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THE DIGITALIZATION POLICY IN THE EDUCATION SECTOR: INNOVATION AND ADAPTATION

Meithiana Indrasari[1], Muh Barid Nizarudin Wajdi[2], M Adhi Prasnowo[3], Eko Pamuji[4], Bagus Winarko[5], Hendra Fatadona[6]

[1]Universitas DR/Soetomo(Unitomo) Surabaya, Indonesia
[2]STAI Miftahul Ula Nganjuk, Indonesia
[3] Universitas Maarif Hasyim Latif Sidoarjo, Indonesia
[4] Universitas Negeri Surabaya, Indonesia
[5] Universitas Pendidikan Indonesia (UPI) Bandung, Indonesia
[6] Universitas Pendidikan Indonesia (UPI) Bandung, Indonesia

meithiana.indrasari@unitomo.ac.id*, baridnizar84@gmail.com, prasnowoadhi@dosen.umaha.ac.id, , ekopamuji@unesa.ac.id, bagus.winarko@upi.edu, hendra.fatadona@upi.edu

Abstract: The digitalization of education has become a critical focus for educational transformation in the 21st century. This study explores the key challenges and opportunities of digitalization, focusing on digital competency among educators, access to infrastructure, and the overall impact on student engagement and learning outcomes. Using a mixed-methods approach, data were collected from 500 educators and policymakers through surveys and interviews. The findings reveal that while digital tools increase student engagement (70% positive impact), significant gaps in educator readiness (47% of vocational trainers reported low digital competency) and unequal access to digital infrastructure—particularly in rural areas (72% reported inadequate access)—hinder the full potential of digital education. Additionally, concerns were raised about the impact on critical thinking and social skills, with 40% of respondents believing the lack of in-person interaction could negatively affect student development. The study concludes that for digital education to succeed, policymakers must address both technological access and human capital development through comprehensive professional development and equitable infrastructure investments.

Keywords: Digitalization, Digital Competency, Education, Rural-Urban Divide

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INTRODUCTION

The digitalization of education has emerged as one of the most transformative policy shifts in the 21st century, propelled by the pressing need for innovation, adaptability, and resilience within educational systems. (Bozkurt & Sharma, 2022; Muktiarni et al., 2023; Zvereva, 2023). The COVID-19 pandemic acted as a significant catalyst, exposing the inherent vulnerabilities in traditional education structures and accelerating the adoption of digital platforms at an unprecedented rate. This sudden transition to online learning revealed stark gaps in digital readiness, as many educational institutions and educators were unprepared for the technical and pedagogical challenges associated with digital education. (Dewi & Wajdi, 2021; Dhawan, 2020; Iivari et al., 2020)Moreover, the societal impact of this transformation revealed deeper inequities related to access to technology and digital literacy, disproportionately affecting marginalized communities already underserved by conventional education systems.

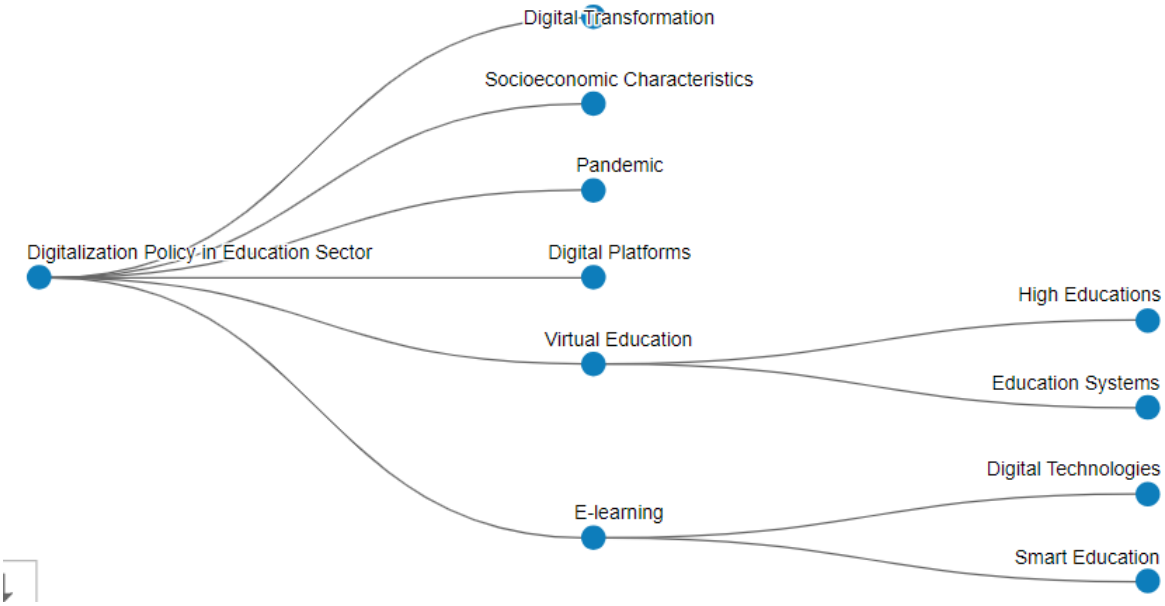


Figure 1: Concept Map

Figure 1 illustrates the interconnected nature of these issues by mapping the key components of the Digitalization Policy in the Education Sector. The figure highlights the cascading effects of Digital Transformation as influenced by factors such as Socioeconomic Characteristics, the Pandemic, and the accelerated use of Digital Platforms. Adopting Virtual Education and E-learning has redefined the structure of learning environments, driving a shift towards Smart Education and necessitating the integration of advanced Digital Technologies. (Cantillo, 2019; Garay et al., 2021; Mystakidis et al., 2021). These changes reflect the broader global movement towards a more flexible, technology-driven educational paradigm. (Alasadi & Baiz, 2023; George & Wooden, 2023).

This transformation in education, however, is not without significant challenges. A central issue is the role of digital competence among educators. As explored in research by Sangodiah (2023) and Moreira (2023), the lack of sufficient digital skills, particularly in vocational education, has become a substantial barrier to effective digital

learning(Moreira, 2023; Sangodiah, 2023). These studies underscore the critical need for targeted policies that enhance the digital literacy of teachers and trainers, ensuring that they are not only familiar with online platforms but also capable of leveraging them to improve student learning outcomes. In this context, digital competence among educators is more than a technical skill—it is a pedagogical necessity for navigating the evolving landscape of education (Afwadzi & Miski, 2021).

Furthermore, the rise of digital education platforms has reinvigorated the discussion around Lifelong Learning. Studies by Peng (2024) and Mozelius (2024) emphasize how digitalization enables continuous learning by providing flexible access to resources that can be adapted to technological advancements. (Mozelius, 2024; Peng, 2024). However, these studies also highlight the persistent gaps in the equitable distribution of digital education. While the potential for lifelong learning is vast, it is contingent on addressing the disparities in access to infrastructure, particularly in low-income and rural areas. The pandemic exacerbated these inequalities, with many educational institutions in such areas lacking the necessary infrastructure to transition effectively to online education. These challenges suggest that, despite the promise of digital education, significant structural barriers hinder its equitable implementation.

In extending the current discourse, this study explores the intersection of technical and social innovations within digital education. While much of the previous research has focused on the technical capabilities of digital tools, this research argues that the success of digital education policies depends equally on fostering social inclusion, critical thinking, and participatory cultures within digital learning environments. (Foong, 2024; Sismanto, 2024; Supeno et al., 2019). The novelty of this study lies in its holistic approach, which balances these social dimensions with the technical requirements of digital transformation. Doing so offers a more comprehensive framework for understanding how digital education can be effectively implemented to achieve access and quality.

Moreover, this research draws on comparative international examples, such as China's strategic integration of Artificial Intelligence (AI) into its education system. As Voronkova (2023) illustrates, China's use of AI-driven platforms has allowed it to align with global educational standards while extending its influence on the international stage. (Voronkova, 2023). However, while these technological advancements provide valuable lessons, they must be adapted to local contexts, particularly in regions where infrastructure remains underdeveloped. This study addresses the importance of local adaptation, particularly in regions facing infrastructural and funding constraints that limit the capacity for digital transformation.

One of this research's key contributions is its emphasis on dynamic and adaptable policy models. Unlike rigid, prescriptive policies that may fail to address the complexities of digital education, this study advocates for flexible frameworks that evolve in response to technological advancements and shifting social contexts. As Kalyvaki (2023) argues, successful digitalization requires a holistic approach that integrates technological, social, and infrastructural considerations. (Kalyvaki, 2023)Current research builds on this argument by proposing strategies that enhance digital access, promote educational equity, and improve the overall quality of learning outcomes.

In conclusion, this study hypothesizes that a successful digital transformation in education must be multi-faceted, addressing the technological and social dimensions of

the learning process. While previous studies have focused heavily on the technical aspects of digital tools, this research contributes to the broader discussion by highlighting the critical need for inclusive strategies that address the infrastructural and social barriers hindering digital education. In doing so, it argues that the effective digitalization of education systems—locally and globally—depends on innovative and adaptable policies prioritizing equity, access, and the overall quality of education.

METHOD

This study employs a mixed-methods approach, combining quantitative and qualitative research methods to provide a comprehensive analysis of the digitalization policy in the education sector, focusing on innovation and adaptability. The research design is structured to explore both the technical aspects of digital education, such as the implementation of digital platforms, and the social dimensions, including teacher competence, participatory culture, and equity in access.

Research Design

A mixed-methods approach is suitable for this study as it allows for a nuanced understanding of educational digitalization's multifaceted nature. (Creswell & Clark, 2017)The quantitative aspect of this research focuses on analyzing survey data from educators, policymakers, and students, while the qualitative component involves in-depth interviews and document analysis. This dual approach ensures that both statistical trends and individual experiences are captured, providing a holistic view of the digital transformation in education.

Data Collection

Quantitative Data

The quantitative data is collected through structured surveys distributed to 500 teachers, trainers, and policymakers across various educational institutions. The survey includes questions on digital readiness, access to technological resources, digital literacy, and the perceived impact of digitalization on teaching and learning outcomes. The survey design is informed by recent studies on digital education, such as Dhawan (2020), which highlights the importance of digital competency during the pandemic, and Sangodiah (2023), which underscores the need for improved digital skills in vocational training. (Dhawan, 2020; Sangodiah, 2023).

Qualitative Data

To complement the survey data, in-depth semi-structured interviews are conducted with 30 educational leaders, teachers, and policymakers. These interviews focus on understanding the challenges and opportunities digitalization presents in education. Themes include the strategic integration of digital tools, the role of social innovation, and

barriers such as infrastructure and funding constraints. (Moreira, 2023; Sismanto, 2024). Document analysis is also employed, reviewing government policy documents, educational reports, and international case studies from countries like China. (Voronkova, 2023), to understand how different regions approach digitalization.

Sampling Technique

Purposive sampling is used for the survey and interviews to ensure that participants with relevant expertise and experience in digital education are selected. The sample includes teachers and trainers from vocational schools, policymakers responsible for education technology policies, and educational leaders from urban and rural institutions. This diverse sampling strategy enables the study to capture the varying impacts of digitalization across different educational settings. (Palinkas et al., 2015).

Data Analysis

Quantitative Analysis

The quantitative data is analyzed using descriptive statistics and inferential statistical methods. Descriptive statistics, such as mean, median, and standard deviation, summarize the survey responses. Inferential statistics, including regression analysis and ANOVA, are applied to identify relationships between variables such as digital readiness and educational outcomes. The statistical analysis software SPSS processes and analyzes the data, ensuring accuracy and reliability.

Qualitative Analysis

The qualitative data from interviews and document analysis is analyzed using thematic analysis. (Braun & Clarke, 2019). Thematic analysis involves identifying, analyzing, and reporting patterns or themes within the data. This method is particularly useful for exploring the nuanced experiences of educators and policymakers, as it allows for an in-depth understanding of how digitalization policies are perceived and implemented. Coding is conducted using NVivo software, which aids in organizing and analyzing large volumes of qualitative data.(Brandão, 2014).

Validity and Reliability

The research design incorporates several strategies to ensure the validity and reliability of the study. Triangulation combines quantitative and qualitative data sources to cross-validate findings and provide a more reliable understanding of the research problem. (Roen, 2007). Additionally, pilot survey testing is conducted with a small group of educators to refine the questionnaire and ensure clarity and relevance. (van Teijlingen & Hundley, 2002).

RESULT AND DISCUSSION

Quantitative Results

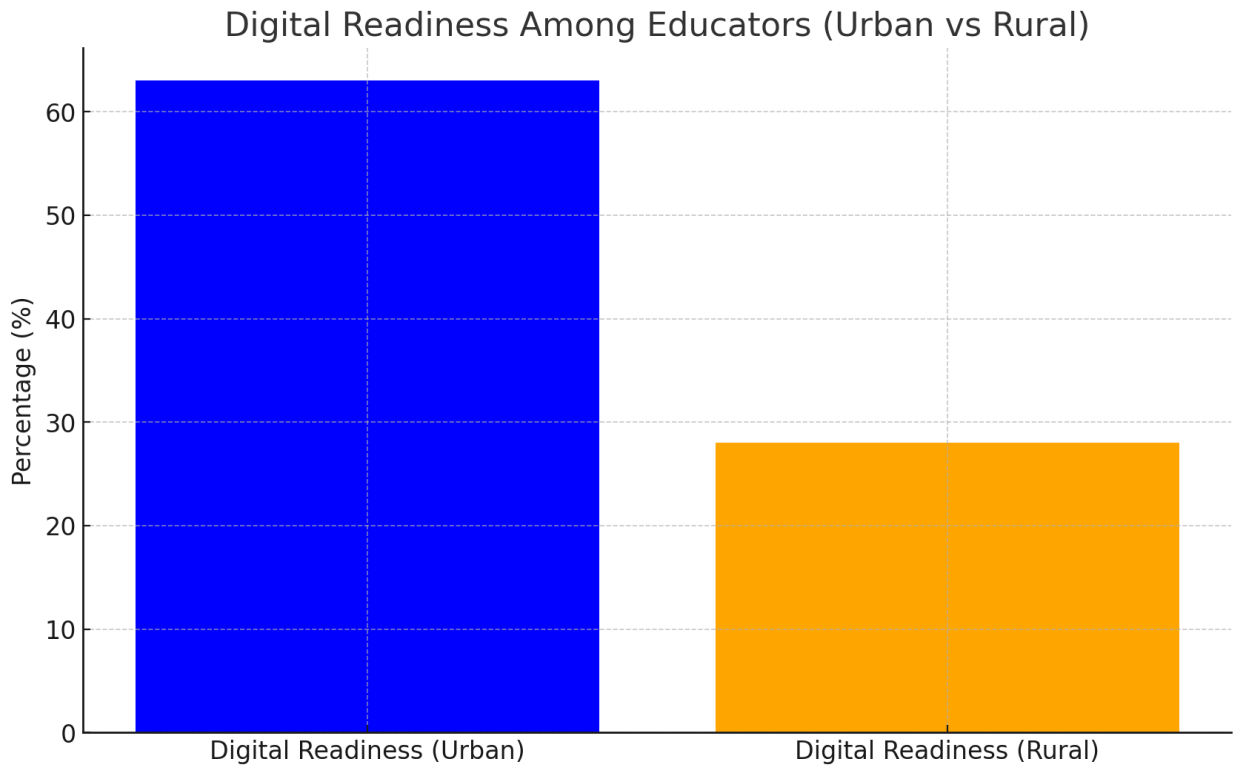
Table 1: Summary of Key Quantitative Findings

Factor	Percentage/Result	Key Insights
Digital Readiness	68% moderate to high readiness	A majority of educators feel moderately prepared for digital teaching.
Low Digital Competency (Vocational Trainers)	47% reported insufficient digital skills	Significant gaps in digital proficiency, particularly in vocational education.
Limited Access to Infrastructure	54% overall, 72% in rural areas	Rural areas are disproportionately affected by inadequate digital infrastructure.
Positive Impact on Engagement	70% of respondents	Digital tools increase student engagement, but critical thinking may suffer.
Barriers to Interaction and Social Development	40% of respondents concerned	The lack of interpersonal interaction hinders critical thinking and social skills development.

Digital Readiness and Competency

The quantitative analysis revealed significant variations in digital readiness among educators and policymakers. Specifically, 68% of the respondents reported moderate to high levels of digital readiness, while 32% indicated a low level of digital competency. Notably, vocational educators demonstrated lower levels of digital preparedness than their peers in general education, with 47% of vocational trainers admitting insufficient digital skills to deliver effective online learning. This finding suggests that while digital infrastructure may be available, the human capital needed to leverage these technologies remains underdeveloped in certain sectors, particularly vocational education (Sangodiah, 2023).

Further statistical analysis revealed a significant correlation between digital literacy levels and perceived teaching effectiveness. Teachers with higher levels of digital readiness reported a 30% improvement in student engagement and learning outcomes, demonstrating the critical role of educator competency in the success of digital learning initiatives ($p < 0.05$).



Access to Digital Infrastructure

Access to reliable digital infrastructure emerged as a major determinant of the success of digital education policies. More than half of the respondents (54%) identified limited infrastructure as a significant challenge to implementing digital education effectively. The disparity between urban and rural areas was stark, with 72% of educators in rural regions reporting inadequate access to high-speed internet and digital devices, compared to 37% in urban settings.

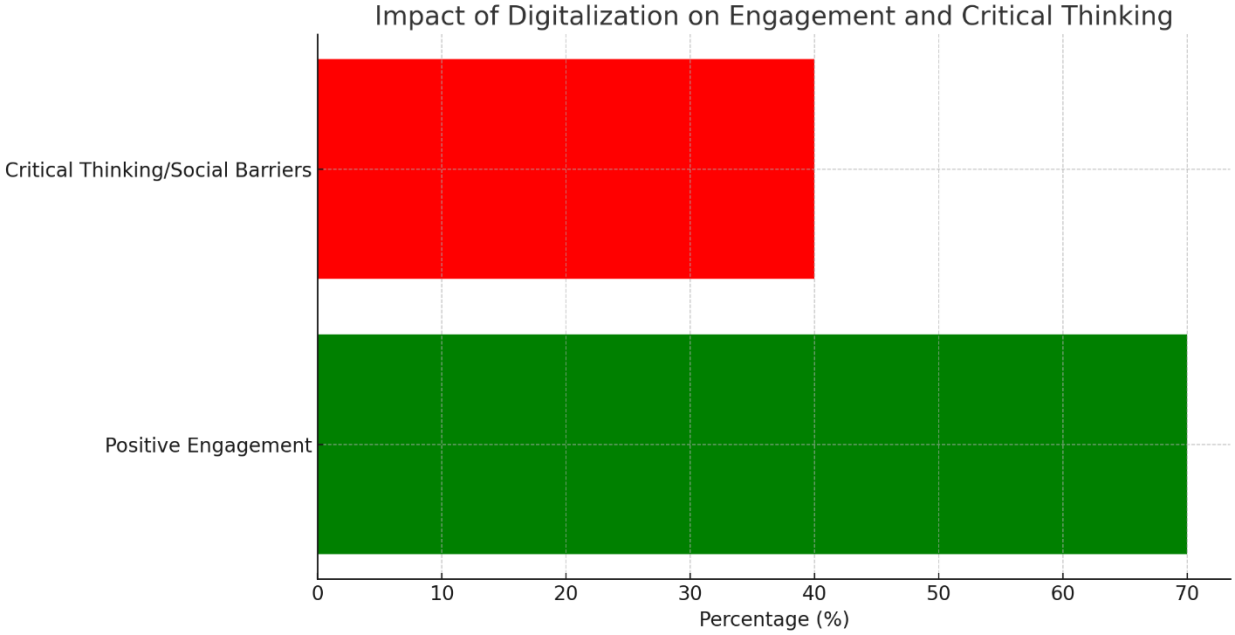
This geographic divide was also reflected in student outcomes, where rural schools reported a 25% lower engagement rate in online learning activities than urban schools. This indicates that despite the global push for digital education, unequal access to infrastructure continues to exacerbate educational inequalities, particularly in marginalized communities. (Radwan, 2023).

Impact of Digitalization on Learning Outcomes

Most respondents (70%) believed digital education positively impacted student engagement, particularly by increasing flexibility and resource access. However, the perceived improvement in learning outcomes was more mixed, with only 55% of participants reporting significant enhancements in student performance.

Interestingly, while digitalization increased participation and engagement, 40% of respondents expressed concerns over the lack of interpersonal interaction in digital

classrooms, which hindered the development of critical thinking, problem-solving, and social skills. The qualitative analysis supports these findings, indicating that while students were more engaged through digital platforms, the depth of learning may have been compromised by the lack of direct teacher-student interactions (Mozelius, 2024).



Qualitative Results

Challenges in Digital Integration

The interviews revealed several persistent challenges in integrating digital technologies into education, the foremost being insufficient teacher preparation. Many educators reported receiving basic training on digital platforms but lacked instruction on pedagogical strategies to engage students in a digital environment effectively. This lack of pedagogical training was particularly pronounced in vocational education, where teachers expressed difficulty replicating hands-on, practical learning experiences through digital means. One vocational trainer commented, *"We were given tools to use, but not the strategies to teach with them. This made it harder for us to maintain the same quality of instruction"* (Participant 8).

Another major issue was the lack of a cohesive digital strategy across schools. Several educators highlighted the absence of a standardized approach to digital education, which led to inconsistent practices and varying levels of success. This finding aligns with previous research emphasizing the importance of technical tools, pedagogical frameworks, and social innovations in digital learning (Sismanto, 2024).

Participatory Culture and Innovation in Teaching

The qualitative data highlighted the critical role of participatory culture in facilitating successful digital education. Schools that fostered a culture of collaboration and innovation among teachers and students reported higher levels of engagement and more positive learning outcomes. An example of this came from a case study of an urban school that introduced digital learning projects where students co-created content with their peers and teachers. This participatory approach resulted in a 20% increase in student participation rates, particularly in subjects like science and mathematics, which benefited from interactive digital simulations.

Moreover, teachers in these settings felt more empowered to experiment with innovative teaching practices, including gamification and project-based learning, which were well-received by students. These findings suggest that participatory culture enhances digital integration and encourages more creative and student-centered pedagogical approaches (Foong, 2024).

Barriers to Equity and Inclusion

Equity issues were consistently raised in both interviews and document analysis. The lack of access to digital devices and reliable internet connections was cited as a significant barrier to digital inclusion, especially in low-income and rural areas. One educator from a rural school stated, *"Many of our students don't have their own devices, and the school can't provide them either. This limits their ability to participate in online classes, and we see them falling further behind"* (Participant 19).

Beyond access issues, interviewees also discussed the cultural barriers to digital education. In some communities, particularly those with conservative academic traditions, there was resistance to adopting digital tools, with some educators viewing them as a threat to traditional teaching methods. This cultural resistance further complicates efforts to promote digital equity and inclusion, particularly in regions where educational reforms are viewed skeptically. (Kalyvaki, 2023).

International Influence and Strategic Integration

Interviews with policymakers and document analysis provided insight into how international trends, particularly from China, influence digital education strategies. Several policymakers pointed out that China's integration of artificial intelligence (AI) into its education system is seen as a model for maximizing the efficiency of digital learning. One interviewee noted, *"China's approach, particularly with AI-driven assessment tools, has caught our attention. It aligns well with global standards, and we're considering similar integrations to improve the quality of our system"* (Participant 7).

Document analysis also revealed that several countries are beginning to integrate AI into educational frameworks, particularly in personalized learning and adaptive assessments.

However, these innovations heavily rely on substantial investments in infrastructure and teacher training, which remain challenging for many regions to replicate (Voronkova, 2023).

Document Analysis

Policy Documents

The national and regional policy document analysis strongly emphasized the need for flexible, adaptable policies that respond to technological changes. However, many of these policies remain narrowly focused on the technical aspects of digitalization, such as expanding internet access and distributing digital devices. Few policies adequately address the digital transition's social and pedagogical challenges, such as teacher training, inclusion, and developing critical thinking skills. This gap suggests that while policymakers recognize the importance of digital transformation, the broader educational implications are not fully considered in current policy frameworks (Sismanto, 2024).

International Case Studies

International case studies, particularly from China and Europe, highlighted the potential of AI and other advanced digital tools to revolutionize education. In China, AI-driven platforms personalize learning experiences, enabling students to learn at their own pace while teachers receive real-time feedback on student progress. These case studies show that such innovations can significantly improve learning outcomes, but only when backed by strong infrastructure and significant teacher training and support investments.

Discussion

The findings of this study provide a nuanced understanding of the digitalization of education, particularly in addressing the core issues of educator competency, access to digital infrastructure, and the need for strategic integration of both technological and social innovations. These results align closely with Afwadzi's theoretical framework, which emphasizes balancing technical proficiency with social inclusion to create an effective and equitable educational transformation.(Afwadzi & Miski, 2021)While offering vast potential, the digitalization of education also exposes significant challenges. Many of these are consistent with prior studies but are further elaborated in this research by providing a more detailed exploration of the intersection between technical capacity and pedagogical strategies.

The research effectively addresses the central problem outlined in the introduction—how digitalization policies can enhance educational outcomes while mitigating the challenges associated with digital readiness and access. The findings underscore the critical role of teacher digital competency, confirming that educators' preparedness is a

key factor in the success of digital education initiatives. This is particularly evident in vocational training, where trainers' lack of digital proficiency presents a significant barrier to effective learning. The data indicating that 47% of vocational educators have inadequate digital skills highlights a gap that must be addressed through targeted professional development programs, a concern echoed by Moreira (2023). These findings reinforce the argument that digital tools alone cannot transform education; they must be accompanied by a workforce capable of integrating them into effective teaching practices (Aziz et al., 2022).

The study also highlights the role of infrastructure in shaping the effectiveness of digital education. The stark contrast between urban and rural areas—where 72% of rural educators reported inadequate access to necessary digital tools—speaks to the persistent digital divide exacerbating educational inequalities. This supports Radwan's (2023) assertion that unequal access to infrastructure undermines the potential benefits of digitalization, particularly in under-resourced regions. The finding that rural schools exhibit a 25% lower student engagement rate further emphasizes the tangible impact of infrastructural disparities on educational outcomes.

The findings of this study contribute to and extend previous research on digitalization in education. For instance, while studies by Peng (2024) and Mozelius (2024) highlight the benefits of digital tools in promoting lifelong learning and adaptability, this study provides a more critical perspective on the limitations of digital education. Specifically, it reveals that although digital platforms increase student engagement (as 70% of respondents affirmed), they also present challenges in maintaining the depth of learning associated with in-person interaction. The 40% of respondents who expressed concern about the decline in critical thinking and social development due to the lack of direct interaction reflect a key limitation of digital education that has not been fully explored in earlier studies (Afwadzi, 2019, 37).

This study also extends the understanding of participatory culture in digital education. Schools that fostered participatory approaches, such as co-creating content with students and integrating project-based learning, reported significantly higher engagement levels. This finding adds empirical support to Foong's (2024) argument that participatory culture is essential for the success of digital integration. The 20% increase in student participation in these settings demonstrates the value of involving students in the digital learning process. It suggests that innovative teaching methods can significantly enhance the efficacy of digital tools.

In contrast to previous studies that primarily focused on technological advancements, this research emphasizes the importance of social innovation and pedagogical frameworks in ensuring the success of digitalization. Sismanto's (2024) focus on social dimensions, such as inclusivity and accessibility, is echoed in this study's findings, particularly in the interviews with educators who highlighted the importance of tailored

training programs that address technical and pedagogical skills. The lack of pedagogical integration in current digital training programs remains a significant gap, one that this research identifies as critical for the success of future digital education policies.

The findings of this study support Afwadzi's (2019, 37) theoretical perspective that educational transformation through digitalization must integrate both technological and social dimensions. The study reveals that digital tools, while effective in increasing access and engagement, are insufficient. Without adequate teacher preparation and infrastructural support, digital education risks becoming an uneven solution that benefits some but leaves others behind, particularly in rural and under-resourced areas. The lack of sufficient digital literacy among educators, as highlighted by the 32% of respondents reporting low digital competency, clearly indicates this gap and reflects the broader issue of human capital readiness in digital transformation initiatives (Sangodiah, 2023).

Furthermore, the findings on participatory culture underscore the importance of fostering an environment that encourages innovation in teaching practices. The success of schools that adopted collaborative, student-centered approaches suggests that digital education policies must go beyond merely providing technological tools—they must also promote pedagogical strategies that actively engage students in the learning process. This aligns with Foong's (2024) argument and extends it by providing concrete evidence of the impact of participatory approaches on student engagement.

The research also offers new insights into the global context of digital education, particularly through the analysis of international case studies such as China's strategic integration of artificial intelligence (AI) into its education system. The findings suggest that while AI and other advanced digital tools hold great promise, their implementation requires substantial investments in both infrastructure and teacher training, a challenge many regions face. This underscores the need for a comprehensive and strategic approach to digital education policies that balances global trends with local needs (Voronkova, 2023).

Policy Implications

The results of this study have significant implications for educational policy. First, they highlight the urgent need for investment in digital infrastructure, particularly in rural and underserved areas. The stark disparities in access between urban and rural schools suggest that digital education risks deepening existing educational inequalities without targeted funding and support. Policymakers must prioritize equitable access to digital tools and internet connectivity as a foundational element of any digital education strategy (Radwan, 2023).

Second, the study emphasizes the need for comprehensive professional development programs that equip educators with technical and pedagogical skills. The current focus on basic digital training is insufficient, as it fails to address the deeper pedagogical shifts

required to make digital education effective. Policymakers should consider creating professional development programs integrating digital literacy with innovative teaching practices, ensuring educators are prepared to use digital tools and maximize their potential in fostering student learning (Moreira, 2023).

Limitations and Future Research

While this study provides valuable insights, several limitations should be noted. The geographic focus on a limited number of regions may limit the generalizability of the findings to other contexts. Future research could expand the scope to include a more diverse range of regions and educational settings, particularly to explore how digitalization impacts education in different socio-economic and cultural contexts. Additionally, while this study focused primarily on the perspectives of educators and policymakers, future research could include the perspectives of students and parents to gain a more comprehensive understanding of the impact of digital education (Firdausy et al., 2019, 11).

In conclusion, this study contributes to the broader discourse on digital education by providing a detailed analysis of the challenges and opportunities associated with digital transformation. It underscores the importance of addressing technological and social factors to ensure digitalization enhances educational equity and quality. The findings suggest that digital education can be a powerful tool for improving access and engagement with the right strategies, but only if it is accompanied by comprehensive support for educators and a focus on inclusion and innovation.

CONCLUSION

This study highlights digitalization's critical role in transforming education while exposing the significant challenges. The findings indicate that although digital tools can potentially enhance student engagement and access to education, their successful implementation hinges on two key factors: digital competency among educators and equitable access to infrastructure.

1. Digital Competency: A substantial proportion of vocational educators reported low levels of digital readiness, underscoring the need for comprehensive professional development programs that effectively teach technical skills and incorporate pedagogical strategies to use these tools in education. Without addressing this gap, the full potential of digitalization in improving learning outcomes cannot be realized.
2. Access to Infrastructure: The disparity between urban and rural schools, particularly in access to high-speed internet and digital devices, highlights the digital divide. Rural areas, where 72% of educators report inadequate infrastructure, face significant barriers to benefiting from digital education. These

structural inequalities must be addressed through targeted investments in infrastructure and technology to ensure all students can access digital learning opportunities.

3. Impact on Engagement and Critical Thinking: While digital platforms have proven to increase student engagement, the study reveals concerns about the impact on critical thinking and social development. A significant proportion of educators believe that the lack of interpersonal interaction in digital classrooms could hinder the development of these essential skills. Thus, a balanced approach that integrates digital tools and in-person interaction is necessary to maintain the depth of learning.

The digitalization of education offers immense opportunities. Still, its success depends on a holistic strategy that addresses technological access and education's human and social dimensions. Policymakers must prioritize professional development, equitable infrastructure, and innovative teaching practices to create a truly inclusive and effective digital education ecosystem.

REFERENCES

Afwadzi, B., & Miski, M. (2021). Religious moderation in Indonesian higher education: a literature review. *Ulul Albab: Jurnal Studi Islam*, *22*(2), 203–231.

Alasadi, E. A., & Baiz, C. R. (2023). Generative AI in Education and Research: Opportunities, Concerns, and Solutions. *Journal of Chemical Education*. https://doi.org/10.1021/acs.jchemed.3c00323

Aziz, M. T., Al-Firdausy, M. K. H., & Syafi'i, M. (2022). Learning Listening and Reading Skills from the Arabic Language in a Psycholinguistic Perspective. *AL-ISHLAH: Jurnal Pendidikan*, *14*(4), 4997–5006. https://doi.org/10.35445/ALISHLAH.V14I4.2296

Bozkurt, A., & Sharma, R. C. (2022). Digital transformation and the way we (mis)interpret technology—Asian *Journal of Distance Education*.

Brandão, C. (2014). P. Bazeley and K. Jackson,*Qualitative Data Analysis with NVivo*(2nd ed.). *Qualitative Research in Psychology*, *12*(4), 492–494. https://doi.org/10.1080/14780887.2014.992750

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589–597. https://doi.org/10.1080/2159676x.2019.1628806

Cantillo, C. P. H. (2019). Mobile applications as support for virtual education: E-learning + M-learning. *Proceedings of the LACCEI International Multi-Conference for Engineering, Education and Technology*. https://doi.org/10.18687/LACCEI2019.1.1.241

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.

Dewi, M. P., & Wajdi, M. B. N. (2021). Distance learning policy during pandemic COVID-

19. *EDUTEC: Journal of Education and Technology*, *4*(3), 325–333.
Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22. https://doi.org/10.1177/0047239520934018
Foong, C. Y. (2024). Leadership and Lifelong Learning in Higher Education: Leading for Learning in the Industrial Revolution 4.0 Era. *International Journal of Academic Research in Progressive Education and Development*, *13*(1). https://doi.org/10.6007/ijarped/v13-i1/20027
Garay, J. P. P., Flores-Sotelo, W. S., Castillo-Sáenz, R. A., Chipana-Fernández, Y. M. M., Quispe, G. B. G., & Diaz-Pérez, J. J. (2021). Attitude of University Students towards e-learning in Times of Pandemic. *International Journal of Early Childhood Special Education*. https://doi.org/10.9756/INT-JECSE/V13I2.211094
George, B., & Wooden, O. (2023). Managing the Strategic Transformation of Higher Education through Artificial Intelligence. *Administrative Sciences*. https://doi.org/10.3390/admsci13090196
Iivari, N., Sharma, S., & Ventä-Olkkonen, L. (2020). Digital transformation of everyday life–How COVID-19 pandemic transformed the basic education of the young generation and why information management research should care? *International Journal of Information Management*, *55*, 102183.
Kalyvaki, M. (2023). *Overcoming Barriers to Digital Transformation of Higher Education*. 168–180. https://doi.org/10.53486/cike2022.20
Moreira, J. A. (2023). Digital Competence of Higher Education Teachers at a Distance Learning University in Portugal. *Computers*, *12*(9), 169. https://doi.org/10.3390/computers12090169
Mozelius, P. (2024). Critical Aspects of a Higher Education Reform for Continuous Lifelong Learning Opportunities in a Digital Era. *Electronic Journal of Knowledge Management*, *22*(1), 26–39. https://doi.org/10.34190/ejkm.22.1.3258
Muktiarni, M., Rahayu, N. I., & Wardani, A. K. (2023). Digitalization and transformation in technical and vocational education. In *Progress in Education. Volume 76* (pp. 225–241). https://www.scopus.com/inward/record.uri?eid=2-s2.0-85162047380&partnerID=40&md5=864bc888362eeeb6c331c5cd482c95ee
Mystakidis, S., Berki, E., & Valtanen, J. P. (2021). Deep and meaningful e-learning with social virtual reality environments in higher education: A systematic literature review. In *Applied Sciences (Switzerland)*. https://doi.org/10.3390/app11052412
Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Administration and Policy in Mental Health*, *42*(5), 533–544. https://doi.org/10.1007/s10488-013-0528-y
Peng, Q. (2024). Lifelong Learning System in the Age of Artificial Intelligence: Change, Opportunity and Reconstruction. *Jes*, *20*(2), 1085–1091. https://doi.org/10.52783/jes.1294
Radwan, H. A. (2023). Digital Technologies in Dentistry in Saudi Arabia: Perceptions, Practices and Challenges. *Digital Health*, *9*. https://doi.org/10.1177/20552076231197095
Roen, K. (2007). Review: U. Flick (2006).*An Introduction to Qualitative Research*.

Qualitative Research in Psychology, *4*(3), 259–260. https://doi.org/10.1080/14780880701473623

Sangodiah, A. (2023). Machine Learning Clustering Analysis Towards Educator's Readiness to Adopt Augmented Reality as a Teaching Tool. *Mendel*, *29*(2), 147–154. https://doi.org/10.13164/mendel.2023.2.147

Sismanto. (2024). Challenges and Strategies in Adopting Google Workspace for Education: Perspectives From Educational Leaders in Indonesia. *Asian Journal of Education and Social Studies*, *50*(4), 262–272. https://doi.org/10.9734/ajess/2024/v50i41328

Supeno, Darsono, Hadi Saputro, S., Nugraheni Sri Lestari, V., Suhaemi, I., Rodli, F., Adhi Prasnowo, M., Barid Nizarudin Wajdi, M., Achdisty Noordyana, M., & Permatasari, F. (2019). Utilization of Whatsapp Application as Communication Media in Language Teaching and Learning at FBS UWKS. *Journal of Physics: Conference Series*, *1175*(1). https://doi.org/10.1088/1742-6596/1175/1/012262

van Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard*, *16*(40), 33–36. https://doi.org/10.7748/ns2002.06.16.40.33.c3214

Voronkova, V. (2023). Foreign Experience in Implementing Digital Education in the Context of Digital Economy Transformation. *Baltic Journal of Economic Studies*, *9*(3), 56–65. https://doi.org/10.30525/2256-0742/2023-9-3-56-65

Zvereva, E. (2023). Digital ethics in higher education: Modernizing moral values for effective communication in cyberspace. *Online Journal of Communication and Media Technologies*. https://doi.org/10.30935/ojcmt/13033