



Research Article

DIGITAL TRANSFORMATION IN HIGHSCHOOL EDUCATION: A CASE STUDY AT THE EXPERIMENTAL HIGH SCHOOL – HO CHI MINH CITY UNIVERSITY OF EDUCATION

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ABSTRACT

This study examines the current status of digital transformation (DT) at the Experimental High School – Ho Chi Minh City University of Education. Using a mixed-methods approach (document analysis, surveys with 712 students and 59 staff, and interviews), the research evaluates DT maturity based on national frameworks (Decisions 4725/QĐ-BGDDT and 956/QĐ-SGDĐT). The results of the research showed that the school reached Level 2 of 3 in digital maturity; Infrastructure is stable but limited by bandwidth; LMS is widely adopted, yet digital content integration and teacher–student interaction remain uneven; Management systems exist but lack full data integration. Key strengths include LMS adoption and teacher training, while challenges involve infrastructure gaps and stakeholder engagement. The study proposes practical solutions for network upgrades, teacher capacity building, content centralization, and data system integration to support digital transformation in schools.

Keywords: digital transformation; educational technology; general education; school management

1. Introduction

Digital transformation (DT) has become a global priority in education, fundamentally reshaping school management, pedagogical practices, and learner engagement (Blass & Köhler, 2019; UNESCO, 2021). International initiatives aim to leverage digital technologies to create more adaptive, inclusive, and future-oriented education systems (Miao et al., 2022; UNESCO, 2024).

In Vietnam, DT in education is guided by key national policies and frameworks. Resolution 52-NQ/TW establishes strategic directions for the Fourth Industrial Revolution (2019), while Decision 749/QĐ-TTg sets out the National Digital Transformation Program

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until 2025 with an orientation towards 2030. Decision 131/QĐ-TTg promotes the accelerated application of information technology in education and training during 2022–2025. Within the education sector, Decision 4725/QĐ-BGDĐT provides national indicators for assessing DT maturity, and Decision 956/QĐ-SGDĐT offers localized guidelines for Ho Chi Minh City (Ministry of Education and Training, 2022; Department of Education and Training of Ho Chi Minh City, 2024).

Despite these strategic frameworks, DT implementation at the secondary school level remains uneven, constrained by differences in infrastructure, teacher digital competencies, and management capacities (Nguyen et al., 2019; Tran et al., 2019; Bui et al., 2022). Previous studies have explored DT from multiple perspectives, including conceptual frameworks, technological readiness, teacher professional development, and school leadership; however, empirical evidence at the school level using standardized maturity indicators is limited (Tække & Paulsen, 2023; Yuliandari et al., 2023).

The Experimental High School – Ho Chi Minh City University of Education provides a pioneering case, having invested in infrastructure, learning management systems, and digital governance mechanisms. This study evaluates the school's DT maturity using national frameworks, integrating document analysis, surveys, and interviews. By situating the case within both global and national contexts, the study contributes empirical evidence to Vietnam's DT agenda and provides practical insights for scaling DT implementation across upper secondary education.

2. Literature review

2.1. Conceptualizing digital transformation in education

DT in education involves the strategic integration of digital technologies into teaching, learning, and administrative processes, requiring not only technological adoption but also pedagogical, organizational, and cultural changes (Blass & Köhler, 2019; UNESCO, 2021). Effective DT depends on investment in educators' and administrators' digital competencies as well as alignment of technology, governance, and institutional capacity to ensure high-quality and inclusive outcomes (Pettersson, 2021; Ho & Nguyen, 2023). In the Vietnamese context, DT is frequently conceptualized as a connected ecosystem in which platforms, content, pedagogy, and management operate synergistically to enhance institutional effectiveness.

A commonly used analytical lens is the People–Process–Technology (P–P–T) framework, which emphasizes the interplay of leadership, organizational processes, and technological infrastructure (Siebel, 2020; Westerman et al., 2014). Scholars argue that rapid technology uptake alone is insufficient; visionary leadership, process redesign, and cultural change are equally decisive (Rogers, 2016; Westerman et al., 2014). In educational settings, this framework maps onto three interdependent domains—(i) infrastructure and equipment,

(ii) teaching and learning, and (iii) school management—providing a coherent structure to assess DT progress (Yuliandari et al., 2023).

2.2. Policy and implementation context in Vietnam

National policies provide the strategic context for DT in Vietnam. Resolution 52-NQ/TW outlines directions for the Fourth Industrial Revolution, while Decisions 749/QĐ-TTg and 131/QĐ-TTg establish the National Digital Transformation Program and promote accelerated application of information technology in education and training (Prime Minister, 2020; Government of Vietnam, 2022; The Communist Party of Vietnam, 2019). At the sector level, Decision 4725/QĐ-BGDĐT sets national indicators for DT maturity, and Decision 956/QĐ-SGDĐT provides localized guidelines for schools in Ho Chi Minh City (Ministry of Education and Training, 2022; Department of Education and Training of Ho Chi Minh City, 2024).

Empirical studies indicate uneven DT implementation at the secondary school level, with urban schools showing stronger infrastructure and digital readiness than rural areas (Nguyen et al., 2019; Tran et al., 2019). Key challenges include limited bandwidth, gaps in teacher digital competencies, and partial adoption of management systems (Bui et al., 2022; Le & Phan, 2023).

2.3. Domains of digital transformation

Digital transformation in schools can be evaluated across three interrelated domains. First, infrastructure and equipment are foundational, including internet connectivity, devices, smart classrooms, and digital libraries. While Vietnamese schools have improved access to Wi-Fi and interactive tools, practical constraints such as bandwidth limitations and low device-to-student ratios remain (OECD, 2019; UNESCO, 2022).

Second, teaching and learning are enhanced through student-centered, interactive models supported by learning management systems (LMS), virtual classrooms, and multimedia content. Emerging technologies, including artificial intelligence and the Internet of Things, enable adaptive learning and personalized assessment (Miao et al., 2022; UNESCO, 2024). Although platform adoption is widespread, teacher capacity and content integration are often inconsistent (Nguyen, 2023; Bui et al., 2022).

Third, school management involves digital governance, dashboards, and interoperable software to support data-driven decisions. Platforms such as VNPT SmartEdu and SMAS illustrate practical deployment, though interoperability and full module adoption remain limited (Le & Phan, 2023). Leadership and organizational culture are critical for translating digital tools into tangible educational outcomes (Håkansson Lindqvist & Pettersson, 2019).

2.4. Research gaps

While DT has the potential to enhance access, engagement, and personalized learning, most research in Vietnam has focused on isolated aspects such as infrastructure or teacher readiness, without integrating governance, pedagogy, and technology into a holistic school-

level assessment (Nguyen, 2023; Ho & Nguyen, 2023). This highlights the need for empirical studies employing standardized maturity indicators to provide a comprehensive evaluation, justifying the mixed-methods approach of the present study.

3. Methodology and findings

3.1. Research design and data collection

This study employed a convergent mixed-methods design, integrating quantitative surveys, qualitative interviews, and document analysis to provide a comprehensive understanding of digital transformation (Creswell & Clark, 2018). Quantitative data were collected from 712 students (Grades 10–12) and 59 teachers and staff. Participants were selected using Slovin's formula to ensure representativeness (Slovin, 1960). Qualitative data were obtained through semi-structured interviews with 12–15 teachers, purposively chosen to reflect diverse teaching experience and digital proficiency (Guest et al., 2006). Interviews explored experiences with digital tools, participation in professional development, and pedagogical innovation. Document analysis included strategic plans, infrastructure inventories, and digital resource records to triangulate findings (Bowen, 2009). Table 01 summarises the demographic characteristics of the participants.

Table 1. Demographic characteristics of participants

<i>Teachers and staff</i>			<i>Students</i>		
<i>Years of Teaching</i>	n	%	<i>Grade level</i>	n	%
Less than 10 years	23	39	Grade 10	294	41
From 10 to 20 years	15	25	Grade 11	306	43
Greater than 20 years	21	36	Grade 12	112	16
Total	59	100%	Total	712	100%

Quantitative surveys were administered via Google Forms, focusing on digital competencies, infrastructure perception, and digital tool usage. Responses were classified into five levels: Very Low (0–20%), Low (21–40%), Medium (41–60%), High (61–80%), Very High (81–100%). Descriptive statistics were calculated to summarize trends. Qualitative data from interviews were recorded with informed consent, transcribed verbatim, and thematically analyzed following Braun and Clarke's (2006) six-step procedure. Inductive coding identified recurrent themes, which were triangulated with survey results. Integration of data followed a convergent analysis strategy, allowing quantitative and qualitative strands to complement each other, providing a holistic picture of the school's digital transformation.

3.2. Digital transformation maturity findings and discussion

3.2.1. Digital transformation in infrastructure and equipment

This section examines the school's digital infrastructure and equipment, which form the foundational layer of DT (OECD, 2019; UNESCO, 2022). According to the national maturity framework under Decision 956/QĐ-SGDĐT, infrastructure readiness determines the capacity for technology integration in teaching, learning, and school management. Table

02 presents the institutional self-assessment results based on standardized criteria. The school's digital infrastructure was assessed using institutional records. Over 75% of classrooms are equipped with teaching aids, projectors, and internet connectivity (3/3). IT equipment meets minimum standards (2/4). The school has a studio for digital content creation (3/3) and smart classrooms/labs (2/2). Library digital resources remain limited (2/4), and internet bandwidth is insufficient during peak hours (1/4). The overall score is 14/20 (Level 2, Decision 956/QĐ-SGDĐT), indicating progress with clear room for improvement.

Table 2. Institutional self-assessment of digital infrastructure

Criterion	Maximum Points	Self-assessment
1.1. Infrastructure and equipment for DT in teaching and learning		
Percentage of classrooms with teaching aids, projectors, and internet connectivity	3	3
Meeting the minimum requirements for IT teaching equipment	4	2
Availability of a studio room (including computers, equipment for creating digital learning materials, electronic lectures)	3	3
Availability of smart classrooms and modern practical laboratories	2	2
Availability of infrastructure, equipment, and software for the library	4	2
1.2. Internet connectivity and bandwidth adequately meet the needs of the school.	4	2
Total	20	14

Note: Level 1: Below 8; Level 2: 8-14; Level 3: Above 14

Interviews confirmed that while network coverage fully supports administrative staff, it allows simultaneous access for fewer than 25% of students, reflecting significant bandwidth limitations during peak periods (score 1/4). Feedback from both staff and students aligned with institutional records, reinforcing the credibility of the self-assessment. Occasional equipment and connectivity issues were also reported, disrupting teaching and learning. These findings highlight persistent challenges in infrastructure reliability and the need for targeted upgrades to advance DT.

3.2.2. Digital transformation in teaching and learning

The school's digital transformation in teaching and learning was assessed using the national evaluation framework outlined in Decision 956/QĐ-SGDĐT (Department of Education and Training of Ho Chi Minh City, 2024). The school demonstrates high levels of awareness and implementation regarding online teaching plans, regulatory compliance, and LMS deployment among both teachers and students. According to the policy framework, criteria 1, 2, and 3 are mandatory prerequisites. Failure to meet these prerequisites results in a null score for the entire domain.

Table 3. Evaluations of prerequisite conditions by teachers and students

Criterion	Teacher (%)	Student (%)	Note
Having a plan for organizing online teaching (combined with face-to-face instruction, issued separately, or integrated within the annual teaching organization plan)	96.6	94.0	Mandatory prerequisite
Promulgation of regulations on the organization of online teaching; Implementation of LMS/LCMS connected to the sector's database	86.4	92.7	
Deployment of the LMS/LCMS platform	96.6	93.8%	

Survey results show widespread LMS use for assignments and platform integration, but moderate levels of teacher-student interaction, assessment diversity, and parental involvement.

Table 4. Digital transformation activities in teaching and learning

Activity	Staff (%)	Score	Students (%)	Score
Teachers assign self-study tasks	94%	3.0	95%	3.5
Teachers respond to students' questions	54%	2.0	81%	3.0
Regular testing and assessment via LMS	61%	1.5	82%	2.5
Parents involved in student learning	54%	3.0	59%	3.5
Integration of online teaching platforms	83%	5.0	92%	5.5
LAN-based computer testing implemented	66%	9.0	—	—
Computer-based testing linked to management system	56%	3.0	—	—

Survey findings reveal strong adoption of core LMS functions (83–96%), including assignment distribution and platform integration. However, teacher–student interaction, assessment diversity, and parental involvement remain moderate. Computer-based testing is available but not fully integrated with management systems.

Qualitative insights complement the survey findings. A purposive sample of 12 to 15 teachers from diverse disciplines and digital proficiency levels was selected, following Guest et al.'s (2006) data saturation guidelines. Interviews revealed that most teachers participate annually in digital training programs organized by the school or the Department of Education and Training. One teacher remarked, "*The training programs are practical and up to date. We often receive guidance on new platforms and digital teaching tools that can be applied immediately.*" These initiatives have encouraged pedagogical innovation, including widespread use of tools such as Quizizz and Google Classroom. Another teacher shared, "*Some senior colleagues are still hesitant to try new tools, although they've attended the same training sessions,*" highlighting generational differences in adoption. Teachers also emphasized that creating high-quality digital content is time-consuming, suggesting the need for stronger technical support or shared resource repositories. These narratives align with survey data indicating that 95% of teachers have received digital training, 92% use digital tools to innovate their teaching, and 88% develop digital content.

Table 5. Digitalized teaching materials by grade (2023–2024)

Digitalized Teaching Materials	Grade 10	Grade 11	Grade 12
Electronic tests	118	133	102
Presentations & data tables	119	132	87
Audio/images/videos	163	160	109
E-lectures	159	170	106
Total (% of required 1080)	559	595	404
	51,8%	55,1%	37,4%

All departments have developed shared digital materials, including electronic tests, presentations, multimedia resources, and e-lectures. However, these materials have not yet been fully integrated into a comprehensive e-learning system. The school scores a full 3/3 for digital content development under the evaluation rubric.

Overall, the school's DT level in teaching and learning is Level 2 out of 3 (17.5/30), reflecting solid LMS adoption, teacher training, and digital content production. Key challenges include inconsistent teacher–student interaction, limited use of matrix-based and formative assessments, fragmented integration of content, and uneven staff digital competencies. Moving toward a higher maturity level requires enhancing LMS interactivity, expanding professional development on digital pedagogy, integrating e-learning content more comprehensively, and providing targeted support to less digitally proficient educators.

3.2.3. Digital transformation in school management

The school's digital transformation in management was evaluated using the national maturity framework outlined in Decision 956/QĐ-SGDĐT (Department of Education and Training of Ho Chi Minh City, 2024). This framework assesses administrative digitalization through prerequisites (e.g., strategic planning, database integration) and the extent of software interoperability across core management modules.

Table 6. Digital transformation in school management

Criteria	Max Points	Percentage (%)	Notes/Score
Establishment of a dedicated digital transformation unit	—	91.5	Mandatory prerequisite
Issuance of formal plan for digital transformation and IT application	—	91.5	Mandatory prerequisite
Integration of school management software with national educational databases	—	86.4	Mandatory prerequisite
Data verification rate against National Population Database $\geq 99\%$	—	80.0	Mandatory prerequisite
Implementation of comprehensive school management software system	60	68.0	<i>Score based on integration & modules completeness*</i>
- Student Information Management Module (academic records tracking)	—	93.2	
- Staff Management Module (administrative & academic personnel)	—	71.2	

- Facilities Management Module (infrastructure & assets)	—	54.2	
- School Health Information Management Module	—	64.4	
- Electronic Portal Module (public info per regulations)	—	78.0	
- Digital Gradebook and Student Report Card System	—	96.6	
Budget plan allocated for digital transformation initiatives	10	69.0	Full points
Deployment of online communication platforms connecting schools and families	8	97.0	High implementation
Implementation of online student enrollment services	12	69.0	Moderate implementation
Adoption of cashless payment methods for educational services	10	88.0	Good adoption rate

Note: Score depends on system integration: standalone modules receive 40 points; fully interoperable systems with seamless data exchange receive 60 points. A 10-point penalty applies for each missing core module.

The school has made substantial progress in digital school management. All key prerequisites are in place, including the establishment of a dedicated digital transformation unit and a formal IT plan (91.5%), integration with national databases (86.4%), and a high data verification accuracy rate (80%). The comprehensive school management software system has achieved a moderate level of implementation (68%). Among individual modules, the Student Information Management (93.2%) and Digital Gradebook (96.6%) modules show high levels of adoption, while the Staff Management (71.2%), School Health (64.4%), and Facilities Management (54.2%) modules are less consistently utilized.

Communication and service modernization are strong, with 97% of participants reporting the use of online communication platforms between families and schools, 69% indicating the use of online enrollment services, and 88% adopting cashless payment methods. However, interoperability among software modules remains limited, hindering seamless data exchange across systems. While 68% of staff report daily use of digital tools, only 42% express confidence in their effectiveness, underscoring the need for further capacity-building initiatives.

In sum, the school currently achieves Level 2 in software integration and data management. To advance to a higher digital maturity level, it is essential to address interoperability gaps, improve infrastructure management systems, and enhance staff digital literacy through targeted professional development programs.

3.2.4. Summary of strengths, weaknesses, and proposed solutions

The school demonstrates a Level 2 DT maturity, indicating moderate digital readiness with notable progress across infrastructure, pedagogy, and management.

Strengths are evident in multiple domains. The school benefits from well-equipped classrooms, smart laboratories, and a dedicated digital content studio, providing a robust foundation for technology-enhanced learning. Pedagogically, LMS adoption is widespread, supported by regular professional development, resulting in the production of e-lectures, multimedia resources, and electronic assessments. Administrative digitalization is also advanced, including the use of comprehensive student information systems, digital gradebooks, online communication platforms, and cashless payment services, alongside integration with national educational databases.

Weaknesses remain in infrastructure and human capacity. Internet bandwidth limits simultaneous student access, while teacher–student engagement through digital platforms is inconsistent. Formative assessments are underutilized, digital content integration across subjects is fragmented, and staff digital competencies vary. Parental engagement is moderate, constrained by limited digital literacy and platform accessibility.

Proposed solutions include: (i) upgrading network infrastructure and integrating AI-supported classroom tools to enhance connectivity and interactive learning; (ii) implementing targeted professional development on advanced LMS functions, AI-assisted assessment, and gamified pedagogy, complemented by mentoring for less digitally proficient staff; (iii) establishing a centralized repository for standardized, sharable digital content; (iv) enhancing LMS interactivity and real-time monitoring to support formative and personalized learning; and (v) strengthening parental engagement via user-friendly portals and digital literacy initiatives. Ensuring sustainable implementation requires diversified funding and fostering a school culture of digital innovation.

Collectively, these measures aim to advance the school toward Level 3 maturity, aligning infrastructure, pedagogy, and management with national standards while promoting inclusive, high-quality education.

4. Conclusion

This study successfully assessed the DT maturity level at the Experimental High School. Using a rigorous mixed-methods approach and national frameworks, the research confirmed that the school has achieved Level 2 out of 3 in overall digital maturity. The primary strengths lie in high LMS adoption, widespread teacher training, and advanced student management systems. However, critical challenges persist in insufficient internet bandwidth and limited interoperability among management software modules. To advance towards Level 3, the study proposes targeted interventions focusing on network upgrades, digital pedagogy enhancement, and seamless data system integration.

❖ **Conflict of Interest:** Authors have no conflict of interest to declare.

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CHUYÊN ĐỔI SỐ TRONG GIÁO DỤC PHỔ THÔNG: NGHIÊN CỨU TRƯỜNG HỢP TẠI TRƯỜNG TRUNG HỌC THỰC HÀNH ĐẠI HỌC SƯ PHẠM

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TÓM TẮT

Nghiên cứu đánh giá thực trạng chuyển đổi số tại Trường Trung học Thực hành – Trường Đại học Sư phạm Thành phố Hồ Chí Minh. Phương pháp hỗn hợp gồm phân tích tài liệu, khảo sát 712 học sinh và 59 cán bộ – giáo viên, cùng phỏng vấn, dựa trên khung chuyển đổi số quốc gia (Quyết định 4725 và 956). Kết quả nghiên cứu cho thấy Trường đạt mức 2/3 về trường thành số; hạ tầng ổn định nhưng băng thông còn hạn chế; LMS được áp dụng rộng rãi, song tích hợp nội dung số và tương tác giáo viên – học sinh chưa đồng đều; hệ thống quản lý chưa liên thông dữ liệu hoàn toàn. Điểm mạnh là LMS và đào tạo giáo viên; hạn chế gồm hạ tầng và sự tham gia các bên. Nghiên cứu đề xuất nâng cấp mạng, bồi dưỡng năng lực số, tích hợp nội dung và hệ thống quản lý để thúc đẩy chuyển đổi số giáo dục.

Từ khóa: chuyển đổi số; công nghệ giáo dục; giáo dục phổ thông; quản trị trường học