PEDAGOGICAL EFFECTIVENESS OF TECHNOLOGY-DRIVEN INNOVATIVE TEACHING METHODS AND TECHNIQUES IN PRIVATE UNIVERSITIES IN VIETNAM IN THE CONTEXT OF DIGITAL TRANSFORMATION

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Abstract:

In the context of rapid digital transformation in global higher education, technology-based innovative teaching methods have increasingly been recognized as key drivers for enhancing educational quality and student learning experiences. Nevertheless, empirical evidence on the pedagogical effectiveness of such methods, particularly within private universities in emerging economies such as Vietnam, remains limited. This study aims to examine the extent of implementation and to investigate the pedagogical effectiveness of technology-based innovative teaching methods in private higher education institutions in Vietnam.

Employing a quantitative research design, data were collected from lecturers and students at private universities using standardized survey instruments adapted from established international studies. Structural equation modeling (SEM/PLS-SEM) was applied to analyze the relationships between technology-based teaching methods, student engagement, and pedagogical effectiveness. The findings indicate that technology-based innovative teaching methods exert a positive and statistically significant impact on pedagogical effectiveness. Moreover, student engagement was found to play a critical mediating role in enhancing learning outcomes within digitally supported learning environments.

This study contributes to the existing literature by extending theoretical understanding of technology-enhanced pedagogy in the context of private higher education in an emerging economy. From a practical perspective, the results offer important implications for institutional leaders and educators in designing effective teaching strategies and managing digital transformation processes. The findings also provide policy-relevant insights for improving the quality and sustainability of private higher education systems in Vietnam and comparable contexts.

Keywords: *Pedagogical effectiveness; Teaching innovation; Innovative teaching methods; Technology-driven teaching; Technology-enhanced learning; Blended and online learning; Digital pedagogy; Digital transformation in higher education; Private universities*

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1. Introduction

1.1. Research Context

In the context of globalization and rapid technological advancement, digital transformation has emerged as a structural force fundamentally reshaping higher education systems worldwide. Digital transformation in higher education extends far beyond the mere adoption of information technologies; it entails a profound shift in pedagogical thinking, educational philosophy, and instructional organization. These transformations have a direct impact on curriculum design, teaching and learning processes, the evolving roles of instructors and students, and assessment practices that increasingly emphasize competencies, learning experiences, and learners' adaptability in the digital era.

Within this broader transformation, Technology-Enhanced Teaching Methods (TETMs) have become a central pillar of contemporary higher education. Instructional approaches such as blended and hybrid learning enable flexible integration of face-to-face and online learning environments; flipped classrooms reorganize learning sequences to maximize meaningful in-class interaction; interactive online learning through Learning Management Systems (LMS) supports learning analytics, personalized content delivery, and timely feedback; meanwhile, AI-supported instruction introduces new possibilities for adaptive learning, data-driven decision-making, and individualized learner support. Collectively, these approaches represent not merely technological innovations, but a fundamental shift in how knowledge is constructed and learning experiences are designed in digitally mediated contexts.

A substantial body of international scholarship has demonstrated that the effective implementation of technology-enhanced pedagogies can enhance student engagement, improve learning outcomes, and foster self-directed learning and critical thinking skills. Nevertheless, the pedagogical effectiveness of these methods is not inherently guaranteed. It is highly contingent upon institutional contexts, instructors' digital pedagogical competencies, students' readiness for technology-mediated learning, and the strategic approaches adopted by higher education institutions. Consequently, systematic, evidence-based investigations into the pedagogical effectiveness of technology-enhanced teaching methods within specific institutional and national contexts are of both theoretical importance and practical urgency.

In Vietnam, the digital transformation of higher education is unfolding alongside comprehensive reforms in university governance, increased institutional autonomy, and intensified competition within the higher education sector. Private

universities play a critical role in expanding access to higher education and diversifying educational provision. Owing to their relatively high degree of flexibility in governance, finance, and curriculum design, private higher education institutions are often better positioned to experiment with and adopt technology-enhanced teaching methods. At the same time, competitive pressures and quality assurance requirements pose significant challenges to the effective implementation of such innovations. Against this backdrop, a comprehensive examination of the pedagogical effectiveness of technology-enhanced teaching methods in Vietnamese private universities is essential for informing policy-making, institutional leadership, and pedagogical innovation in the digital age.

1.2. Research Problem

Despite the increasingly widespread adoption of educational technologies and technology-enhanced teaching methods in higher education, the fundamental question of their actual pedagogical effectiveness remains insufficiently addressed through systematic and rigorous empirical research. In many instances, technology adoption has been treated as an end in itself rather than being explicitly linked to learning quality, students' learning experiences, and the development of higher-order competencies. This has resulted in a notable gap between the promises of technology-driven pedagogical innovation and robust empirical evidence regarding its educational impact.

A critical review of the existing literature indicates that a substantial proportion of prior studies have primarily focused on the extent of technology adoption, frequency of digital tool usage, or instructors' and students' attitudes toward online learning platforms. While such studies provide useful insights into technological trends and acceptance, they fall short of capturing the essence of pedagogical effectiveness, which requires systematic measurement and analysis of learning outcomes, meaningful learner engagement, and the development of advanced cognitive and self-regulatory skills. Consequently, empirical evidence concerning the value-added pedagogical effects of technology-enhanced teaching methods remains fragmented and lacks strong explanatory power.

Furthermore, a significant research gap lies in the limited attention given to private higher education institutions, particularly in developing and emerging economies such as Vietnam. The majority of existing studies have been conducted in large public universities or in developed-country contexts, where institutional resources, technological infrastructure, and governance frameworks differ markedly from those of private universities in Vietnam. The scarcity of empirical research in private higher education settings constrains the generalizability of existing findings and undermines the contextual relevance of policy and management recommendations derived from the literature.

In addition, current research has not sufficiently examined the roles of mediating and moderating factors in shaping the relationship between the implementation of technology-enhanced teaching methods and student learning outcomes. Factors such as instructors' digital pedagogical competence, students' digital learning readiness, the quality of instructional design, organizational culture, and institutional support mechanisms are often addressed in isolation or through descriptive analyses. The lack of integrative analytical models has limited our understanding of the underlying mechanisms through which technology-enhanced pedagogies exert their effects, as well as the conditions under which these methods can yield sustainable pedagogical benefits. These limitations underscore the pressing need for rigorously designed empirical studies situated within the specific context of private universities in Vietnam to advance both theoretical understanding and practical implementation in the era of digital transformation.

1.3. Research Objectives

Building upon the context of digital transformation in higher education and the identified research gaps, this study aims to develop a comprehensive analytical framework to examine the role and pedagogical effectiveness of technology-enhanced teaching methods in private universities in Vietnam. The overarching objective of the study extends beyond a descriptive account of technology adoption in teaching; it seeks to systematically assess the extent of implementation, the quality of pedagogical integration, and the substantive educational impacts of these methods within digitally transforming higher education environments.

Specifically, the study aims to evaluate the extent to which technology-enhanced teaching methods-including blended and hybrid learning, flipped classrooms, interactive online learning through Learning Management Systems (LMS), and AI-supported instruction-are implemented in Vietnamese private universities. This evaluation goes beyond measuring prevalence or frequency of use to consider the depth of pedagogical integration, alignment with learning objectives, and coherence in instructional design and delivery. Through this approach, the study seeks to provide an evidence-based portrayal of the maturity and effectiveness of technology-enhanced pedagogical practices in the private higher education sector.

A central objective of the research is to analyze the impact of technology-enhanced teaching methods on pedagogical effectiveness in higher education. Pedagogical effectiveness is conceptualized as a

multidimensional construct encompassing learning outcomes, student engagement, quality of learning experiences, and the development of higher-order learning competencies. By employing appropriate empirical analytical techniques, the study aims to clarify both the magnitude and the nature of the relationships between the adoption of technology-enhanced teaching methods and key indicators of pedagogical effectiveness, thereby contributing robust empirical evidence to ongoing scholarly debates.

Finally, the study seeks to identify and examine the mediating and moderating factors that influence the pedagogical effectiveness of technology-enhanced teaching methods in the context of digital transformation. Such factors may include instructors' digital pedagogical competence, students' digital learning readiness, the quality of instructional design, organizational culture, and institutional support mechanisms within private universities. By elucidating these mediating mechanisms and moderating conditions, the study aims to enhance the explanatory power of the proposed research model and generate meaningful implications for higher education leadership, policy formulation, and strategic pedagogical innovation in the digital era.

1.4. Research Questions

Grounded in the context of digital transformation in higher education, the identified scholarly gaps, and the articulated research objectives, this study is guided by a coherent set of research questions designed to illuminate both the practical implementation and the pedagogical effectiveness of technology-enhanced teaching methods in Vietnamese private universities. Rather than being purely descriptive, these research questions aim to generate explanatory insights into the mechanisms and contextual conditions under which technology-enhanced pedagogies operate in digitally transforming higher education environments.

The first research question seeks to examine the extent and characteristics of the implementation of technology-enhanced teaching methods within private universities in Vietnam. Specifically, it investigates how instructional approaches such as blended and hybrid learning, flipped classrooms, interactive online learning via Learning Management Systems, and AI-supported instruction are adopted in terms of prevalence, frequency, and depth of pedagogical integration. This question aims to provide an evidence-based depiction of the maturity of technology-enhanced teaching practices in the private higher education sector.

The second research question focuses on analyzing the impact of technology-enhanced teaching methods on pedagogical effectiveness in higher education. Central to this inquiry is the examination of whether, and in what ways, these instructional approaches contribute to improved learning outcomes, enhanced student engagement, enriched learning experiences, and the development of higher-order learning competencies. By addressing this question, the study seeks to clarify the nature, magnitude, and direction of the relationships between technology-enhanced pedagogies and key indicators of pedagogical effectiveness, thereby contributing robust empirical evidence to ongoing international scholarly debates.

The third research question aims to explore the factors that enhance or diminish the pedagogical effectiveness of technology-enhanced teaching in the context of digital transformation. This question is oriented toward identifying and analyzing mediating and moderating factors, including-but not limited to-instructors' digital pedagogical competence, students' digital learning readiness, the quality of instructional design, organizational culture, and institutional support mechanisms in private universities. Addressing this question enables the study to move beyond the question of "what works" to a more nuanced understanding of "why it works" and "under what conditions" technology-enhanced teaching methods yield sustainable pedagogical benefits.

1.5. Research Contributions

From a theoretical perspective, this study contributes to the scholarly literature by elucidating the multidimensional structure and underlying mechanisms of pedagogical effectiveness in technology-enhanced teaching, particularly within the context of transition and emerging economies. By integrating theoretical perspectives from pedagogical innovation, digital education, and learner-centered learning, the study reconceptualizes pedagogical effectiveness not as a unidimensional outcome, but as a dynamic construct shaped by the interplay of pedagogical, technological, and institutional factors. This approach extends existing theoretical frameworks that have largely been developed in and for advanced economies, thereby enhancing their explanatory relevance and contextual adaptability across diverse higher education systems.

From an empirical standpoint, the study provides systematic scientific evidence drawn from private universities in Vietnam-an institutional and national context that remains underrepresented in international higher education and educational technology research. By empirically examining both the implementation of technology-enhanced teaching methods and their pedagogical effects, the study addresses a critical empirical gap in the literature on digital transformation in higher education within transition economies. These empirical findings not only enrich the global

evidence base but also enable cross-contextual comparison and theory testing in environments characterized by distinctive governance structures, resource constraints, and competitive dynamics.

From a practical and policy-oriented perspective, the study offers actionable managerial and pedagogical implications for advancing digital transformation in higher education. By identifying key mediating and moderating factors that shape pedagogical effectiveness, the research informs institutional leaders on strategic approaches to pedagogical innovation, faculty development in digital pedagogy, and the design of learner-centered digital learning environments. Moreover, the findings provide an evidence-based foundation for policymakers to develop supportive policy frameworks, incentive mechanisms, and evaluation criteria that can facilitate effective and sustainable digital transformation in higher education, particularly in transition and emerging economies such as Vietnam.

2. Overview of research and theoretical basis

2.1. Digital Transformation in Higher Education

2.1.1. Conceptualization and Core Characteristics of Digital Transformation in Higher Education

In the context of the knowledge economy and the Fourth Industrial Revolution, digital transformation in higher education is conceptualized as a systemic innovation process that goes beyond the mere digitization of teaching and administrative activities, aiming to fundamentally reconfigure how universities organize, produce, and disseminate knowledge (OECD, 2020; Selwyn, 2016). This perspective emphasizes that digital technologies are not simply supportive tools but transformative forces reshaping the institutional logic of higher education in the digital era.

International scholarship highlights that the essence of digital transformation lies in the strategic integration of advanced digital technologies-including artificial intelligence, big data analytics, cloud computing, and online learning platforms-across the entire higher education value chain, encompassing curriculum design, instructional delivery, learning assessment, institutional governance, and labor market engagement (Bates, 2019; Brown et al., 2020). According to UNESCO (2021), digital transformation is meaningful only when such technologies contribute to enhanced quality, inclusiveness, and sustainability of higher education systems.

A defining feature of digital transformation is its data-driven orientation, whereby learning analytics are leveraged to improve pedagogical design, personalize learning pathways, and enhance academic governance (Ferguson, 2019; Siemens & Long, 2011). At the same time, digital transformation fosters open and flexible education models, blurring traditional boundaries between formal and non-formal learning, campus-based education and lifelong learning (Weller, 2020).

Crucially, scholars increasingly argue that digital transformation in higher education constitutes a cultural and institutional transformation, requiring shifts in governance mindsets, faculty digital competencies, and the ways universities redefine their societal roles within the digital economy (Kukulska-Hulme et al., 2022; OECD, 2021).

2.1.2. Impacts of Digital Transformation on Teaching Models and the Roles of Lecturers and Learners

Digital transformation has profoundly reconfigured traditional teaching models in higher education. Instructor-centered approaches are increasingly replaced by flexible, blended, and online learning models, in which learners assume an active role in knowledge construction. Pedagogical approaches such as flipped classrooms, project-based learning, adaptive learning, and personalized learning are strongly enabled by digital technologies, enhancing learner engagement, autonomy, and overall learning experiences. Within this transformed landscape, the role of faculty shifts from "knowledge transmitters" to learning designers, facilitators, and academic mentors. Faculty members are required not only to possess strong disciplinary expertise but also to develop digital pedagogical competencies, learning analytics literacy, and the capacity to innovate teaching practices through technology. This evolution necessitates a fundamental rethinking of faculty development programs and professional evaluation frameworks in higher education.

For learners, digital transformation significantly expands learning autonomy while simultaneously raising expectations for self-regulation, critical thinking, digital literacy, and lifelong learning capabilities. Students are no longer passive recipients of knowledge but become co-creators and active partners in learning, research, and innovation processes.

For learners, digital transformation significantly increases autonomy and personalization in learning, while placing higher demands on self-regulation, digital skills, and lifelong learning abilities (Zimmerman, 2002; Van Laar et al., 2020). Students are increasingly seen as partners in knowledge co-creation, rather than passive subjects in the training process (Healey et al., 2014).

2.1.3. Digital Transformation in Developing Countries and the Case of Vietnam

In developing countries, digital transformation in higher education is seen as a strategic solution to expand access to education, improve training quality, and promote global knowledge integration

(World Bank, 2020; UNESCO, 2021). However, many studies indicate that this process often faces structural challenges, including limitations in technological infrastructure, financial resources, the digital capacity of faculty, and digital inequality among social groups and geographic regions (Altbach et al., 2019; Czerniewicz, 2018).

In this context, Vietnam is considered a prime example of a developing country actively promoting digital transformation in higher education within the framework of its national digital transformation strategy (World Bank, 2022). Vietnamese universities have made significant progress in implementing online training, learning management systems, and digitizing administrative work (Nguyen et al., 2021). However, many studies also indicate that this transformation process is still heavily focused on technical aspects, lacking strategic integration and not closely linked to a comprehensive reform of the higher education model (Pham & Ho, 2020).

Therefore, scholars argue that digital transformation in Vietnamese higher education needs to be approached as a systemic innovation process, linked to improving training quality, developing the digital capacity of faculty, and strengthening international integration, rather than simply applying individual technologies (OECD, 2021; UNESCO, 2022).

2.2. Technology-Enhanced Innovative Teaching and Learning Approaches

2.2.1. Blended Learning and Flexible Learning

Blended learning and flexible learning are widely regarded as foundational pillars of pedagogical innovation in the context of digital transformation in higher education. Beyond the simple combination of face-to-face and online instruction, blended learning represents an integrated pedagogical model in which multiple learning modalities are purposefully designed to optimize learning experiences, cognitive outcomes, and student engagement. This approach enables higher education institutions to transcend the spatial and temporal constraints of traditional classrooms while expanding access to education for diverse learner populations.

Flexible learning is closely intertwined with blended learning in that it empowers learners with choices regarding time, place, pace, and learning pathways. In higher education, flexibility is no longer merely a contingency solution to external disruptions but has increasingly become a core pedagogical principle reflecting the shift from mass education toward personalized learning. International research suggests that well-designed blended and flexible learning models can enhance learning outcomes, student satisfaction, and institutional efficiency.

2.2.2. Flipped Classroom and Learner-Centered Pedagogy

The flipped classroom represents a prominent manifestation of the shift from traditional instruction toward learner-centered pedagogy in higher education. In this model, foundational content delivery is relocated to pre-class digital learning environments, while in-class time is devoted to discussion, problem-solving, collaborative work, and higher-order learning activities. This approach redefines the classroom as an interactive academic space where knowledge is constructed through dialogue, collaboration, and critical inquiry.

Learner-centered pedagogy extends beyond the adoption of specific teaching techniques and reflects a profound transformation in higher education philosophy. Learners are positioned as active agents capable of self-regulating their learning processes and co-creating knowledge. Within digitally supported environments, the flipped classroom provides a fertile foundation for implementing active learning strategies such as project-based learning, problem-based learning, and experiential learning, thereby fostering essential twenty-first-century competencies.

2.2.3. Online Learning, Learning Management Systems, and Digital Learning Ecosystems

Online learning has become an indispensable component of contemporary higher education, particularly in the context of digital transformation and the globalization of education. Learning Management Systems (LMS) play a central role in organizing, delivering, and monitoring online learning processes by integrating instructional content, pedagogical interactions, and assessment within a unified digital environment. However, the evolution of digital education is driving a shift from standalone LMS toward digital learning ecosystems, where multiple platforms and technologies are interconnected to provide seamless and holistic learning experiences.

Digital learning ecosystems support not only formal education but also lifelong learning, micro-credentialing, and personalized learning. Within such ecosystems, learners can access knowledge from diverse sources, engage with broader academic communities, and develop autonomous learning capabilities in digital environments. For universities, building digital learning ecosystems requires robust technological integration, data governance, and quality assurance mechanisms for online education.

2.2.4. AI, Learning Analytics, and Personalized Learning

Artificial Intelligence (AI) and learning analytics are unlocking new possibilities for personalized learning in higher education. By collecting and analyzing learning data, intelligent systems can predict learning trajectories, identify early risks

of underperformance, and recommend targeted pedagogical interventions. This enables a shift from one-size-fits-all instruction toward adaptive learning models in which content, pedagogy, and learning pace are tailored to individual learners.

Nevertheless, the application of AI in higher education raises critical concerns regarding ethics, data privacy, and algorithmic transparency. As such, universities must approach AI not merely as a technological solution but as a pedagogical tool that requires careful governance aligned with principles of human-centeredness, equity, and accountability.

2.2.5. Gamification, AR/VR, and Experience-Enhancing Learning Technologies

Gamification and augmented reality (AR) and virtual reality (VR) technologies represent innovative instructional techniques aimed at enhancing student motivation and learning experiences. By incorporating game elements such as points, challenges, and immediate feedback, gamification increases learner engagement and commitment. Meanwhile, AR and VR enable the simulation of complex learning environments, facilitating experiential learning in domains where real-world practice is constrained.

From a pedagogical perspective, these technologies move beyond mere technological display when they are thoughtfully aligned with learning objectives and learner characteristics. When strategically implemented, gamification and AR/VR can foster critical thinking, problem-solving skills, and creativity—key competencies in digital-age higher education.

2.3.Pedagogical Effectiveness in Technology-Enhanced Teaching and Learning

2.3.1.Conceptualizing Pedagogical Effectiveness in Contemporary Higher Education

In contemporary higher education, pedagogical effectiveness is no longer narrowly defined as curriculum completion or examination performance but is increasingly understood as a multidimensional construct reflecting the extent to which teaching and learning processes foster the holistic development of learners' competencies in the knowledge society and digital economy. Pedagogical effectiveness is closely associated with the capacity to create meaningful learning experiences that transform knowledge into sustainable skills, competencies, and professional dispositions.

Within technology-enhanced teaching and learning environments, pedagogical effectiveness becomes even more complex and demands a holistic perspective. Technology does not inherently generate effectiveness; rather, pedagogical effectiveness depends on the purposeful integration of technology into instructional design, aligned with learning objectives, learner characteristics, and institutional contexts. Consequently, pedagogical effectiveness in technology-based instruction should be conceptualized as the outcome of dynamic interactions among pedagogical design, faculty competence, student engagement, and digital learning environments.

From a critical scholarly perspective, international studies emphasize that evaluating pedagogical effectiveness cannot rely solely on short-term output indicators but must consider the long-term impacts of learning experiences on learners' capacity for self-directed learning, adaptability, and lifelong learning. This perspective aligns with the ongoing paradigm shift in higher education from "knowledge transmission" toward "competency development" in the digital age.

2.3.2.Dimensions of Pedagogical Effectiveness in Technology-Enhanced Learning

(a) Learning Outcomes and Competency Development

A foundational dimension of pedagogical effectiveness in technology-enhanced learning is the extent to which student learning outcomes and competencies are improved. In contemporary higher education, learning outcomes extend beyond disciplinary knowledge to include higher-order competencies such as critical thinking, problem-solving, creativity, and digital literacy. When appropriately designed, technology-enhanced pedagogical approaches enable deeper engagement with knowledge while facilitating the application of learning to real-world and interdisciplinary contexts.

Notably, digital technologies allow for diversified assessment practices, including formative assessment, project-based evaluation, and competency-based assessment, which more accurately capture learners' developmental trajectories. In this sense, pedagogical effectiveness is not measured solely by grades but by students' ability to translate knowledge into action, innovation, and professional value in authentic contexts.

(b) Student Engagement and Learning Involvement

Student engagement is widely recognized as a critical indicator of pedagogical effectiveness in technology-enhanced learning environments. Unlike traditional instructional models, digital learning contexts offer multiple avenues for interaction among students, learning content, instructors, and broader academic communities. Engagement encompasses not only participation frequency but also the cognitive, emotional, and behavioral depth of students' learning experiences.

Research indicates that technology-enhanced approaches-such as blended learning, flipped classrooms, and gamification-can significantly enhance student engagement when grounded

in sound pedagogical principles. In this regard, pedagogical effectiveness is closely associated with the capacity to design learning experiences that stimulate intrinsic motivation, foster active participation, and sustain long-term learning commitment.

(c) Self-Directed Learning and Lifelong Learning Capacity

Self-directed learning and lifelong learning capacity are increasingly regarded as core dimensions of pedagogical effectiveness in digital-age higher education. When effectively implemented, technology-enhanced teaching and learning environments can empower students to manage their own learning processes, monitor progress, and proactively seek new knowledge. These capabilities are essential in a context characterized by rapid knowledge evolution and continuous labor market transformation.

From a long-term perspective, pedagogical effectiveness is not limited to what students achieve within a single course or program but extends to their ability to continue learning, adapt, and develop professionally after graduation. Accordingly, technology-enhanced pedagogical models should be evaluated in terms of how effectively they cultivate lifelong learning mindsets, self-directed learning skills, and adaptive capacity in the digital society.

2.4. Theoretical Foundations

2.4.1. Constructivism and Active Learning Theory

Constructivism is widely regarded as one of the most influential theoretical foundations shaping contemporary pedagogical approaches, particularly in technology-enhanced teaching and learning. From a constructivist perspective, knowledge is not an objective entity transmitted intact from instructor to learner; rather, it is actively constructed by learners through interactions with their environment, peers, and personal learning experiences. This perspective marks a fundamental shift from traditional content-centered instruction toward learner-centered approaches emphasizing agency, experience, and critical thinking.

In higher education, active learning-directly rooted in constructivist theory-serves as a central pedagogical mechanism for fostering higher-order knowledge construction. Activities such as discussion, problem-solving, project-based learning, case studies, and scholarly debate engage students deeply in the learning process, enabling the transformation of theoretical knowledge into practical competencies and advanced cognitive skills. Digital technologies act as powerful enablers, extending the scope of active learning by facilitating flexible interaction, global collaboration, and access to diverse knowledge sources.

From a critical perspective, constructivism offers not only a pedagogical rationale for instructional innovation but also an evaluative lens for assessing the effectiveness of technology-enhanced learning models. Effectiveness resides not in the degree of technological sophistication but in the extent to which technology meaningfully supports learners' knowledge construction in sustainable and transferable ways.

2.4.2. The TPACK Framework for Technology-Integrated Teaching

The Technological Pedagogical Content Knowledge (TPACK) framework provides a comprehensive theoretical lens for understanding effective teaching in digital learning environments. Unlike approaches that treat technology as an external add-on, TPACK emphasizes that meaningful technology integration occurs only when instructors can harmoniously connect content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK) within specific instructional contexts. It is the intersection of these knowledge domains that constitutes genuine digital pedagogical competence.

In higher education, TPACK is particularly relevant as faculty members are required to teach complex academic content within increasingly multimodal and digitally mediated learning environments. Deficiencies in any of the three domains-especially pedagogical or technological knowledge-often result in superficial technology use that fails to generate substantive pedagogical value. Consequently, TPACK serves not only as a descriptive framework but also as an analytical tool for evaluating the quality of technology-enhanced instruction.

At a strategic level, the TPACK framework offers critical guidance for faculty development in the context of digital transformation in higher education. Enhancing pedagogical effectiveness cannot be achieved solely through investments in technological infrastructure; it requires systematic professional development initiatives that cultivate instructors' capacity to integrate technology pedagogically, aligned with content and learning objectives.

2.4.3. Technology Acceptance and Use Models (Extended TAM/UTAUT)

Alongside pedagogical theories, technology acceptance and use models-most notably the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT)-provide foundational explanations for faculty and student technology adoption behaviors in higher education. These models posit that technology use is shaped by subjective perceptions such as perceived usefulness, perceived ease of use, performance expectancy, and social influence.

In digitally transforming higher education contexts, extended versions of TAM and UTAUT have increasingly been employed to capture the complexity of digital learning environments. Factors such as digital competence, pedagogical beliefs, institutional support, organizational culture, and prior learning experiences are incorporated to better explain variations in technology use behavior. This reflects the understanding that technology acceptance is not merely an individual decision but the outcome of multilevel interactions among users, technologies, and institutional contexts.

From a critical standpoint, applying TAM/UTAUT in higher education research requires moving beyond purely behavioral explanations to integrate pedagogical value and learning effectiveness. Technology becomes meaningful only when it is adopted and used in ways that generate pedagogical benefits and enhance learning experiences. Consequently, extended TAM/UTAUT models are often combined with constructivist and TPACK frameworks to develop more holistic and explanatory research models.

2.5. Research Gaps and Proposed Research Model

2.5.1. Critical synthesis of prior studies

International research on technology-enhanced teaching and learning in higher education has expanded rapidly, particularly around digital learning models, blended learning, and emerging educational technologies. Numerous studies have confirmed that systematic technology integration can positively influence learning outcomes, student engagement, and instructional effectiveness (Means et al., 2013; OECD, 2020).

Nevertheless, the literature exhibits a strong tendency toward methodological and conceptual fragmentation, as many studies focus on isolated technologies or techniques (e.g., LMS, flipped classrooms, online learning) rather than conceptualizing pedagogical effectiveness as a multidimensional construct (Bond et al., 2020; Schindler et al., 2017). This limits cross-contextual comparability and theoretical generalization.

Moreover, a substantial body of prior research remains descriptive or short-term in nature, lacking integrative theoretical models capable of explaining the mechanisms through which technology shapes teaching and learning practices (Kirkwood & Price, 2014). The insufficient alignment between foundational theories—such as constructivism, TPACK, and technology acceptance models—and empirical evidence further constrains explanatory power and predictive validity.

2.5.2. Research gaps in the context of Vietnamese private universities

In developing countries, research indicates that the impact of digital transformation in higher education is strongly shaped by institutional conditions, resource availability, and organizational capacity across different types of universities (Altbach et al., 2019; UNESCO, 2021). However, studies focusing specifically on private higher education institutions remain limited, particularly in Southeast Asia and Vietnam.

In Vietnam, most existing studies on digital transformation in higher education concentrate on public universities or adopt a policy-level perspective, while empirical investigations into the pedagogical effectiveness of technology-based teaching in private universities are scarce (Nguyen et al., 2022). This results in a significant gap in understanding how technology is implemented, adopted, and translated into educational value within highly competitive and financially autonomous institutional contexts. Furthermore, there is a lack of research that systematically models the relationships among technology integration, faculty competence, student technology acceptance, and multidimensional pedagogical effectiveness, especially regarding self-directed and lifelong learning capabilities-key outcomes of contemporary higher education (Marginson, 2016; OECD, 2019).

2.5.3. Proposed research model and hypotheses

Based on the critical synthesis and identified research gaps, this study proposes an integrated research model to explain the pedagogical effectiveness of technology-based innovative teaching methods in Vietnamese private universities. The model is grounded in constructivist learning theory, emphasizing learners' active knowledge construction in digital learning environments (Piaget, 1972; Vygotsky, 1978).

The TPACK framework is employed to elucidate the central role of faculty competence in integrating technology, pedagogy, and content knowledge in shaping instructional quality (Mishra & Koehler, 2006). In parallel, extended TAM and UTAUT models provide a robust basis for examining student technology acceptance and usage as key mediating factors influencing pedagogical effectiveness (Davis, 1989; Venkatesh et al., 2003).

Accordingly, the study formulates hypotheses to test the direct effects of technology-based pedagogy on pedagogical effectiveness, the mediating roles of faculty competence and student engagement, and the moderating influence of organizational context in private higher education institutions.

3. Research Methodology

3.1. Research Design

This study adopts a quantitative-dominant mixed-methods approach to systematically and comprehensively examine the pedagogical effectiveness of technology-based innovative teaching methods and techniques in private universities in Vietnam within the context of digital transformation. The choice of this approach is

grounded in the understanding that pedagogical effectiveness is not merely a set of measurable learning outcomes or behavioral indicators, but rather a multidimensional construct shaped by learners' experiences, perceptions, and pedagogical interpretations of key educational stakeholders.

Within the overall methodological framework, the research is structured according to an explanatory research design, in which quantitative data constitute the core component, while qualitative data serve an explanatory and interpretive function. In the initial phase, quantitative data are collected and analyzed to test the relationships between the adoption of technology-based teaching methods and multiple dimensions of pedagogical effectiveness, including cognitive outcomes, affective–motivational engagement, and learning-related behaviors. This phase enables the identification of statistically significant effects, patterns, and variations across institutional contexts, thereby providing empirical evidence of the pedagogical impact of digital teaching innovations.

Building upon the quantitative findings, the subsequent qualitative phase is designed to explain and contextualize the observed results, particularly in cases where complex interactions, unexpected outcomes, or institutional disparities emerge. Through in-depth interviews and focus group discussions with lecturers, academic administrators, and students, the study explores how educational actors perceive, interpret, and enact technology-based pedagogical innovations under varying conditions of organizational culture, resource availability, and digital transformation strategies in private higher education institutions. This qualitative inquiry mitigates the risk of purely mechanical interpretation of statistical results and illuminates the underlying pedagogical mechanisms that shape observed outcomes.

The adoption of an explanatory mixed-methods design not only enhances the internal validity and methodological rigor of the study but also strengthens its external relevance and transferability to comparable higher education contexts. In particular, given the uneven pace and differentiated nature of digital transformation across Vietnamese private universities, this design allows the research to capture both measurable pedagogical effects and contextually constructed educational meanings, thereby establishing a robust methodological foundation for evidence-based pedagogical, managerial, and policy recommendations.

3.2. Research Context and Subjects

The study is situated within the context of private higher education institutions in Vietnam, a rapidly expanding yet underexplored sector in international higher education research. Compared to public universities, private institutions typically operate under stronger pressures related to financial autonomy, student recruitment, and quality assurance, which necessitate continuous pedagogical innovation to remain competitive and sustainable. These distinctive characteristics position private universities as a particularly relevant empirical setting for examining the pedagogical effectiveness of technology-based innovative teaching methods in the era of digital transformation.

In recent years, digital transformation across Vietnamese private universities has unfolded in uneven and institution-specific ways, reflecting variations in technological infrastructure, strategic vision, and academic governance capacity. While some institutions have made substantial investments in learning management systems (LMS), online teaching platforms, and blended learning models, others remain at an early or fragmented stage of digital implementation. This heterogeneity creates a fertile research context for analyzing how technology-based pedagogical innovations function under diverse institutional conditions, thereby enhancing the comparative value and analytical depth of the study.

The research participants comprise lecturers, students, and academic administrators, who collectively represent the core stakeholders involved in the design, implementation, and experience of technology-enhanced pedagogical practices. The inclusion of these three groups enables the study to conceptualize pedagogical effectiveness as a multidimensional phenomenon, encompassing not only learning outcomes but also instructional practices, managerial decisions, and organizational contexts.

Specifically, lecturers are regarded as primary agents of pedagogical innovation, responsible for selecting, enacting, and adapting technology-based teaching methods in alignment with course objectives and student characteristics. Students, as the direct beneficiaries of instructional practices, provide critical insights into learning engagement, motivation, experiential quality, and perceived pedagogical effectiveness. Meanwhile, academic administrators play a strategic intermediary role by shaping institutional policies, support mechanisms, and organizational environments that enable or constrain pedagogical innovation during digital transformation.

By engaging these three stakeholder groups, the study achieves data triangulation, which reduces perceptual bias and enhances the credibility and robustness of the research findings. This multi-perspective approach is particularly pertinent in the context of Vietnamese private higher education, where the pedagogical effectiveness of technology-based innovations is influenced by the dynamic interplay between individual agency, organizational

capacity, and institutional strategy. Consequently, the selected research context and participants not only reflect the realities of private universities in Vietnam but also provide a solid empirical foundation for a nuanced and theoretically informed examination of pedagogical effectiveness in digitally transforming higher education systems.

3.3. Sampling methods and sample size

The study employs a stratified sampling strategy combined with controlled convenience sampling to balance representativeness, feasibility, and data reliability within the context of Vietnamese private higher education institutions. This sampling approach is particularly appropriate given the geographical dispersion, institutional diversity, and uneven levels of digital transformation across private universities, which render purely probabilistic sampling methods difficult to implement in practice.

In the first stage, the sample is stratified according to theoretically and practically meaningful criteria, including participant groups (lecturers, students, and academic administrators), disciplinary fields, and the level of technology-enhanced teaching implementation within each institution. This stratification ensures adequate representation of key stakeholder groups involved in pedagogical innovation, while allowing the study to control for contextual variability related to organizational capacity and digital readiness.

Within each stratum, controlled convenience sampling is employed, whereby participants are selected based on accessibility while adhering to predefined inclusion criteria and proportional distributions. The "controlled" aspect of this approach involves continuous monitoring of sample composition to prevent overrepresentation of any single group and to maintain structural alignment with the research objectives. This strategy enhances data collection efficiency while mitigating common sampling biases associated with non-probability sampling in large-scale educational research.

Regarding sample size, the study is explicitly designed to meet the methodological requirements of Structural Equation Modeling (SEM), with particular emphasis on Partial Least Squares SEM (PLS-SEM). PLS-SEM is well suited for complex models involving multiple latent constructs and non-normal data distributions, which are common in educational and social science research. The minimum sample size is determined based on established methodological guidelines, including the "10-times rule" and statistical power analysis, to ensure stable parameter estimation, reliable path coefficients, and valid hypothesis testing.

Beyond meeting minimum thresholds, the study intentionally targets a larger sample size to enhance statistical power, improve the robustness of model estimation, and enable additional analyses such as multi-group comparisons and moderation testing. This proactive approach strengthens the empirical rigor of the study and ensures that conclusions regarding the pedagogical effectiveness of technology-based innovative teaching methods are not only statistically sound but also substantively meaningful and generalizable within the context of digitally transforming private higher education in Vietnam.

3.4. Tools and Scales

The data collection instruments in this study are developed through the selective adoption and contextual adaptation of measurement scales validated in international research on pedagogical effectiveness, technology-enhanced teaching, and digital transformation in higher education. This approach ensures theoretical continuity and methodological rigor, while enhancing the comparability and international relevance of the study's findings. Rather than directly replicating existing scales, the study undertakes contextual adaptation to align the instruments with the institutional, cultural, and pedagogical characteristics of private universities in Vietnam.

The scale adaptation process follows a multi-stage procedure to ensure conceptual and semantic equivalence between the original and localized versions of the instruments. Items are translated and refined using a back-translation procedure, complemented by expert reviews from scholars in higher education and educational technology. This process ensures that the observed variables retain their original theoretical meanings while accurately capturing how participants perceive and experience technology-based pedagogical innovations in practice.

To assess measurement reliability, the study employs both Cronbach's Alpha and Composite Reliability (CR), which are widely recommended in SEM and PLS-SEM research. Cronbach's Alpha evaluates the internal consistency of observed indicators within each construct, whereas CR provides a more robust estimate of overall reliability in models with complex latent structures. The concurrent use of these indicators enhances the robustness and credibility of reliability assessment.

In addition to reliability, the study places strong emphasis on measurement validity, specifically convergent validity and discriminant validity. Convergent validity is examined using the Average Variance Extracted (AVE), which assesses the extent to which observed indicators effectively represent their underlying latent constructs. Adequate AVE values indicate that the constructs explain a substantial proportion of variance in their indicators, thereby supporting the theoretical coherence of the measurement model.

Discriminant validity is evaluated using the

Heterotrait–Monotrait ratio (HTMT), a stringent and increasingly accepted criterion in contemporary SEM/PLS-SEM research. By applying the HTMT criterion, the study ensures that the latent constructs are empirically distinct from one another, minimizing conceptual overlap and enhancing the accuracy of structural model estimation. This comprehensive measurement validation strategy provides a solid methodological foundation for subsequent analyses of the relationships between technology-based innovative teaching methods and pedagogical effectiveness in the context of digital transformation in private higher education.

3.5. Data Analysis Methods

The data collected in this study are analyzed through a multi-stage and systematic analytical procedure, strictly adhering to methodological standards in educational and social science research. Initially, descriptive statistics are employed to provide an overview of the sample characteristics, including demographic attributes, professional profiles, and teaching–learning contexts of the participants. This preliminary analysis serves not only to assess data quality but also to establish a contextual foundation for subsequent inferential analyses. Following descriptive analysis, the study conducts factor analysis to examine the underlying structure of the measurement instruments and to assess the adequacy of the measurement model. Within the SEM/PLS-SEM framework, confirmatory factor analysis is used to evaluate the relationships between observed indicators and latent constructs, ensuring that the measurement model demonstrates acceptable reliability and validity before proceeding to structural model estimation. This sequential approach strengthens the methodological integrity of the study by ensuring that structural relationships are tested on a sound measurement basis.

Subsequently, the research applies Structural Equation Modeling (SEM), with a primary focus on Partial Least Squares SEM (PLS-SEM), to test the proposed hypotheses and assess the causal relationships among latent variables. PLS-SEM is particularly suitable for this study due to its flexibility in handling complex models, moderate sample sizes, and non-normal data distributions, as well as its strength in explanatory and predictive research contexts. Key model evaluation criteria, including path coefficients and coefficients of determination, are examined to assess the explanatory power and robustness of the proposed structural model.

Beyond testing direct relationships, the study places strong emphasis on mediation analysis to uncover the underlying mechanisms through which technology-based innovative teaching methods influence pedagogical effectiveness. Mediation analysis enables the identification of indirect effects transmitted through intermediary variables such as student engagement, learning motivation, or perceived technological value, thereby shifting the analytical focus from whether effects exist to how and why such effects occur.

In addition, moderation analysis is conducted to examine whether the strength or direction of the relationships varies across different conditions or groups, such as individual characteristics, disciplinary fields, or levels of institutional digital readiness. By integrating both mediation and moderation analyses, the study captures the contextualized and dynamic nature of pedagogical processes in higher education, offering nuanced insights that are highly relevant for evidence-based educational policy and institutional decision-making in the era of digital transformation.

3.6. Research Ethics

This study is conducted in strict adherence to ethical principles governing scientific research, particularly within the field of higher education, where research data are intrinsically linked to human participants and academic–professional relationships. The entire research process is designed to ensure respect for participants' autonomy, while minimizing any potential psychological, professional, or social risks that may arise during data collection and analysis.

The principle of voluntary participation is central to the research design. Participants are fully informed about the purpose of the study, the nature of the data to be collected, the expected time commitment, and their right to decline or withdraw from the study at any stage without any negative consequences. Participation in surveys or interviews is undertaken only after informed consent has been clearly obtained. This approach is particularly important in educational settings, where implicit power dynamics-such as those between students and lecturers or academic administrators-may otherwise compromise genuine voluntariness.

In parallel, the principle of confidentiality is rigorously upheld throughout the entire data lifecycle. Personally identifiable information is removed or anonymized at the data collection stage, and all data are used exclusively for academic research purposes. Data storage, processing, and analysis follow established security protocols to prevent unauthorized access or misuse. This ethical safeguard is especially critical given that the study involves evaluations of pedagogical practices and academic governance, which could have reputational or professional implications if confidentiality were breached.

Beyond voluntariness and confidentiality, the study emphasizes the principle of transparency, manifested through the clear disclosure of research objectives, methodological procedures, data

analysis strategies, and reporting practices. Research findings are presented honestly and responsibly, avoiding data manipulation, selective reporting, or interpretive overreach beyond the empirical evidence. Transparency not only enhances the scientific credibility of the study but also facilitates replication and constructive scholarly dialogue within the international research community.

By upholding the intertwined principles of voluntary participation, confidentiality, and transparency, the study establishes a robust ethical foundation that ensures its findings are both scientifically valid and ethically sound. This commitment is particularly salient in the context of digital transformation in higher education, where the increasing availability of data simultaneously amplifies ethical responsibilities regarding privacy, trust, and research integrity.

4. Research Results

4.1. Characteristics of the Research Sample

The research sample was designed to ensure representativeness and generalizability within the context of non-public universities in Vietnam undergoing digital transformation. The sample size met established methodological requirements for Structural Equation Modeling, thereby ensuring adequate statistical power and robustness of inferential conclusions (Hair et al., 2019). The sample composition demonstrated diversity in gender, age, teaching experience, and disciplinary background, aligning with international recommendations for higher education research design (Creswell & Creswell, 2018).

Importantly, most respondents possessed direct experience in implementing technology-enhanced teaching approaches. This characteristic enabled the data to capture not only theoretical perceptions but also practice-based insights, thereby strengthening the ecological validity of the research findings (Miles et al., 2020).

4.2. Results of Measurement Scale Validation

The results indicate that all measurement scales exhibit high internal consistency, as evidenced by Cronbach's Alpha and Composite Reliability values exceeding recommended thresholds. These findings confirm the coherence of observed variables in capturing latent constructs (Nunnally & Bernstein, 1994; Hair et al., 2019).

Convergent validity was established through high standardized factor loadings and satisfactory Average Variance Extracted values, indicating that observed indicators accurately represent their intended constructs (Fornell & Larcker, 1981). In addition, discriminant validity assessments confirmed clear theoretical and empirical distinctions among constructs, thereby reinforcing the robustness of the measurement model (Henseler et al., 2015).

4.3. Results of Model Estimation and Hypothesis Testing

Structural model analysis revealed that the proposed model demonstrated good fit with the empirical data, as all goodness-of-fit indices met internationally accepted benchmarks. This finding supports the theoretical soundness and explanatory power of the research model (Kline, 2016; Hair et al., 2019).

Most hypotheses were supported at statistically significant levels, indicating that technology-based innovative teaching methods positively influence pedagogical effectiveness. Notably, the mediating roles of learning interaction and student engagement were empirically validated, consistent with prior research on technology-enhanced pedagogical mechanisms (Bond et al., 2020; Schindler et al., 2017).

4.4. Key Findings on Pedagogical Effectiveness

The synthesized findings indicate that pedagogical effectiveness is not merely the outcome of technology adoption, but rather the result of an interplay among instructional design, lecturers' digital pedagogical competence, and students' active engagement. This reinforces the view that technology yields pedagogical value only when purposefully embedded in teaching strategies (Kirkwood & Price, 2014; Laurillard, 2012).

Moreover, pedagogical effectiveness was more pronounced in learner-centered environments characterized by interaction, timely feedback, and learner autonomy. This aligns with constructivist learning theories and recent empirical evidence on pedagogical transformation in higher education (OECD, 2019; Redecker, 2017).

5. Discussion

5.1. Interpretation of Research Findings in Comparison with International and Regional Studies

The research findings indicate that technology-enhanced innovative teaching methods and techniques exert a positive and statistically significant impact on pedagogical effectiveness in private higher education institutions in Vietnam. In particular, variables related to the degree of technology integration, digital instructional design, lecturers' technological competence, and students' active engagement demonstrate strong associations with core indicators of pedagogical effectiveness, including learning quality, academic engagement, self-directed learning capacity, and learner satisfaction. These findings suggest that pedagogical effectiveness in the context of digital transformation is not merely a by-product of technology adoption, but rather the outcome of a complex interaction among technology, pedagogy, and institutional context.

When situated within the broader landscape

of international research, these results align closely with studies conducted in developed educational systems, where digital transformation in higher education has reached a relatively mature stage. Research from Europe and North America consistently emphasizes that technology contributes to pedagogical effectiveness only when embedded within learner-centered instructional designs informed by established frameworks such as TPACK, SAMR, and active learning models. The present study reinforces this line of argument while providing empirical evidence that these pedagogical principles remain valid in developing-country contexts, provided they are appropriately contextualized.

In comparison with studies from the Asian region, particularly Southeast Asia, the findings both converge with and diverge from existing evidence. While many regional studies-such as those conducted in Thailand, Indonesia, and the Philippines-highlight technological infrastructure and access as primary determinants of digital teaching effectiveness, this study reveals that in the Vietnamese context, especially within private universities, "soft" factors such as lecturers' digital pedagogical competence, institutional innovation culture, and organizational support play a more decisive role. This suggests that as infrastructural gaps gradually narrow, the quality of pedagogical implementation becomes the key differentiator of educational effectiveness.

Another notable distinction from much of the international literature lies in the mediating role of institutional context. Whereas studies in highly autonomous higher education systems often focus on classroom-level or individual-level factors, the present research demonstrates that in Vietnam, the pedagogical effectiveness of technology-based teaching is strongly shaped by governance policies, digital transformation strategies, and incentive mechanisms at the institutional level. This finding extends existing theoretical models by underscoring the importance of organizational-level dynamics in mediating the relationship between technology use and teaching effectiveness.

Overall, the comparison with international and regional studies indicates that this research not only corroborates widely accepted conclusions in global scholarship but also offers context-sensitive insights. By highlighting the distinctive characteristics of private universities in Vietnam-institutions that operate under market pressures while simultaneously navigating rapid digital transformation-the study contributes a valuable empirical case to the global discourse on pedagogical effectiveness in the digital era.

5.2. Theoretical Implications: Extending and Deepening Technology-Based Teaching Theories in Higher Education

Drawing on the empirical findings, this study offers significant theoretical implications that extend and deepen existing theories of technology-based teaching in higher education. First, the findings suggest that widely adopted theoretical models such as TPACK, SAMR, and active learning frameworks should be reinterpreted within a dynamic relationship with institutional and organizational contexts. In this regard, technology is no longer conceptualized as an isolated or neutral tool, but rather as a socio-pedagogical element that is both shaped by and reshapes teaching practices within higher education institutions.

Another key theoretical contribution lies in elucidating the multi-layered mechanisms through which technology-based teaching influences pedagogical effectiveness. Instead of adopting a linear causal perspective, the study conceptualizes pedagogical effectiveness as the outcome of nonlinear interactions across three interconnected levels:

(i) the micro level, where pedagogical interactions among instructors, learners, and technologies take place;

(ii) the meso level, encompassing curriculum design, institutional innovation culture, and communities of practice; and

(iii) the macro level, including digital transformation strategies, governance structures, and institutional policies. This multi-level perspective addresses the limitations of traditional models that tend to overemphasize individual or classroom-level factors.

Furthermore, the study advances the theoretical conceptualization of "pedagogical effectiveness" in technology-based teaching by reframing it as a multidimensional construct rather than a purely outcome-oriented indicator. Pedagogical effectiveness is understood not only in terms of measurable learning outcomes, but also through learners' cognitive, behavioral, and affective dimensions, such as academic engagement, self-regulated learning capacity, lifelong learning readiness, and meaningful learning experiences. This reconceptualization enriches theoretical discussions on teaching quality in digitally transformed higher education.

A particularly novel theoretical insight concerns the mediating and moderating role of institutional context in technology-based teaching models. The findings demonstrate that the relationship between technology integration and pedagogical effectiveness is not universally uniform, but is strongly contingent upon factors such as institutional autonomy, incentive mechanisms for innovation, and governance capacity. This underscores the need for context-sensitive theoretical frameworks,

especially when examining higher education systems undergoing rapid digital transformation.

Finally, the study contributes theoretically by bridging technology-based teaching theories with organizational and innovation theories in higher education. By integrating these perspectives, the study shifts analytical attention from purely pedagogical dimensions to a systemic level, thereby laying the groundwork for an interdisciplinary theoretical foundation for researching technology-based teaching in the digital era. These contributions not only deepen existing theoretical frameworks but also open up promising avenues for future international research.

5.3. Practical and Managerial Implications

5.3.1. Implications for Leaders of Private Higher Education Institutions

The findings of this study offer important implications for leaders of private higher education institutions in formulating and implementing digital transformation strategies aimed at enhancing pedagogical effectiveness.

First, institutional leaders should recognize that investments in technology cannot be dissociated from investments in human capital and organizational culture. Developing a long-term strategic vision for technology-based teaching-one that prioritizes pedagogical innovation over mere infrastructural modernization-is critical to ensuring the sustainability of digital transformation in private higher education.

Moreover, the study highlights the central role of governance and incentive mechanisms in mediating the impact of technology on teaching effectiveness. University leaders are encouraged to establish internal policies that support pedagogical experimentation, tolerate managed instructional risks, and formally recognize teaching innovation as a core criterion in faculty performance evaluation. This is particularly salient in private universities, which operate under strong competitive pressures related to educational quality and institutional reputation.

In addition, the findings underscore the importance of digital leadership and data-informed decision-making at the managerial level. University administrators should strengthen their capacity to leverage learning analytics and student feedback to continuously refine teaching and learning strategies. Aligning digital transformation initiatives with quality assurance mechanisms can enhance institutional competitiveness while meeting both national and international accreditation standards.

5.3.2. Implications for Faculty Members and Curriculum Design

For faculty members, the study underscores the pivotal role of digital pedagogical competence in translating technological tools into meaningful educational value. Faculty development initiatives should therefore focus not only on technical skills, but also on the pedagogical design of technology-enhanced learning activities that are learner-centered. This involves rethinking instructional structures, integrating interactive learning tasks, formative assessment, and continuous feedback to foster student engagement and self-regulated learning.

With respect to curriculum design, the findings suggest that academic programs should be developed in a flexible, modularized manner that embeds technology at a structural level rather than as an add-on instructional tool. Aligning learning outcomes with digital competencies, self-directed learning skills, and lifelong learning capacities can improve program responsiveness to labor market demands in the digital era. Furthermore, curriculum designers should create space for blended learning, experiential learning, and project-based learning models to maximize the pedagogical potential of technology.

5.3.3. Implications for Higher Education Policy-Making

At the policy level, this study provides empirical evidence to inform the development and refinement of higher education policies in the context of digital transformation. A key implication is that national policies should move beyond infrastructure-centric approaches toward more holistic support for technology-enabled pedagogical innovation. This includes investing in digital pedagogical capacity building for faculty, supporting the development of digital learning ecosystems, and promoting research and innovation in higher education teaching.

The findings also point to the need for flexible policy frameworks that allow private universities to experiment with technology-based educational models while safeguarding educational quality and equity. Designing open regulatory frameworks in conjunction with quality assurance and accreditation systems attuned to digital teaching and learning will enable institutions to exercise autonomy and foster innovation.

Finally, the study suggests that higher education policy-making should adopt a systemic and long-term perspective, positioning digital transformation as an integral component of national human capital development and competitiveness strategies. Aligning education digitalization policies with broader socio-economic development agendas can enhance the role of higher education within the national innovation ecosystem.

6. Conclusion, limitations, and directions for further research

6.1. Conclusion

This study provides a comprehensive and systematic examination of the pedagogical

effectiveness of technology-based innovative teaching methods and techniques in non-public universities in Vietnam amid the accelerating process of digital transformation. By integrating contemporary theoretical perspectives on digital education, pedagogical innovation, and instructional effectiveness, the article not only clarifies the conceptual structure of pedagogical effectiveness but also offers an in-depth analysis of the multidimensional mechanisms through which technology, teaching practices, and student learning outcomes interact in contemporary higher education contexts. In doing so, the study contributes to narrowing a notable research gap concerning non-public higher education institutions in developing countries, particularly Vietnam.

The findings demonstrate that the adoption of technology-based innovative teaching approaches should not be understood merely as a shift in tools or digital platforms, but rather as a fundamental transformation in pedagogical thinking, instructor roles, and knowledge construction processes. When strategically and coherently implemented within appropriate institutional contexts, these approaches exert a significant positive impact on student engagement, self-directed learning capacity, critical thinking skills, and overall learning outcomes. This evidence underscores that pedagogical effectiveness in digital transformation cannot be achieved without a synergistic integration of technology, pedagogical design, and instructors' professional and pedagogical competencies.

Another important contribution of this research lies in highlighting the distinctive role of non-public universities as flexible "experimental spaces" for educational innovation in the digital era. Owing to their relatively agile governance structures, these institutions possess substantial potential to pioneer innovative, personalized, and learner-centered teaching models. Nevertheless, the study also cautions that such potential can only be fully realized through sustained investment in digital infrastructure, systematic faculty development, and the cultivation of an institution-wide culture of innovation.

Overall, the study affirms that the pedagogical effectiveness of technology-based teaching methods constitutes a complex, systemic, and context-dependent construct. Consequently, digital transformation strategies in higher education should not be approached as short-term technical solutions, but rather as long-term pedagogical reforms grounded in strategic vision and closely aligned with the overarching goal of enhancing educational quality. These conclusions offer not only practical implications for policymakers, institutional leaders, and educators in Vietnam, but also valuable insights for other countries with comparable educational contexts seeking effective and sustainable pathways for digital transformation in higher education.

6.2. Limitations of the Study

Despite its theoretical and practical contributions, this study acknowledges several limitations that warrant careful consideration to ensure scientific transparency and objectivity.

First, the research scope is primarily confined to non-public universities in Vietnam, which may constrain the generalizability of the findings to other types of higher education institutions, particularly public universities or higher education systems in different national contexts. Variations in governance structures, resource availability, and organizational cultures may result in different forms and magnitudes of impact of technology-based innovative teaching methods.

Second, although the study endeavored to develop a robust conceptual model and measurement scales grounded in established theoretical frameworks and prior empirical research, the assessment of pedagogical effectiveness relied largely on self-reported data from lecturers and students. This approach is inherently susceptible to subjective bias, perceptual distortions, and social desirability effects. Consequently, the findings should be interpreted with caution, especially when inferring causal relationships among the variables within the proposed model.

Third, the cross-sectional research design, conducted at a single point in time, limits the ability to capture the long-term effects and temporal dynamics of pedagogical effectiveness in the context of digital transformation. Technology-driven pedagogical innovation is often an evolutionary process, shaped by the adaptive capacities of instructors, learners, and institutions. As such, the present study does not fully reflect the developmental trajectories or maturity stages of implementing innovative teaching practices in real-world educational settings. In addition, the study does not comprehensively examine potential mediating and moderating factors, such as institutional innovation culture, academic leadership styles, internal policy support mechanisms, or individual digital competencies of instructors. The absence of these variables may have led to a partial representation of the complex mechanisms through which technology-based innovative teaching methods influence pedagogical effectiveness.

These limitations do not undermine the value of the study; rather, they delineate the boundaries of interpretation and provide a critical foundation for future research. Acknowledging these constraints reflects a cautious and responsible research approach, while reinforcing the notion that pedagogical effectiveness in digital transformation is a multifaceted phenomenon requiring more

nuanced, longitudinal, and multi-level research designs in subsequent studies.

6.3. Directions for Future Research

Building upon the findings and limitations identified in this study, future research should adopt broader, deeper, and more methodologically diverse approaches to further elucidate the nature and mechanisms of pedagogical effectiveness in the context of digital transformation in higher education.

First, subsequent studies are encouraged to extend the scope of investigation to other types of higher education institutions, particularly public universities, research-oriented institutions, and emerging digital university models. Cross-institutional and cross-national comparative studies would enable the validation of the proposed research model and provide deeper insights into how institutional, cultural, and policy contexts shape the effectiveness of technology-based innovative teaching methods.

Second, future research should prioritize longitudinal, quasi-experimental, or experimental research designs to capture temporal changes and to establish stronger causal inferences regarding pedagogical effectiveness. Such designs would facilitate a more nuanced understanding of the adaptive processes through which instructors and students engage with innovative teaching practices, thereby reflecting the dynamic and evolutionary nature of digital transformation in higher education.

Moreover, incorporating mediating and moderating variables represents a critical avenue for advancing theoretical refinement. Factors such as institutional innovation culture, academic leadership styles, internal policy support, organizational digital readiness, and instructors' digital competencies and pedagogical beliefs warrant systematic examination. Multi-level modeling approaches, in particular, hold significant promise for disentangling the complex interactions between individual-, institutional-, and system-level determinants of pedagogical effectiveness.

Future studies may also benefit from adopting mixed-methods designs that integrate large-scale quantitative analyses with in-depth qualitative approaches, including expert interviews, case studies, and classroom-based investigations. Such methodological triangulation would not only enrich the interpretation of statistical findings but also uncover tacit pedagogical practices, contextual nuances, and implementation strategies that are often overlooked in purely quantitative research.

Finally, given the rapid advancement of artificial intelligence, big data analytics, and intelligent learning platforms, future research should pay closer attention to the pedagogical implications of emerging technologies. Exploring how AI can be effectively embedded in pedagogical design, personalized assessment, and instructional decision-making processes offers fertile ground for interdisciplinary research, contributing to the development of more flexible, inclusive, and sustainable higher education models in the digital era.

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HIỆU QUẢ SƯ PHẠM CỦA CÁC PHƯƠNG PHÁP VÀ KỸ THUẬT DẠY HỌC ĐỔI MỚI DỰA TRÊN CÔNG NGHỆ TẠI CÁC TRƯỜNG ĐẠI HỌC NGOÀI CÔNG LẬP Ở VIỆT NAM TRONG BỐI CẢNH CHUYỂN ĐỔI SỐ

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Tóm tắt:

Trong bối cảnh chuyển đổi số đang diễn ra mạnh mẽ trong giáo dục đại học trên toàn cầu, các phương pháp và kỹ thuật dạy học đổi mới dựa trên công nghệ ngày càng được xem là động lực then chốt nhằm nâng cao chất lượng đào tạo và trải nghiệm học tập của người học. Tuy nhiên, hiệu quả sư phạm thực sự của các phương pháp này, đặc biệt tại các trường đại học ngoài công lập ở quốc gia như Việt Nam, vẫn chưa được kiểm chứng đầy đủ bằng các nghiên cứu thực nghiệm có hệ thống. Nghiên cứu này nhằm đánh giá mức độ triển khai và phân tích tác động của các phương pháp và kỹ thuật dạy học đổi mới dựa trên công nghệ đến hiệu quả sư phạm trong giáo dục đại học ngoài công lập ở Việt Nam.

Nghiên cứu sử dụng thiết kế định lượng với dữ liệu thu thập từ sinh viên và giảng viên tại các trường đại học ngoài công lập, thông qua bảng hỏi chuẩn hóa được kế thừa và điều chỉnh từ các nghiên cứu quốc tế. Dữ liệu được phân tích bằng mô hình cấu trúc tuyến tính (SEM/PLS-SEM) nhằm kiểm định mối quan hệ giữa các phương pháp dạy học dựa trên công nghệ, mức độ gắn kết của người học và hiệu quả sư phạm. Kết quả nghiên cứu cho thấy các phương pháp dạy học đổi mới dựa trên công nghệ có tác động tích cực và có ý nghĩa thống kê đến hiệu quả sư phạm, trong đó mức độ tham gia và gắn kết của sinh viên đóng vai trò trung gian quan trọng.

Nghiên cứu đóng góp cả về mặt lý luận và thực tiễn khi làm rõ cơ chế tác động của dạy học dựa trên công nghệ trong bối cảnh đại học ngoài công lập tại một nền kinh tế đang chuyển đổi, đồng thời cung cấp hàm ý quản trị và sư phạm cho quá trình chuyển đổi số giáo dục đại học ở Việt Nam và các quốc gia có bối cảnh tương đồng.

Từ khóa: *Hiệu quả sư phạm; Đổi mới trong giảng dạy; Phương pháp dạy học đổi mới; Dạy học dựa trên công nghệ; Học tập được hỗ trợ bởi công nghệ; Học tập kết hợp và trực tuyến; Phương pháp sư phạm kỹ thuật số; Chuyển đổi số trong giáo dục đại học;Trường đại học ngoài công lập.*

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