indonesia. The Merdeka Curriculum facilitated through the Merdeka Mengajar Plafform, has witnessed widespread adoption, with over 151,000 schools implementing the curriculum by the end of 2022. The curriculum offers flexibility and adaptability, allowing schools to tailor their approach to match their specific facilities, vision, mission, and student's learning needs.

Educational technology innovations, such as online learning platforms, interactive courses and materials, mobile applications, and virtual and augmented reality, have demonstrated their potential to enhance student learning outcomes. These technologies enable personalized learning experiences, active engagement,

collaboration, and expanded access to education. By leveraging educational technology, educators can create dynamic and personalized learning environments that empower students and improve their academic achievements. However, challenges and constraints associated with educational technology implementation must be addressed. These include limited infrastructure, the need for comprehensive teacher training, equitable access, and careful selection and integration of technology tools. Overcoming these challenges requires investments in technological infrastructure, ongoing professional development for teachers, and a thoughtful approach to integrating technology into lesson planning.

To fully realize the benefits of educational technology in the Merdeka Curriculum, future efforts should include in-depth case studies and analysis of schools' experiences, as well as continuous evaluation and monitoring of technology effectiveness. Additionally, collaboration between educational institutions, the Ministry of Education, and other stakeholders is crucial to ensuring successful implementation and maximizing the potential of educational technology in improving student learning outcomes. Overall, implementing educational technology in the Merdeka Curriculum presents a promising pathway toward enhancing education in Indonesia. By embracing educational technology, schools can create engaging, inclusive, and personalized learning environments that empower students and equip them with the necessary skills for the future.

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BIBLIOGRAPHY

Ali, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher education studies*, *10*(3), 16–25.

All, A., Castellar, E. P. N., & Van Looy, J. (2016). Assessing the effectiveness of digital game-based learning: Best practices. *Computers & Education*, *92*, 90-103.

Allison, S. Z. (2022). THE IMPACT OF EDUCATIONAL TECHNOLOGY AND FREQUENCY OF USAGE. *Journal of Social Political Sciences*, *3*(2), 104–119.

Almalki, S. (2016). Integrating Quantitative and Qualitative Data in Mixed Methods Research--Challenges and Benefits. *Journal of Education and Learning*, *5*(3), 288–296.

Azhari, B., & Fajri, I. (2022). Distance learning during the COVID-19 pandemic: School closure in Indonesia. *International Journal of Mathematical Education in Science and Technology*, *53*(7), 1934-1954.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77-101.

Cirocki, A., & Anam, S. U. (2021). 'How much freedom do we have?'The perceived autonomy of secondary school EFL teachers in Indonesia. *Language Teaching Research*, 13621688211007472.

Drane, C. F., Vernon, L., & O'Shea, S. (2021). Vulnerable learners in the age of COVID-19: A scoping review. *The Australian Educational Researcher*, *48*(4), 585–604.

Emilia, E., & Sukyadi, D. (2023). Program evaluation of English language learning for EYL curriculum development in Indonesia: teachers' perception, challenges, and expectation. *Journal on English as a Foreign Language*, *13*(1), 314-338.

Erdoğan, V. (2019). Integrating 4C skills of the 21st century into four language skills in EFL classes. *International Journal of Education and Research*, *7*(11), 113–124.

Ferguson, C., Davidson, P. M., Scott, P. J., Jackson, D., & Hickman, L. D. (2015). Augmented reality, virtual reality, and gaming are integral to nursing. *Contemporary nurse*, *51*(1), 1–4.

Frasson, C. (2021, September). A framework for personalized, fully immersive virtual reality learning environments with gamified design in education. In *Novelties in Intelligent Digital Systems: Proceedings of the 1st International Conference (NIDS, 2021), Athens, Greece* (Vol. 338, p. 95).

Gorard, S., & Taylor, C. (2002). What is segregation? A comparison of measures in terms of 'strong'and 'weak'compositional invariance. *Sociology*, *36*(4), 875-895.

Hadi, A., Marniati, M., Ngindana, R., Kurdi, M. S., Kurdi, M. S., & Fauziah, F. (2023). New Paradigm of Merdeka Belajar Curriculum in Schools. *AL-ISHLAH: Jurnal Pendidikan*, *15*(2), 1497-1510.

Hamilton, B. (2022). *Integrating technology in the classroom: Tools to meet the needs of every student*. International Society for Technology in Education.

Irawati, D., Najili, H., Supiana, S., & Zaqiah, Q. Y. (2022). Merdeka Belajar Curriculum Innovation and Its Application in Education Units. *Edumaspul: Jurnal Pendidikan*, *6*(2), 2506-2514.

Jaiswal, A., & Arun, C. J. (2021). The Potential of Artificial Intelligence for Transformation of the Education System in India. International Journal of Education and Development using Information and Communication Technology, 17(1), 142-158.

Kaur, P., Dhir, A., Tandon, A., Alzeiby, E. A., & Abohassan, A. A. (2021). A systematic literature review on cyberstalking. An analysis of past achievements and future promises. *Technological Forecasting and Social Change*, *163*, 120426.

Kelly, A. E., Lesh, R. A., & Baek, J. Y. (Eds.). (2014). *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching*. Routledge.

Kelly, J. (2014). *Women, history, and theory: The essays of Joan Kelly*. University of Chicago Press.

Kennedy, K. J. (Ed.). (2021). *Social studies education in South and South East Asian contexts*. Routledge.

Kong, S. C., Chan, T. W., Griffin, P., Hoppe, U., Huang, R., Kinshuk, … & Yu, S. (2014). E-learning in school education in the coming ten years for developing 21st-

century skills: Critical research issues and policy implications. *Journal of Educational Technology & Society*, *17*(1), 70–78.

Kounlaxay, K., Shim, Y., Kang, S. J., Kwak, H. Y., & Kim, S. K. (2021). Learning media on mathematical education based on augmented reality. *KSII Transactions on Internet and Information Systems (TIIS)*, *15*(3), 1015-1029.

Kupchyk, L., & Litvinchuk, A. (2021, March). Constructing personal learning environments through ICT-mediated foreign language instruction. In *Journal of Physics: Conference Series* (Vol. 1840, No. 1, p. 012045). IOP Publishing.

Lestari, N. A. P. (2023). Analysis of 2013 curriculum problems so it is changed into a Merdeka curriculum. *Jurnal Pendidikan Dasar Nusantara*, *8*(2), 263-274.

Licorish, S. A., Owen, H. E., Daniel, B., & George, J. L. (2018). Students' perception of Kahoot!'s influence on teaching and learning. *Research and Practice in Technology Enhanced Learning*, *13*(1), 1–23.

Liebech-Lien, B. (2020). The bumpy road to implementing cooperative learning: Towards sustained practice through collaborative action. *Cogent education*, *7*(1), 1780056.

Liu, D. Y. T., Bartimote-Aufflick, K., Pardo, A., & Bridgeman, A. J. (2017). Data-driven personalization of student learning support in higher education. *Learning analytics: Fundaments, applications, and trends: A view of the current state of the art to enhance e-learning*, 143-169.

Mabsutsah, N., Hariyadi, S., & Prihatin, J. (2023). The Readiness of Science Teachers to Implement Differentiated Learning and Integrated STEM in Ecology Subject of the "Merdeka" Curriculum in Junior High School. *BIOEDUKASI*, *21*(2), 99-110.

Mavangere, N., Edifor, E. E., Adedoyin, F., Apeh, E., & Owusu, A. (2022, October). Education inequality in underserved regions: Exploring technology's role in promoting diversity and inclusivity. In *2022 IEEE International Conference on e-Business Engineering (ICEBE)* (pp. 288–293). IEEE.

Medero, G. S., & Albaladejo, G. P. (2020). The Use of a Wiki to Boost Open and Collaborative Learning in a Spanish University. *Knowledge Management & E-Learning*, *12*(1), 1-17.

Muhson, M. (2022). Discourse Analysis of Merdeka Belajar Curriculum Application in Madrasahs toward the Islamic Religious Education Learning System. *EDUCATION: Journal of Education*, *7*(2), 92–103.

Norawati, R., & Puspitasari, Y. (2022). The Learning Skills of English as a Foreign Language (EFL) Student-Teachers in Project- and Case-based Learning. *JEELS (Journal of English Education and Linguistics Studies)*, *9*(2), 255-277.

Okoye, K., Arrona-Palacios, A., Camacho-Zuñiga, C., Hammout, N., Nakamura, E. L., Escamilla, J., & Hosseini, S. (2020). Impact of students evaluation of teaching: A text analysis of the teacher's qualities by gender. *International Journal of Educational Technology in Higher Education*, *17*(1), 1-27.

Owolabi, J., & Bekele, A. (2021). Implementing innovative educational technologies in teaching anatomy and basic medical sciences during the COVID-19 Pandemic in a developing country: The COVID-19 silver lining? *Advances in medical education and practice*, 619-625.

Plass, J. L., & Kalyuga, S. (2019). Four ways of considering emotion in cognitive load theory. *Educational Psychology Review*, *31*, 339-359.

Pratikno, Y., Hermawan, E., & Arifin, A. L. (2022). Human Resource 'Kurikulum Merdeka'from Design to Implementation in the School: What Worked and What Not in Indonesian Education. *Jurnal Iqra': Kajian Ilmu Pendidikan*, *7*(1), 326-343.

Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of Applied and Advanced Research*, *3*(1), 33-35.

Restu, R., Sriadhi, S., Gultom, S., & Ampera, D. (2022). Implementation Of The Merdeka Belajar-Kampus Merdeka Curriculum Based On The RI 4.0 Platform At Universitas Negeri Medan. *Journal of Positive School Psychology*, 10161–10176.

Rohiyatussakinah, I. (2021). Implementing MBKM and the Relationship of Curriculum Policy Based on a Case of EFL Education in Japan. *Journal of English Language Teaching and Literature (JELTL)*, *4*(2), 39-50.

Rushton, M. A., Drumm, I. A., Campion, S. P., & O'Hare, J. J. (2020). Immersive and virtual reality technologies enable nursing students to experience scenario-based, basic life support training—exploring the impact on confidence and skills. *CIN: Computers, Informatics, Nursing*, *38*(6), 281–293.

Saiyad, S., Virk, A., Mahajan, R., & Singh, T. (2020). Online teaching in medical training: Establishing good online teaching practices from cumulative experience. *International Journal Of Applied And Basic Medical Research*, *10*(3), 149.

Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *Kolner Zeitschrift fur Soziologie und Sozialpsychologie*, *69*(Suppl 2), 107.

Simamora, R. M., & Pasaribu, D. (2023). Education Should Embrace All Potential: Students' Reflective Essays on the Meaning of Merdeka Belajar. *Studies in Learning and Teaching*, *4*(1), 68-87.

Stalmeijer, R. E., McNaughton, N., & Van Mook, W. N. (2014). Using focus groups in medical education research: AMEE Guide No. 91. *Medical teacher*, *36*(11), 923–939.

Tondeur, J., Aesaert, K., Pynoo, B., Van Braak, J., Fraeyman, N., & Erstad, O. (2017). Developing a validated instrument to measure preservice teachers' ICT competencies: Meeting the demands of the 21st century. *British Journal of Educational Technology*, *48*(2), 462-472.

Wekerle, C., Daumiller, M., & Kollar, I. (2022). Using digital technology to promote higher education learning: The importance of different learning activities and their relations to learning outcomes. *Journal of Research on Technology in Education*, *54*(1), 1-17.

Zhao, X., & McClure, C. D. (2022). Gather. Town: A gamification tool to promote engagement and establish online learning communities for language learners. *RELC Journal*, 00336882221097216.

Zhou, Y., Wieringa, T. H., Brouwer, J., Diemers, A. D., & Bos, N. A. (2023). Challenges to acquiring similar learning outcomes across four parallel thematic learning communities in an undergraduate medical curriculum. *BMC Medical Education*, *23*(1), 1-14.

Zou, B., & Li, J. (2015). Exploring Mobile Apps for English Language Teaching and Learning. *Research-publishing. net*.