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Digital transformation in Vietnam's education: Opportunities, challenges, and development strategies

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Abstract Digital transformation in education has become a global priority, and Vietnam is no exception in its pursuit of integrating technology into the educational sector. This study examines the current state of digital transformation in Vietnam's education system, exploring its opportunities, challenges, and proposing strategic solutions for sustainable development. Using a mixed-methods approach, the research collected data from 350 participants, including teachers, students, and educational experts across various regions. The findings indicate a significant digital divide between urban and rural areas, with urban educators benefiting from better access to digital tools and resources, while rural counterparts face challenges such as inadequate infrastructure and limited technological support. This disparity affects the overall effectiveness of digital integration in education, particularly in ensuring equal opportunities for all students. The study also identifies the necessity of targeted professional development programs to enhance teachers' digital literacy, which plays a vital role in improving student engagement and performance. To address these challenges, the research proposes several actionable strategies. These include prioritizing investments in digital infrastructure for rural schools, designing customized training programs for educators to improve their technological proficiency, and implementing policies to ensure equitable access to digital tools across all regions. These initiatives aim to bridge the digital divide and foster an inclusive educational environment. By adopting these measures, Vietnam can create a more equitable and effective education system, preparing students with the skills needed to thrive in the digital age. This transformation will not only benefit the education sector but also contribute to the country's broader socio-economic development.

Keywords: digital transformation, education, Vietnam, digital literacy, student engagement

1. Introduction

Digital transformation in education has emerged as a critical focus for countries worldwide, and Vietnam is no exception. As the nation strives to enhance its educational outcomes and adapt to the rapid technological advancements of the 21st century, it faces both significant opportunities and challenges. The Vietnamese government has recognized the importance of integrating digital technologies into education as a means to improve quality and accessibility. According to Vietnam's Prime Minister's Decision No. 749/QD-TTg, the National Digital Transformation Programme aims to leverage technology to foster innovative teaching and learning environments by 2025, with a vision extending to 2030 (VPM, 2020).

The urgency for this transformation is underscored by projections that indicate substantial job opportunities in the digital economy. The Boston Consulting Group (2017) estimates that by 2035, there could be approximately 400 million job opportunities globally driven by digital innovations. Therefore, equipping students with the necessary digital skills has become paramount for their future employability and the country's overall economic growth (Bodewig & Badiani-Magnusson, 2014Kien, P.T. Khanh, M.Q. Tinh, T.T., 2024).

However, the path toward digital transformation is fraught with obstacles. Issues such as inadequate infrastructure, limited access to digital tools, and varying levels of digital literacy among teachers and students pose significant challenges (Kataoka et al., 2020). Additionally, the COVID-19 pandemic has accelerated the need for digital solutions in education, highlighting the gaps in preparedness and responsiveness within the existing system (UNESCO, 2021).

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This paper aims to explore the current state of digital transformation in Vietnam's education sector, identifying key opportunities for growth and the challenges that need to be addressed. Furthermore, strategic development initiatives to facilitate a successful digital transition in educational practices are proposed.

2. Theoretical Framework

2.1. Definition of digital transformation in education

Digital transformation in education signifies a profound shift in how educational institutions operate and deliver learning experiences. This concept goes beyond merely adopting technology; it entails a comprehensive integration of digital tools across teaching, learning, and administrative processes. As educational environments evolve, understanding the various dimensions of digital transformation is crucial for educators, policymakers, and students alike.

In essence, digital transformation in education is about the holistic adoption of digital technologies to enhance educational outcomes. This transformation is defined as the "process of using digital technologies to create new or modified business processes, culture, and customer experiences to meet changing business and market requirements" (Westerman et al., 2014). In the educational context, this definition extends to the adaptation of teaching methodologies, curricular designs, and administrative practices that leverage digital tools for improved efficacy and engagement.

One of the key dimensions of digital transformation is technological integration. The incorporation of digital tools such as learning management systems (LMSs), online collaboration platforms, and adaptive learning technologies plays a significant role in this process. According to the European Commission (2021), digital technologies enhance pedagogical practices by facilitating personalized learning and providing immediate feedback. Platforms such as Google Classroom and Microsoft Teams have revolutionized how educators deliver lessons and interact with students, fostering an environment conducive to collaborative learning (PwC, 2017).

Another critical aspect is pedagogical innovation, driven by digital transformation. Educators are encouraged to explore new teaching methodologies that incorporate technology to promote active learning. For example, blended learning models combine traditional face-to-face instruction with online components, allowing for greater flexibility and personalization of the learning experience (Darling-Hammond & Hyler, 2020, Luong et al, 2024). This shift necessitates that educators rethink lesson planning and assessment, integrating digital resources that align with diverse student learning needs.

Moreover, digital transformation promotes data-driven decision-making. Educational institutions can leverage data analytics to track student performance, identify learning gaps, and tailor interventions accordingly (Kataoka et al., 2020, Khanh. 2023). By analyzing data collected from various digital tools, educators can make informed decisions that enhance instructional practices and improve student outcomes. This data-driven approach is vital for fostering a culture of continuous improvement within educational institutions.

Enhanced communication and collaboration among all stakeholders in the educational ecosystem are also facilitated by digital transformation. Technologies such as video conferencing and messaging platforms enable real-time interactions between students, teachers, and parents, fostering a sense of community and engagement (UNESCO, 2021). Effective communication is crucial for supporting student learning and building strong relationships among educators and families.

Despite its numerous benefits, digital transformation in education also presents challenges that must be addressed. One major concern is the digital divide, which refers to the gap between those who have access to digital technologies and those who do not (Cingano, 2014). In many regions, socioeconomic factors hinder equitable access to technology, exacerbating existing educational inequalities. Policymakers must prioritize initiatives that ensure that all students have the necessary resources to participate fully in a digital learning environment.

Another challenge involves the need for professional development for educators. As technology evolves, teachers must continually update their skills and knowledge to integrate digital tools effectively into their teaching (Caena & Redecker, 2019). Institutions should provide ongoing training and support to ensure that educators are confident and capable of utilizing technology to enhance their learning experiences.

Therefore, digital transformation in education is a multifaceted process that reshapes teaching and learning. By integrating technology, fostering pedagogical innovation, utilizing data for decision-making, and enhancing communication, educational institutions can create a more effective and engaging learning environment. However, addressing challenges such as the digital divide and ensuring ongoing professional development for educators is essential for the successful implementation of digital transformation. As the education sector continues to evolve, embracing these changes will be crucial for preparing students for a dynamic and increasingly digital world.

2.2. Models of digital transformation and key principles

Digital transformation in education is not a one-size-fits-all approach; rather, it encompasses various models and principles that guide educational institutions in implementing effective strategies. Understanding these models and principles is essential for fostering an environment where technology can enhance learning experiences and operational efficiency.

2.2.1. Models of digital transformation

The technology-driven model emphasizes the adoption of digital tools to enhance existing educational practices. In this approach, institutions invest in technologies such as learning management systems (LMSs), online assessment tools, and interactive content delivery systems. This model focuses on integrating technology into traditional teaching methods, aiming to improve student engagement and learning outcomes. For example, many universities have adopted platforms such as Moodle or Blackboard to streamline course management and facilitate online learning experiences (Graham et al., 2013; Bhavna et al., 2024).

The Pedagogical Model prioritizes innovative teaching practices that leverage digital technologies to foster active learning. This model encourages educators to rethink their instructional strategies and integrate digital tools in ways that support student-centered learning. Techniques such as flipped classrooms, gamification, and blended learning fall under this model. By focusing on how technology can transform pedagogical approaches, educators can create more interactive and engaging learning environments (Garrison & Kanuka, 2004). For example, using online discussion forums allows students to engage with course materials more deeply and collaboratively.

The data-driven model centers around the utilization of data analytics to inform decision-making processes in education. By collecting and analyzing data on student performance, attendance, and engagement, institutions can identify trends, monitor progress, and tailor interventions to meet individual learning needs. This model encourages a culture of evidence-based practice, where data are used to enhance curriculum design, teaching methods, and resource allocation (Baker & Inventado, 2014). For example, predictive analytics can help educators identify students at risk of falling behind, enabling timely interventions.

The holistic model takes a comprehensive approach, integrating technology, pedagogy, and data analytics to create a cohesive digital ecosystem in education. This model recognizes that successful digital transformation requires alignment among all aspects of an institution, including infrastructure, curriculum, and stakeholder engagement. The holistic model promotes collaboration among educators, administrators, and students to foster a culture of continuous improvement and innovation (Sangra et al., 2012). Institutions adopting this model often focus on building a robust digital infrastructure while simultaneously empowering educators through professional development.

2.2.2. Key principles of digital transformation

Inclusivity is a cornerstone of effective digital transformation. It is crucial to ensure that all students, regardless of their backgrounds or circumstances, have equitable access to digital resources and opportunities. This principle addresses the digital divide by promoting initiatives that provide necessary tools and support to underserved communities (Cingano, 2014). Educators must prioritize inclusivity to create an environment where all learners can thrive in a digital landscape.

Collaboration among stakeholders is vital for successful digital transformation. This principle emphasizes the importance of partnerships between educators, administrators, parents, and students in shaping digital strategies. By fostering open communication and collaborative decision-making, institutions can create an ecosystem that supports shared goals and collective ownership of the transformation process (Fullan, 2016). Collaborative efforts can lead to innovative solutions and enhance the overall effectiveness of digital initiatives.

Continuous improvement: Digital transformation is an ongoing process that requires a commitment to continuous improvement. Educational institutions must be agile and willing to adapt their strategies on the basis of feedback, data analysis, and emerging trends in technology and pedagogy. This principle encourages a culture of reflection and adaptation, where educators and administrators regularly assess the impact of digital initiatives and make necessary adjustments to optimize outcomes (Harris & Jones, 2016).

Student-Centered Focus: A student-centered focus is essential for effective digital transformation. This principle prioritizes the needs and preferences of learners, ensuring that digital tools and practices enhance their educational experiences. Institutions must design digital initiatives with the goal of improving student engagement, motivation, and learning outcomes (Dabbagh & Kitsantas, 2012). By involving students in the decision-making process, educators can create solutions that resonate with learners and address their unique challenges.

However, the models and key principles of digital transformation in education provide a framework for institutions seeking to enhance their educational practices through technology. By understanding and applying these concepts, educators can create dynamic learning environments that prepare students for success in the digital world.

3. Opportunities from Digital Transformation in Vietnam's Education

Digital transformation is reshaping various sectors globally, and education in Vietnam is no exception. As the country seeks to modernize its educational landscape, the integration of technology provides significant opportunities that can enhance learning experiences, improve educational quality, and promote equity among learners. The digital revolution in education has the potential to not only address longstanding challenges but also pave the way for innovative practices that foster creativity, self-directed learning, and a more inclusive educational environment.

3.1. Enhanced access to education and a reduction in inequality

One of the most remarkable opportunities offered by digital transformation is the enhancement of access to education, particularly for marginalized and underserved communities. In Vietnam, significant disparities in educational access exist, especially between urban and rural areas. Many students in remote locations struggle to receive high-quality education because of inadequate infrastructure, a shortage of qualified teachers, and limited access to resources. Digital platforms can serve as powerful tools to bridge these gaps, providing students with access to high-quality learning materials and experiences regardless of their geographic location.

The emergence of massive open online courses (MOOCs) has revolutionized educational access. These online courses allow learners from diverse backgrounds to enroll in classes offered by renowned institutions, thus democratizing education. According to a report by the World Bank, MOOCs and similar online platforms can significantly increase educational opportunities for rural populations, where traditional educational infrastructures may be lacking (World Bank, 2020). Such initiatives not only empower students but also contribute to the overall development of communities by equipping individuals with knowledge and skills that enhance their employability.

Moreover, digital tools facilitate personalized learning experiences tailored to individual students' needs. Adaptive learning technologies utilize data analytics to assess student performance, enabling customized learning pathways that cater to diverse learning styles and paces. For example, platforms that employ artificial intelligence can identify areas where a student struggles and provide targeted interventions, thereby enhancing learning outcomes. This personalized approach is particularly beneficial for students who may find traditional classroom settings challenging. By reducing barriers to access and providing tailored educational experiences, digital transformation plays a crucial role in promoting educational equity in Vietnam.

3.2. Improvement in teaching and learning quality

The integration of technology in education is poised to significantly enhance the quality of teaching and learning. Digital tools such as learning management systems (LMSs), interactive multimedia content, and assessment technologies are transforming the educational experience for both educators and students. LMS platforms, for example, allow teachers to organize course materials, track student progress, and facilitate communication in a centralized manner, thus streamlining the teaching process.

Furthermore, technology fosters innovative teaching methods that can engage students more effectively. Blended learning models, which combine traditional face-to-face instruction with online learning components, have been shown to improve student engagement and academic performance (Garrison & Kanuka, 2004). In Vietnam, educators can leverage these models to create dynamic and interactive learning environments that cater to various learning styles. For example, using digital simulations or gamified learning experiences can enhance students' understanding of complex concepts and promote active participation.

Additionally, the digital transformation of education provides opportunities for ongoing professional development for teachers. Online training programs, webinars, and digital resources allow educators to enhance their skills and stay abreast of the latest pedagogical strategies and technological advancements. This commitment to professional growth can lead to improved teaching practices, which ultimately benefit student learning outcomes (Zhao, 2016). In this way, continuous professional development fuelled by digital resources ensures that educators are equipped to meet the evolving needs of their students in a rapidly changing educational landscape.

3.3. Encouragement of creativity and self-directed learning

Another vital opportunity presented by digital transformation is the encouragement of creativity and self-directed learning among students. With access to a plethora of online resources, students can explore topics of interest beyond the confines of the traditional curriculum. This autonomy not only increases motivation but also fosters love for lifelong learning. The ability to pursue individual interests in a digital environment encourages students to take charge of their educational journeys.

Digital tools such as online collaboration platforms and content creation applications empower students to work together on projects, share ideas, and engage in creative problem solving. For example, tools such as Google Workspace and Microsoft Teams facilitate group work and enhance communication among students, fostering teamwork and collaborative learning (Johnson et al., 2014). Such collaborative environments not only promote social interaction but also help students develop essential skills, such as critical thinking, adaptability, and communication, which are crucial in today's interconnected world.

Moreover, the internet offers an abundance of resources, including videos, articles, podcasts, and forums, allowing students to pursue knowledge independently. This self-directed approach nurtures critical thinking and analytical skills, preparing students for challenges in both academic and professional settings. By fostering an environment that encourages

exploration and innovation, digital transformation equips students with the tools and mindsets necessary for success in a rapidly changing world.

4. Challenges in Digital Transformation

As Vietnam progresses in its educational transformation through digital means, it faces several challenges that must be navigated to optimize the implementation and benefits of technology in education. These obstacles include limitations in technological infrastructure, a lack of digital skills among teachers and students, and concerns regarding the quality of digital educational content. Recognizing and addressing these challenges is critical for fostering an effective digital learning environment.

4.1. Limitations in technological infrastructure

A significant barrier to digital transformation in Vietnam's educational sector is insufficient technological infrastructure. While urban centers often benefit from relatively good internet connectivity and modern facilities, many rural and remote areas still face challenges with access to reliable high-speed internet and the necessary technological resources. This digital divide creates disparities in educational opportunities, as students in less developed areas struggle to engage with online learning platforms.

The World Bank (2020) emphasized that inadequate infrastructure, including limited internet bandwidth and outdated technology, significantly impacts students' and educators' ability to engage with digital learning resources. For example, many rural schools lack sufficient computers and face intermittent internet access, making it difficult for teachers to deliver quality instruction and for students to access educational materials. Such disparities can exacerbate existing inequalities in educational outcomes, reinforcing a cycle of disadvantage for marginalized communities.

Moreover, a reliance on traditional teaching methods in certain institutions may impede the effective integration of digital tools. Educators who are accustomed to conventional pedagogies might find incorporating technology into their teaching practices challenging, leading to a situation where available resources are underutilized. To address these infrastructure limitations, there is a pressing need for investment in both physical resources and training programs that help educators become more adept at using technology in their teaching.

4.2. Lack of digital skills among teachers and students

Another major challenge is the lack of digital skills among both educators and students. While students today are often referred to as "digital natives" owing to their familiarity with technology, many still lack the critical skills necessary to effectively leverage digital tools for their learning. Moreover, the varying levels of technological proficiency among teachers can result in inconsistencies in the delivery of digital education.

According to a study by the OECD (2019), teachers play a pivotal role in facilitating student learning in a digital context. However, many educators in Vietnam may not have received adequate training in utilizing technology for pedagogical purposes. Consequently, they may struggle to incorporate digital tools into their teaching strategies effectively. Professional development programs that focus on enhancing digital literacy and innovative teaching practices are essential for equipping educators with the skills and confidence needed to navigate the digital landscape.

Additionally, students must learn not only how to use digital tools but also how to critically assess the information they encounter online. In an age characterized by information overload, fostering digital literacy skills—such as critical thinking and media literacy—is vital for preparing students to navigate the complexities of the digital world responsibly. Schools and educational institutions must prioritize comprehensive digital literacy programs that cater to both teachers' and students' needs to ensure successful digital transformation.

4.3. Issues with the quality of digital educational contente

The quality of digital educational content poses another significant challenge that must be addressed during the digital transformation process. Given the abundance of online resources, not all content adheres to high educational standards or aligns with curriculum objectives. This lack of oversight can expose students to inaccurate, outdated, or irrelevant information, thereby undermining the educational experience.

A report by UNESCO (2021) highlights the importance of high-quality, contextually relevant digital content in enhancing the learning experience. It is imperative for educators to access and utilize resources that are not only pedagogically sound but also engaging and applicable to their students' contexts. Ensuring that digital resources are developed with input from educational experts and aligned with local curricula is vital for meeting the specific needs of Vietnamese students.

Moreover, the rapid pace of technological advancement can quickly lead to content becoming outdated. For example, as new educational technologies and methodologies emerge, digital resources need continuous updates to remain effective

and relevant. This constant demand for content revision can place additional strain on educators and institutions already facing resource constraints.

However, while digital transformation presents significant opportunities for Vietnam's educational sector, addressing the challenges posed by technological infrastructure, digital skills gaps, and the quality of educational content is essential. A holistic approach that includes investments in infrastructure, targeted professional development for educators, and the creation of high-quality digital resources will be critical in overcoming these obstacles. By effectively navigating these challenges, Vietnam can harness the potential of digital transformation to create a more equitable and effective educational system.

5. Research Methodology

This study adopts a mixed-methods approach to explore the digital transformation of education in Vietnam. By integrating quantitative and qualitative techniques, this research aims to provide a holistic understanding of the current landscape, challenges, and opportunities related to the use of digital technologies in educational settings.

5.1. Research design

The research employs a sequential explanatory design, beginning with quantitative data collection through surveys, followed by qualitative data collection via interviews. This approach allows for the triangulation of data, enhancing the validity of the findings. The quantitative phase seeks to establish general trends and correlations, whereas the qualitative phase aims to capture the deeper, contextual insights of educational stakeholders.

5.2. Data collection

The data were collected via three primary methods: surveys, in-depth interviews, and document analysis.

Surveys: A comprehensive questionnaire was distributed to a sample of 350 participants, which included 200 teachers, 100 students, and 50 education experts across various provinces in Vietnam. The survey consisted of 25 questions divided into sections covering demographic information, technology usage, perceived effectiveness of digital tools, and challenges faced in digital integration. The respondents rated their agreement with statements on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

In-depth interviews: To supplement the survey data, semistructured interviews were conducted with 25 educational leaders, including 15 school principals, 5 district administrators, and 5 curriculum developers. Each interview lasted between 45 and 90 minutes and focused on exploring themes such as the effectiveness of training programs for teachers, infrastructure challenges, and institutional support for digital initiatives.

The interview protocol included open-ended questions designed to elicit detailed responses, such as “What challenges have you faced in implementing digital tools in your school?” and “How do you perceive the impact of digital technologies on student learning outcomes?” The interviews were recorded, transcribed, and coded to identify recurring themes and insights.

Document Analysis: A thorough review of the relevant literature, policy documents, and institutional reports was conducted to contextualize the research findings. The documents included Vietnam's national education policies, strategic plans from various educational institutions, and case studies on successful digital initiatives. This analysis helped identify gaps in current practices and informed the development of research questions.

5.3. Data analysis

The quantitative data from the surveys were analyzed via SPSS software. Descriptive statistics summarize the demographic profiles of respondents, whereas inferential statistics, such as chi-square tests and correlation analyses, are used to examine relationships between variables, such as the correlation between teachers’ digital literacy and their frequency of technology use in the classroom.

Qualitative data from the interviews were analyzed via NVivo software. A thematic analysis approach was employed, where initial coding focused on themes related to barriers to digital adoption, the perceived effectiveness of training programs, and suggestions for future improvements.

6. Research Results

This section provides a detailed analysis of the research findings on the basis of the methodology described earlier. The results are divided into different categories on the basis of the collected data, including descriptive statistics, digital tool usage, challenges, engagement, and equity issues. SPSS software was used for statistical analysis, and relevant charts and tables are provided to illustrate the key points.

6.1. Descriptive statistics of the participants

Before delving into the specific research results, we provide an overview of the demographic characteristics of the 350 participants, which includes 200 teachers, 100 students, and 50 educational experts. Table 1 summarizes the demographic information:

Table 1 Demographic breakdown of participants.

Category	Frequency (n)	Percentage (%)
Teachers	200	57.10%
Students	100	28.60%
Education Experts	50	14.30%
Gender		
Male	180	51.40%
Female	170	48.60%
Region		
Urban	220	62.90%
Rural	130	37.10%

This table lays the groundwork for further analysis, illustrating the distribution of respondents by role, gender, and region (urban vs. rural).

6.2. Digital tool usage in education

SPSS was used to analyze the frequency and extent of digital tool usage by teachers and students across different regions. The results revealed significant discrepancies between urban and rural areas. Specifically, 82% of teachers in urban areas reported the regular use of digital tools, compared with only 49% in rural areas. This finding underscores the existence of a pronounced digital divide, as access to infrastructure and technological tools varies substantially on the basis of location. The chi-square test confirmed a significant correlation between region and the frequency of digital tool usage ($\chi^2 = 15.234$, $p < 0.001$).

6.3. Challenges in digital integration

The research identified several challenges that educators face when integrating digital tools into teaching. Through regression analysis, we explored the relationship between teachers' digital literacy and their use of technology in the classroom.

Table 2 Regression analysis of digital skills and the frequency of technology use.

Variables	B	SE	Wald	df	Sig.	Exp(B)
Digital Skill Level	1.432	0.223	19.145	1	0	4.189
Region (Urban/Rural)	0.754	0.335	5.071	1	0.024	2.126

The results suggest that teachers with higher digital literacy are 4.189 times more likely to use technology frequently in their teaching than are those with lower skills. This emphasizes the need for targeted professional development to equip teachers with the necessary digital competencies.

6.4. Student engagement with digital tools

The use of digital tools has been shown to significantly enhance student engagement. Blended learning models, which integrate both traditional and online teaching methods, are particularly effective in boosting student motivation and academic performance. A large majority of teachers (85%) reported that students were more engaged and interactive when digital resources were incorporated into the classroom. These resources included video tutorials, interactive simulations, and online discussion platforms.

Qualitative data from teacher interviews further supported these findings, highlighting that digital tools not only increase flexibility in learning but also allow for more personalized educational experiences. This, in turn, fosters deeper student engagement and participation.

6.5. Equity and access issues

Through SPSS analysis and chi-square tests, we explored the disparities in access to digital resources between students from urban areas and those from rural areas. The results, shown in Table 3, reveal substantial differences in internet access:

Table 3 Internet access among urban and rural students.

Region	Internet Access (%)
Urban	92%
Rural	45%

Students in rural areas face significant barriers to accessing high-speed internet and digital learning tools, which further exacerbates educational inequality. This digital divide has been confirmed through multiple government and institutional reports, reinforcing the urgent need for policy interventions to ensure equitable access to technology.

6.6. Professional development needs for teachers

Teacher interviews and survey responses indicate a strong demand for ongoing digital skills training. A total of 72% of the teachers expressed the need for more comprehensive and practical training on the use of digital tools in the classroom, especially in lesson planning, student assessment, and engagement.

The thematic analysis of the interviews revealed that teachers often struggle with integrating technology effectively due to a lack of training and institutional support. Professional development programs that focus on enhancing digital competencies are essential for the successful implementation of digital transformation in education.

6.7. Inferential statistics: Hypothesis testing

To examine the relationships between various factors, inferential statistical tests such as Pearson's correlation and ANOVA were performed.

Pearson correlation: A significant positive correlation was found between teachers' digital literacy and student performance improvements ($r = 0.612$, $p < 0.001$).

ANOVA: The analysis of variance revealed significant differences in technology access between urban and rural students ($F(1, 348) = 25.32$, $p < 0.01$), confirming that location plays a crucial role in digital access.

7. Discussion

The data reveal that urban institutions are more digitally equipped than rural counterparts, with 82% of urban teachers using digital tools compared to 49% in rural areas. Studies by Doan (2020) and Tang and Nguyen (2020) support this finding, emphasizing the uneven distribution of technological resources. Moreover, Tran (2021) notes that IT-based academic credit systems remain inconsistently applied, further exacerbating digital inequalities.

Educators play a crucial role in the successful implementation of digital transformation. The research finds that teachers with higher digital literacy are significantly more likely to integrate digital tools into their teaching. This aligns with findings by Tran, Nguyen, and Pham (2021), who emphasize the importance of improving teachers' competencies. Rodrigues (2017) also highlights that digital transformation requires not only technology adoption but also changes in institutional culture and teaching approaches. The demand for structured professional development programs is evident, supporting recommendations by Abad-Segura et al. (2020) regarding the need for blended learning models and interactive learning management systems.

Student engagement has increased significantly with digital tools, with 85% of teachers reporting greater student interaction. Garrison and Kanuka (2004) advocate for a blended learning model that combines traditional and online methods to enhance flexibility and personalization. However, Johnson et al. (2014) and Ngo (2007) warn that without high-quality digital content aligned with curricula, learning effectiveness may be compromised. Collaborative efforts between policymakers, educators, and content developers are necessary to ensure digital resources meet educational standards.

Government policies, including Decision No. 749/QD-TTg (Prime Minister, 2020), acknowledge the importance of digital transformation, yet implementation faces obstacles such as inconsistent infrastructure development and inadequate institutional support. Pham (2020) and Tran (2020) argue that university autonomy is vital, but many institutions lack financial and technical capacity. Benavide et al. (2020) suggest that a sustainable management approach is necessary for long-term success, balancing technological innovation with institutional goals.

To address these challenges and maximize the benefits of digital transformation, several strategies are recommended. Expanding digital infrastructure is crucial, particularly in rural areas, as suggested by Ton (2022). Structured teacher training programs should be implemented to enhance digital literacy, following recommendations by Caena and Redecker (2019). Additionally, developing high-quality digital content requires collaboration among universities, policymakers, and technology firms (European Commission, 2021). Institutions must also adopt digital transformation frameworks with sustainable funding models and cross-sector partnerships (Matt, Hess, & Benlian, 2015).

The research concludes that while Vietnam has made significant strides in digital transformation, challenges remain. Addressing infrastructure disparities, enhancing teacher training, and improving digital content are essential to ensuring an

inclusive and effective education system. Future research should assess the long-term effects of digital policies and identify scalable best practices. By advancing digital education, Vietnam can better prepare students for the demands of a modern workforce and contribute to broader socio-economic growth.

8. Development Strategies

To address these challenges and capitalize on the opportunities identified in the research findings, several development strategies can be proposed for enhancing digital transformation in Vietnam's education sector. These strategies focus on improving access to technology, fostering digital literacy, promoting professional development for educators, and ensuring equitable educational outcomes.

8.1. Enhancing infrastructure and access

A fundamental step in facilitating digital transformation is to improve the technological infrastructure across both urban and rural areas. The government, in collaboration with private sector partners, should invest in expanding high-speed internet connectivity and providing necessary hardware, such as computers and tablets, to schools in underserved regions. This includes:

Building Digital Infrastructure: Initiatives should be launched to increase internet connectivity in rural areas, ensuring that all schools have access to reliable high-speed internet. This could involve partnerships with telecommunications companies to establish broadband networks in remote locations.

Providing Devices: Distributing devices to students and teachers, particularly in rural schools, is essential for enabling the use of digital tools. Programs can be developed to offer low-cost or free devices to low-income families, ensuring that all students have equal opportunities to engage in digital learning.

8.2. Professional development programs

To maximize the benefits of digital tools in education, it is critical to invest in professional development programs tailored to enhance teachers' digital competencies. This can be achieved through:

Targeted training workshops: Organizing regular training workshops and seminars focused on digital tool integration, pedagogical strategies for blended learning, and the effective use of educational technology. These workshops should cater to various skill levels, ensuring that both novice and experienced educators can benefit.

Mentorship Programs: Establishing mentorship programs where tech-savvy educators can guide their peers in utilizing digital tools effectively. This peer-to-peer support can foster a collaborative learning environment and encourage teachers to share best practices.

Online training modules: Developing online training modules that allow teachers to learn at their own pace. This flexibility is particularly beneficial for those in rural areas, who may face challenges in attending in-person training sessions.

8.3. Fostering digital literacy among students

Equipping students with the necessary digital skills is essential for their success in a rapidly changing digital landscape. Strategies to enhance digital literacy should include the following:

Curriculum Integration: Integrating digital literacy education into the curriculum from an early age. Schools should implement programs that teach students how to navigate digital tools, evaluate online information critically, and use technology responsibly.

Extracurricular Activities: Encouraging the development of extracurricular activities focused on technology, such as coding clubs, digital art programs, and robotics competitions. These activities can provide students with hands-on experience and foster interest in technology-related fields.

8.4. Promoting inclusivity and equity

Ensuring that all students benefit from digital transformation requires a commitment to inclusivity and equity. Strategies should include:

Equitable Access Policies: Developing policies that prioritize equitable access to digital resources for all students, regardless of their socioeconomic status or geographical location. This may involve targeted funding for schools in low-income areas or for families that lack access to technology.

Community Engagement: Engaging local communities in the digital transformation process. Schools can collaborate with local organizations and businesses to provide resources and support for technology initiatives, ensuring that community members are involved in promoting equitable access to education.

8.5. Continuous monitoring and evaluation

Finally, to ensure the effectiveness of these development strategies, it is crucial to implement a system of continuous monitoring and evaluation. This can be achieved through:

Regular Assessments: Conducting regular assessments of digital tool usage, teacher training effectiveness, and student engagement levels. These data can provide valuable insights into areas needing improvement and inform future initiatives.

Feedback Mechanisms: Establishing feedback mechanisms that allow teachers, students, and parents to share their experiences and challenges related to digital learning. This feedback can guide the refinement of strategies and ensure that they meet the needs of all stakeholders.

9. Conclusion

The digital transformation of education in Vietnam presents both significant opportunities and formidable challenges. This research highlights critical aspects of the current landscape, revealing disparities in digital tool usage, access to technology, and the professional development needs of educators. The findings indicate that while urban teachers effectively integrate digital resources into their teaching practices, their rural counterparts face significant barriers, underscoring the pressing need for equitable access to technology across all regions.

Moreover, the study demonstrated that enhancing teachers' digital literacy is essential for fostering student engagement and improving educational outcomes. As digital tools become increasingly integral to teaching and learning, it is crucial for educators to receive comprehensive training that equips them with the necessary skills to leverage these technologies effectively. The positive correlation between teachers' digital literacy and student performance underscores the need for targeted professional development programs.

Addressing the digital divide in access to technology, particularly between urban and rural areas, is vital for ensuring that all students have equal opportunities to benefit from digital learning. Policymakers must prioritize investments in infrastructure, provide devices to underserved communities, and implement strategies that promote inclusivity and equity in education.

Ultimately, the successful implementation of digital transformation in Vietnam's education system requires a collaborative effort among government agencies, educational institutions, teachers, and communities. By fostering an environment that supports continuous learning and adaptation, Vietnam can cultivate a more equitable and effective educational landscape. This will not only prepare students for the demands of the digital age but also contribute to the broader socioeconomic development of the nation.

While challenges remain, the path forward is clear. Through strategic investments, ongoing professional development, and a commitment to equity, Vietnam can harness the full potential of digital transformation in education, paving the way for a brighter future for all learners.

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Ethical Considerations

Not applicable.

Conflict of Interest

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