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Curriculum Digitalization: The Impact of Technology on Curriculum Development in The Era of Industrial Revolution 4.0

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ABSTRACT

The Industrial Revolution 4.0 brings significant technological advancements, reshaping industries, societies, and education. This paper examines the impact of technology on curriculum development, focusing on digital tools such as the Internet of Things (IoT), artificial intelligence (AI), augmented reality (AR), and learning management systems (LMS). These technologies enhance curriculum personalization, improve accessibility, and foster collaborative learning environments. However, challenges like the digital divide, insufficient infrastructure, and limited digital literacy among educators persist. Lorem Ipsum is simply dummy text of the printing and typesetting industry. This study highlights strategies to address these challenges, including fostering educators' digital competencies, investing in infrastructure, and developing inclusive and adaptive curricula. Collaboration among policymakers, educational institutions, and private stakeholders is crucial for building a curriculum that prepares students for a technology-driven future.

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1. INTRODUCTION

The Industrial Revolution 4.0 marks a new era of technological advancement, characterized by the integration of artificial intelligence (AI), the Internet of Things (IoT), big data, and other technologies. This transformation not only changes how industries operate but also impacts nearly every aspect of human life, including education, particularly in Indonesia. Education is a fundamental aspect in the formation of a generation that can adapt to the dynamics of a changing world. In the era of the Industrial Revolution 4.0, the field of education faces the significant challenge of modifying its curriculum to remain pertinent to these developments (Coşkun *et al*., 2019). It has shifted interactions that were once conducted face-to-face in classrooms to online settings, integrating learning processes with the internet (Tangahu, 2021). The evolving revolutionary paradigm is consistently driven by advancements in science and technology that support these changes. In this era of revolution, the field of education is continually challenged to enhance and adapt its systems. In this era, technology not only introduces new tools and methods in learning but also fundamentally changes the educational paradigm (Syerlita & Siagian, 2024). Integrating technology in the education curriculum is crucial so that education prepares learners with theoretical knowledge and practical skills that are relevant to the evolving needs of the industry.

Education must focus on shaping a creative, innovative, and competitive generation. One way to achieve this is by maximizing the use of technology as a tool in education, to produce graduates who can adapt to and positively influence the changing times (Lase, 2019). Education 4.0 is a response to the demands of the Industrial Revolution 4.0, where humans and technology come together to create new opportunities in creative and innovative ways. That new approach to learning encourages students not only to acquire the necessary skills and knowledge but also to identify the sources where they can learn them. As technology continues to evolve, educational institutions must adapt their curricula to integrate these advancements. This ensures that students are equipped with the skills and knowledge needed to thrive in an increasingly digital world. By doing so, education can remain relevant, fostering a generation of learners who are both adaptable and capable of contributing to a rapidly changing society.

Technology has completely transformed the way education is delivered and experienced, revolutionizing traditional teaching and learning methods. Tools such as online learning platforms, digital resources, and interactive technologies have redefined the boundaries of the classroom, making studying not only more accessible but also more engaging and adaptable to individual needs. For students, these innovations open up exciting opportunities to take control of their learning journey. They can progress at their own pace, revisit materials for better understanding, and explore diverse content from anywhere in the world. The interactive nature of modern tools, such as virtual simulations, gamified learning experiences, and collaborative platforms, enables students to engage deeply with lessons, fostering both curiosity and creativity. Moreover, technology bridges gaps in education by providing equitable access to quality resources for learners in remote or underserved areas. Through these tools, students are no longer confined to the limitations of physical classrooms—they can connect with expert educators, participate in global discussions, and explore topics in innovative ways that cater to various learning styles. This transformation goes beyond convenience; it represents a shift toward a more inclusive and personalized approach to education, where every student has the chance to thrive in a dynamic, technology-driven learning environment.

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Technology as a learning medium in the 21st Century era plays an important role in several important aspects, such as accessibility, interactivity, personalization, collaboration, and digital skills development (Bygstad *et al*., 2022). Furthermore, technology enables personalization of learning by providing an adaptive learning platform that can adjust materials, assignments, and feedback based on individual student needs and level of understanding. This helps students to learn at their own pace and according to their learning style (Haleem *et al*., 2022).

The development of technology in education highlights the growing need to digitalize the curriculum to address both explicit and tacit knowledge. Explicit knowledge, which can be easily articulated and shared, can be effectively digitized through online platforms, e-books, and digital resources, making it more accessible (Pellegrino, 2017). Meanwhile, tacit knowledge, learned through practice and experience, can be enhanced through virtual simulations, interactive tools, and hands-on digital learning, helping bridge the gap between theory and practice (Pellegrino, 2017). Moreover, embedded knowledge—often found in business rules, processes, and cultural practices—can be integrated into the digital curriculum through case studies and simulations, providing students with real-world applications. The evolving nature of procedural and conceptual knowledge in technology education also requires a curriculum that adapts to technological advancements, offering interactive exercises and fostering both practical skills and theoretical understanding. Additionally, digital tools can support the development of metacognitive knowledge by providing personalized learning experiences and real-time feedback. Overall, digitalizing the curriculum ensures that students acquire the necessary skills, knowledge, and experiences to succeed in a technology-driven world, aligning education with the demands of modern industries.

In the era of the Fourth Industrial Revolution (IR 4.0), technology has become a driving force in transforming various sectors, including education. As technological advancements continue to shape the way we live and work, the need for a curriculum that aligns with these changes becomes increasingly critical. Digitalization of the curriculum has emerged as a vital approach to enhance the relevance and effectiveness of education in this fast-paced, technology-driven world. This paper aims to explore the impact of technology on curriculum development, highlighting both the opportunities and challenges associated with its digitalization. By examining how technological tools and platforms are integrated into curriculum design and delivery, this study seeks to provide insights into how education systems can adapt to the demands of IR 4.0 while maintaining a focus on holistic student development.

The scope of this discussion encompasses several key aspects, including an overview of curriculum digitalization and its connection to technological innovation, the positive and negative effects of digital tools on teaching and learning, and practical examples of successful implementation in educational institutions. Furthermore, the paper delves into the challenges faced during the process, such as infrastructure limitations, teacher preparedness, and the digital divide, while proposing actionable solutions to address these issues. Through this analysis, the study not only underscores the transformative potential of technology in curriculum development but also offers practical recommendations to support educators and policymakers in designing curricula that are both future-ready and inclusive. Ultimately, this paper aspires to contribute to the ongoing dialogue on the integration of technology in education and its implications for the future of learning.

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2. PREVIOUS STUDY

A review of the extant literature reveals a variety of perspectives on the impact of digitalization and technology on curriculum development in the era of the Industrial Revolution 4.0. Offer a discussion of how technological developments drive changes in curriculum design, emphasizing the importance of integrating digital technology in the education process to improve the quality of learning.

Some researchers (Arek-Bawa & Reddy, 2022) explored how digital curriculum transformation in the context of the Fourth Industrial Revolution can impact the education gap or build bridges of inclusion, highlighting that while digitalization has great potential to improve access and quality of education, social challenges such as the technology divide can exacerbate existing inequalities.

Conversely, some researchers (Sharma *et al*., 2025) postulate that Education 4.0 plays a pivotal role in propelling curriculum innovation and digital literacy. They emphasize that the incorporation of technologies such as online learning and digital tools can facilitate the development of students' competencies to address global challenges.

In their study, some researchers (Yuliandi *et al*., 2024) Explored the development of a curriculum to address the challenges posed by the Fourth Industrial Revolution era. Their research emphasizes the necessity of providing education that is both relevant and competitive by integrating technology into curriculum design.

Some researchers (Magenuka & Sibanda, 2023) examined the impact of technology on electrical engineering education, highlighting the efficacy of digital tools such as interactive simulations and online learning platforms in facilitating effective integration of theory and practice. These studies offer a comprehensive perspective on the potential of curriculum digitization to enhance educational quality, though challenges such as access disparities, technology readiness, and educator training persist as significant concerns. This transformation represents a strategic step in ensuring the relevance of education in the face of evolving global demands.

3. METHODS

This study employs journal analysis focusing on exploring the concepts, implementation, and impacts of curriculum digitalization within the context of the Industrial Revolution 4.0. To obtain relevant and in-depth data, key terms such as “curriculum digitalization,” “industrial revolution 4.0 in education,” and “curriculum revolution” were used. These keywords were carefully selected to filter academic literature that discusses the transformation of curricula through digital technology, the integration of technology into the learning process, and the adaptation of education to meet the demands of globalization and automation. The analysis process includes reviewing various scholarly journals that highlight the challenges, opportunities, and effects of technological advancements on curriculum reform at different levels of education.

4. RESULTS AND DISCUSSION

4.1. Result

The transition toward curriculum digitalization in the era of Industrial Revolution 4.0 has driven extensive research on its implementation and impact. To gain a deeper understanding, this study analyzes four leading journals discussing the integration of technology into curriculum development. The analysis focuses on three main themes: 1) the benefits of digital

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tools, 2) challenges in implementation, and 3) proposed strategies for effective integration. The analysis results reveal three significant patterns from the reviewed journals.

4.1.1. Benefit of digital tools

All the journals highlight that digital tools play a significant role in supporting curriculum development, particularly in enhancing accessibility, personalized learning, collaboration, and educational innovation (Nasution *et al*., 2024) Emphasizes the importance of Internet of Things (IoT) technology, which enables real-time data collection to tailor learning to the individual needs of students. IoT also facilitates the creation of interactive learning environments through the use of smart devices like smart boards and technology-based applications. On the other hand, (Machekhina, 2017) Notes that digitalization, especially through cloud computing, provides high flexibility in accessing educational data. This technology not only simplifies the implementation of remote learning but also enables inter-institutional collaboration, thereby enriching the curriculum with a more dynamic approach. Cloud-based tools, such as Google Classroom and Microsoft Teams, alongside interactive learning platforms like Emodo, have proven effective in supporting students' engagement and learning.

Moreover (Nainggolan *et al*., 2024) Reveals that artificial intelligence (AI) has elevated personalized learning content to meet the specific needs and abilities of individual learners. This technology is further supported by platforms like the Management System (LMS), which (Machekhina, 2017) Described as tools for managing online classes, distributing learning materials, and providing automated assessments. LMS also strengthens collaboration between educators and students, making curriculum development more organized and efficient. Additionally, (Nainggolan *et al*., 2024). Highlights the innovation in learning through the use of Augmented Reality (AR) and Virtual Reality (VR). These technologies enable in-depth simulations of experiments and virtual explorations, enriching students' learning experience and supporting experiential learning that is highly relevant to the 21st century. Media such as AR-enabled mobile applications and VR headsets, as well as gamified platforms like Kahoot and Quizizz, enhance student participation while making learning more interactive and enjoyable.

An additional study by (Mesterjon *et al*., 2022). The implementation of LMS in higher education institutions in Bengkulu highlights the positive impact of integrating information and communication technology (ICT). LMS was utilized through e-learning, electronic libraries, and academic information systems, which significantly improved accessibility by 84%, ease of use by 83%, understanding by 87%, and specialization by 73%. The study also identified four stages of ICT adoption: discovering, learning to use, understanding timing/purpose. And specializing in ICT tools. However, the study's geographic limitations and the lack of discussion on technological barriers and lecturers' perspectives indicate room for further development. Through the implementation of various digital tools such as IoT, cloud computing, LMS, AI, AR, and VR, curriculum development has become more adaptive to students' needs and more responsive to the demands of the digital era.

4.1.2. Challenges in Implementation

The four studies on the implementation of technology in education face various interconnected challenges. The first study, highlights fundamental issues such as the gap between the pace of digitalization of educational infrastructure and the application of technology in learning processes (Mesterjon *et al*., 2022). While access to technological devices is becoming more widespread, many educational institutions have not fully integrated

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these technologies into their curricula effectively. Additionally, the competency of teachers and students in utilizing technology often remains low, hindering the optimal use of technology to achieve learning objectives. This study also notes that the significant digital divide, especially in areas with limited infrastructure, exacerbates access to quality education.

The second study, focuses on the challenges of unequal access to technology, particularly in remote areas or among communities with low socioeconomic conditions. Many students in these regions lack adequate hardware or internet access, hindering their ability to benefit from technology-based learning. Infrastructure limitations, such as poor internet connectivity and expensive hardware, further worsen the situation (Nainggolan *et al*., 2024). This study also highlights that over-reliance on technology can reduce students' ability to learn independently, as they become overly dependent on digital tools. Furthermore, high operational costs, including initial investments in devices and teacher training, place a significant burden on educational institutions. Another identified challenge is the lack of technical skills among educators, necessitating additional training to enable them to effectively utilize technology. Data privacy and security risks, especially with the use of AI and IoT, add further complexity to implementing digital learning.

The third study, examines the challenges of modernizing education in the Industrial Revolution 4.0 era. These include difficulties in integrating advanced technologies like the Internet of Things (IoT) and big data into traditional teaching methods (Nasution *et al*., 2024). Many educational institutions struggle to adapt their curricula to accommodate the dynamic needs of modern industries. Furthermore, cultural and social resistance to change, both from educators and society, poses a major obstacle to adopting new technologies. The lack of focus on developing 21st-century skills, such as creativity, programming, and data analysis, also limits students' ability to meet future workforce demands.

The fourth study, adds another layer of challenges, highlighting the imbalance between the development of digital resources, such as technology-based learning modules, and the implementation of digitalized learning itself. This disparity indicates that although digital tools are available, the process of adapting these technologies into teaching and learning activities remains slow (Machekhina, 2017). Additionally, the lack of innovative ideas and sustainable projects in utilizing technology in education often delays the necessary transformation. Concerns regarding data privacy and security, especially in using technologies like big data and artificial intelligence (AI), are significant. There is an urgent need to ensure that technology is used ethically and inclusively, preventing the exacerbation of social inequalities.

Overall, these four studies reveal that the digital transformation of education requires a holistic and integrated approach. Cross-sector collaboration, strategic investment in infrastructure and training, and awareness of ethical and social risks associated with technology use are essential. By addressing these challenges carefully, digital technology can be harnessed to enhance educational quality, expand access, and better prepare students to meet the demands of the future workforce.

4.1.3. Strategies for Effective Integration

To confront the challenges posed by the Industrial Revolution 4.0 era, it is imperative to adopt effective technology integration strategies within the educational sector. Such methods are instrumental in the development of a curriculum that is both relevant and innovative, while also ensuring inclusivity. An effective approach to technology integration in education involves a series of strategic steps supported by several studies' findings.

(i) The cultivation of educators' digital competencies.

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(ii) The journal "*Membangun Pendidikan 4.0: Peran Vital Teknologi dalam Meningkatkan Kualitas Pembelajaran*" emphasizes that educators' digital competencies, cultivated through continuous training, are paramount to ensure technological literacy. Teachers must be equipped to utilize digital learning tools, such as smart boards and online platforms, and adopt technology-based learning methods that prioritize student creativity and collaboration. These competencies empower educators to function as facilitators, maximizing the potential of technology in the classroom.

(iii) Benefits of Technology in Education

(iv) The journal "*Digitalization of Education as a Trend of Its Modernization and Reforming*" underscores the substantial positive impacts of digitalization on education, including enhanced learning efficiency through real-time monitoring of student learning outcomes, facilitated collaboration through digital tools such as interactive tablets, and reduced administrative burden, allowing teachers to focus on teaching.

(v) Utilization of Technology for Curriculum Personalization and Innovation

(vi) The journal "*Application of Digital Technology to Improve the Quality of Learning in the Era of Revolution 4.0*" further elaborates on this point, asserting that technologies such as the Internet of Things (IoT) and artificial intelligence (AI) can personalize learning by tailoring content to individual needs. The IoT facilitates real-time data collection, while AI generates a more adaptive and responsive learning experience. These observations are in alignment with global strategies that integrate information technology as a fundamental component of the curriculum, as evidenced by its implementation in Russia.

(vii) The Challenges of Digitalization Implementation.

(viii) Notwithstanding its myriad advantages, the digitization of education confronts substantial challenges, including disparities in technological access, inadequate teacher preparedness, and the necessity for substantial investments in infrastructure development. A recent publication in the journal "*Analysis of Industrial Revolution 4.0 Technology-Based Learning in Higher Education*" underscores the imperative for educational institutions to address the digital divide by ensuring equitable access to technology, particularly in remote regions. The provision of digital devices and internet connectivity has emerged as a paramount concern to facilitate educational transformation.

(ix) The Transformation of Learning Methods Through Technology

(x) The journal "*Application of Digital Technology to Improve the Quality of Learning in the Era of Revolution 4.0*" posits that learning transformation necessitates a paradigm shift from conventional methods to a more adaptive approach. Technologies such as augmented reality (AR) and virtual reality (VR) can be utilized to create practical simulations that facilitate student comprehension of complex concepts. Moreover, cloud computing enables collaboration between students and educators and supports the flexibility of learning at any time and from any location.

(xi) Teacher Training and Professional Collaboration

(xii) As stated in the journal "*Membangun Pendidikan 4.0: Peran Vital Teknologi dalam Meningkatkan Kualitas Pembelajaran*", discussion forums such as the Teacher Working Group (KKG) and Subject Teacher Conference (MGMP) can be utilized to share experiences and solutions related to the application of technology in learning. Furthermore, the provision of continuous training for educators will improve their competence in operating the latest technology.

(xiii) Concurrent Emphasis on Character Development and Digital Safety.

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(xiv) The journal "*Digitalization of Education as a Trend of Its Modernization and Reforming*" asserts that technology integration strategies should prioritize the cultivation of creative, collaborative, and critical student competencies. Moreover, ensuring the protection of student data and establishing digital security measures are paramount in the implementation of technology within the educational environment. This comprehensive approach will ensure that education not only enhances cognitive abilities but also fosters the development of resilient character in the next generation, equipping them to confront global challenges.

(xv) Strategic steps must be taken to ensure that education can leverage technology as a pivotal catalyst to establish a more inclusive, responsive, and global solution-based learning environment. This comprehensive transformation is imperative to ensure that the younger generation is adequately prepared to confront the challenges posed by the Industrial Revolution 4.0 era, possessing the necessary skills and character traits that are essential for the contemporary era.

4.2. Discussion

The four journals analyzed offer rich and complementary perspectives on the implementation of digital technology in education in the era of Industry 4.0. Journal 1 *"Analysis of Industrial Revolution 4.0 Technology-Based Learning in Higher Education"* discusses digitalization as a catalyst to improve the efficiency of the educational process, particularly in reducing administrative burdens and expanding access to learning resources. Digitalization enables more interactive, collaborative learning, but the digital divide and teacher readiness are major challenges that need to be addressed. The focus is more on managing education through technology, with a holistic approach to system efficiency (Mesterjon *et al*., 2022).

Journal 2 "Application of Digital Technology to Improve the Quality of Learning in the Era of Revolution 4.0" broadens the discussion by exploring cutting-edge technologies such as artificial intelligence (AI), 3D printing, the Internet of Things (IoT), and cloud computing. This journal highlights how these technologies not only enhance personalized learning but also open up great opportunities for curriculum innovation. For example, AI and big data enable more personalized learning experiences, while 3D printing provides in-depth practical simulations in fields like medicine and architecture. However, the journal also notes significant limitations, including the integration of technology with the traditional curriculum, high initial investments, and low technological literacy among educators (Nainggolan *et al*., 2024).

Journal 3 "Membangun Pendidikan 4.0: Peran Vital Teknologi Dalam Meningkatkan Kualitas Pembelajaran" focuses on the use of IoT to create "smart classrooms" that improve operational efficiency in educational institutions. This technology enables real-time facility management, such as automated temperature and lighting control, which not only improves energy efficiency but also enhances learning comfort. On the other hand, AR and VR technologies provide interactive and immersive learning experiences, allowing students to explore more complex environments in virtual settings. However, the journal emphasizes that the success of technology implementation heavily depends on increasing technological literacy among educators and adapting the curriculum (Nasution *et al*., 2024).

Lastly, Journal 4 "Digitalization of Education as a Trend of Its Modernization and Reforming" provides a comprehensive perspective on the importance of balancing traditional methods with technological innovation. This journal stresses that curricula must be flexible to accommodate the needs of the digital age, ensuring the development of students' critical

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thinking, creativity, and collaboration skills. While offering many benefits, it also notes that digital transformation often faces resistance from institutions that are ill-prepared in terms of infrastructure and resources (Machekhina, 2017).

The four journals agree that technology has great potential to revolutionize education through personalized learning, broader access, and enhanced interactivity. However, all the journals highlight significant challenges, including the digital divide, infrastructure limitations, and the readiness of human resources. To ensure effective implementation, a collaborative approach between governments, educational institutions, and the private sector is required. An adaptive curriculum, ongoing technological training for educators, and investments in infrastructure are crucial steps to maximize the benefits of technology in education. These findings suggest that while technology presents great opportunities, its success depends heavily on strategic planning and managing existing challenges.

4.3. Implications

The implementation of technology in education has significant implications for various stakeholders. For educational institutions, the need for technological infrastructure becomes a top priority. Investments in stable internet networks, hardware such as the Internet of Things (IoT), and cloud-based learning platforms are essential to create an adaptive and inclusive learning environment. Furthermore, strengthening data management through big data and AI technology can assist institutions in making data-driven decisions for more effective educational policies (Nasution *et al*., 2024).

For educators, digital literacy has become an urgent need. Continuous training must be provided to ensure educators can integrate technologies such as AR/VR, AI, and Learning Management Systems (LMS) into the teaching process. The transformation of teachers' roles from traditional instructors to technology facilitators also requires a shift in approach to support more independent and collaborative learning (Machekhina, 2017).

For students, equal access to technology must be prioritized to overcome the digital divide, particularly in underdeveloped areas. Educational technology should also be directed towards developing 21st-century skills, such as critical thinking, creativity, collaboration, and problem-solving. These skills are crucial for students to tackle real-world challenges effectively. Curricula that emphasize these areas enhance students' creativity and adaptability (Rusmin *et al.*, 2024). This is essential to prepare students to face future workforce challenges.

For policymakers, collaboration between the government, private sector, and communities is necessary to provide affordable technological resources. Additionally, policymakers must ensure the protection of students' and educators' data in the digital environment through ethical and privacy-focused regulations. Regulation must ensure equitable access to technology while protecting personal data, preventing disparities in educational opportunities (Sumartono *et al*., 2024).

4.4. Future Research Directions

Further research is needed to evaluate the long-term impacts of technology in education. Studies can focus on the influence of technologies such as AI, AR/VR, and IoT on student learning outcomes, the development of 21st-century skills, and workforce readiness. This research is crucial to understanding the extent to which technology can meet educational needs in the modern era. Innovation in digital curriculum design is also an area that requires particular attention. Research on designing curricula that contextually integrate technology can help meet both local and global educational needs. Competency-based approaches, global collaboration, and personalized learning are key elements that need to be further

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explored. Additionally, the digital divide remains a significant challenge that needs to be addressed. Research exploring effective solutions, such as the provision of affordable devices, the development of offline technology, and community-based training, can help reduce this gap, especially in underdeveloped areas.

The use of technology for student well-being also becomes a relevant topic. Studies on the use of AI and IoT to detect stress, provide personalized learning, and support students' mental health can offer significant benefits in creating a holistic learning environment. Research on ethics and data security is also critical. With the increasing use of technology in education, student data protection must be a priority. Studies on data security policies and ethics can help develop regulations that protect students' privacy and support responsible technology use. Finally, the adaptation of technology in local contexts should be a focus of research. Studies on the implementation of educational technology in developing countries can help understand the unique challenges, such as cultural resistance to technology and resource limitations. This research will support the development of solutions that align with local needs.

5. CONCLUSION

The transition to digitalization in curriculum development, driven by the demands of the Industrial Revolution 4.0, presents significant opportunities and challenges. An analysis of relevant journals reveals that digital tools, such as the Internet of Things (IoT), artificial intelligence (AI), augmented reality (AR), virtual reality (VR), and learning management systems (LMS), offer transformative benefits, including personalized learning, enhanced collaboration, and improved accessibility. However, the implementation of these technologies is accompanied by numerous challenges, including the digital divide, inadequate infrastructure, and insufficient digital literacy among educators. Additionally, ethical concerns related to data security must be addressed. To overcome these challenges, strategic approaches must be adopted. These include fostering educators' digital competencies, investing in infrastructure, and ensuring equitable access to technology. Furthermore, the integration of innovative and adaptable curricula that leverage technological advancements while maintaining ethical standards is imperative for achieving a comprehensive transformation in education.

Collaboration among policymakers, educational institutions, and private sector stakeholders is vital to navigate these complexities effectively. Future research should focus on addressing the digital divide, enhancing student well-being through technology, and ensuring data security while exploring the contextual application of digital tools to meet local and global educational needs. Ultimately, by embracing these strategies, education systems can harness digitalization to build inclusive, innovative, and future-ready learning environments.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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