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Developing digital competence for general education teachers in the context of educational digital transformation in Vietnam

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Abstract---Digital transformation has fundamentally reshaped educational systems, making digital competence an essential professional requirement for general education teachers. This study aims to analyze the theoretical foundations, international frameworks, current practices, challenges, and development strategies for teachers' digital competence in the context of educational digital transformation in Vietnam. A qualitative research design was employed using literature review, policy analysis, and qualitative content analysis. Secondary data were collected from international organizations, including UNESCO, the European Commission, OECD, and the World Bank, together with Vietnamese policy documents and peer-reviewed studies indexed in Scopus and Web of Science. The findings indicate that digital competence has evolved beyond basic ICT skills to encompass pedagogical integration, digital resource development, assessment, communication and collaboration, cybersecurity, digital ethics, problem-solving, and lifelong learning. Vietnam has established an increasingly favorable policy environment for educational digital transformation; however, disparities in teachers' digital competence, uneven access to professional development, limited pedagogical integration of digital technologies, and insufficient application of artificial intelligence and learning analytics remain significant challenges. Based on the review, the study proposes a comprehensive framework for strengthening teachers' digital competence through coordinated actions involving policymakers,



teacher education institutions, schools, and teachers themselves. The findings provide practical implications for designing sustainable professional development programs and support the implementation of educational digital transformation in Vietnam.

Keywords---digital competence, teacher professional development, educational digital transformation, general education teachers, DigCompEdu, Vietnam.

1. Introduction

Digital transformation has become a strategic priority for education systems worldwide, fundamentally reshaping teaching, learning, assessment, and educational management. Emerging technologies such as artificial intelligence (AI), cloud computing, learning management systems (LMS), big data, and digital learning resources have expanded opportunities for personalized learning, collaborative knowledge construction, and evidence-based educational decision-making. Consequently, digital competence is increasingly recognized as a core professional competency that enables teachers to effectively integrate digital technologies into pedagogical practices and respond to the evolving demands of twenty-first-century education (Carretero et al., 2017; Redecker, 2017).

International organizations have consistently emphasized the importance of developing teachers' digital competence as a prerequisite for achieving quality, equitable, and inclusive education. UNESCO considers digital competence a key component of lifelong learning and sustainable educational development, while the European Commission has established the European Framework for the Digital Competence of Educators (DigCompEdu) to guide teacher professional development in the digital era (Carretero et al., 2017; Redecker, 2017). Recent studies further demonstrate that teachers with higher levels of digital competence are more capable of designing student-centered learning environments, implementing innovative pedagogies, and improving learning outcomes (Lucas et al., 2021; Mattar et al., 2022). Conversely, insufficient digital competence remains one of the major barriers to effective educational digital transformation (Ilomäki et al., 2016).

In Vietnam, educational digital transformation has been promoted through a series of national policies, including the National Digital Transformation Program to 2025 with a vision to 2030 and the digital transformation strategy of the education sector. These policies encourage educational institutions to integrate digital technologies into teaching, learning, assessment, educational administration, and professional development. As a result, teachers are expected not only to possess fundamental digital skills but also to demonstrate the ability to integrate digital technologies pedagogically, develop digital learning resources, ensure cybersecurity and digital ethics, and continuously update their professional competencies to meet the changing educational landscape (OpenGovAsia, 2022).

Despite significant policy support and increasing investment in digital infrastructure, the development of teachers' digital competence in Vietnam still faces numerous challenges. Existing studies indicate disparities in digital competence among teachers due to differences in teaching experience, educational levels, access to digital technologies, institutional support, and opportunities for continuous professional development (Huong et al., 2024; Nguyen et al., 2024). Moreover, while many studies have examined the digital competence of students, university learners, or citizens in general, relatively limited attention has been paid to systematically analyzing the development and professional training of digital competence for general education teachers within the context of Vietnam's ongoing educational digital transformation.

Addressing this research gap, this paper aims to analyze the theoretical foundations of teachers' digital competence, review current policies and practices for developing digital competence among general education teachers in Vietnam, identify existing challenges, and propose recommendations to strengthen teacher professional development in support of sustainable educational digital transformation. The findings are expected to provide useful implications for educational policymakers, teacher education institutions, and school leaders in designing effective digital competence development strategies that align with both international frameworks and Vietnam's educational reform agenda.

2. Literature Review

2.1. Digital Competence

Digital competence has evolved from the traditional concept of information and communication technology (ICT) skills into a comprehensive set of knowledge, skills, attitudes, and ethical values required for individuals to participate effectively in digital society. Early studies primarily associated digital competence with the ability to operate computers and digital devices. However, contemporary research views digital competence as a multidimensional construct that integrates technological, cognitive, pedagogical, communicative, and ethical dimensions (Ilomäki et al., 2016).

One of the most influential frameworks is the European Digital Competence Framework (DigComp), developed by the European Commission. DigComp defines digital competence as the confident, critical, and responsible use of digital technologies for learning, work, and participation in society (Ferrari & Punie, 2013; Carretero et al., 2017). The framework consists of five interconnected competence areas:

Information and data literacy; Communication and collaboration; Digital content creation; Safety; Problem solving.

For educators, the European Commission further introduced the Digital Competence Framework for Educators (DigCompEdu), which extends the DigComp model by emphasizing pedagogical applications of digital technologies. DigCompEdu identifies six professional competence areas, including professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence (Redecker, 2017).

Recent studies have demonstrated that teachers' digital competence is positively associated with instructional quality, innovative teaching practices, and students' learning outcomes (Lucas et al., 2021). Teachers with strong digital competence are more capable of integrating technology into lesson planning, designing interactive learning environments, applying digital assessment methods, and supporting personalized learning (Mattar et al., 2022). Furthermore, digital competence contributes significantly to teachers' lifelong learning, professional adaptability, and resilience in rapidly changing educational environments (Bonfield et al., 2020).

2.2. Professional Development of Digital Competence for Teachers

Professional development refers to continuous learning activities that enhance teachers' professional knowledge, pedagogical skills, and instructional effectiveness throughout their careers. In the digital era, professional development increasingly focuses on strengthening teachers' digital competence to enable meaningful integration of technology into educational practice rather than merely improving technical skills (Redecker, 2017).

Research indicates that effective digital competence development should be viewed as a continuous, school-based, and collaborative process rather than isolated training events. Successful professional development programs generally combine formal training, mentoring, peer collaboration, self-directed learning, and reflective practice (Lucas et al., 2021). These approaches encourage teachers to apply newly acquired competencies directly in classroom contexts and continuously improve their instructional practices.

Several factors influence the effectiveness of digital competence development. Individual characteristics such as age, teaching experience, motivation, self-efficacy, and prior digital knowledge affect teachers' willingness to adopt new technologies (Jiménez-Hernández et al., 2020; Portillo et al., 2020). Institutional factors -including leadership support, digital infrastructure, access to technological resources, school culture, and professional learning communities—also play essential roles in facilitating teachers' digital transformation (Cattaneo et al., 2022; Lucas et al., 2021).

Recent international research further suggests that artificial intelligence, adaptive learning platforms, online professional communities, and micro-credential systems are becoming important tools for supporting teachers' continuous digital competence development. These innovations enable personalized professional learning pathways while increasing flexibility and accessibility for teachers working in diverse educational contexts (Mattar et al., 2022).

2.3. Digital Competence Development for General Education Teachers in Vietnam

Vietnam has made considerable progress in promoting digital transformation within the education sector through comprehensive national strategies and policy initiatives. The Ministry of Education and Training has encouraged schools to integrate digital technologies into curriculum delivery, assessment, educational management, and teacher professional development. Consequently, digital competence has become an essential requirement for general education teachers.

Existing Vietnamese studies reveal encouraging improvements in teachers' awareness and use of digital technologies. Huong et al. (2024) reported that Vietnamese English teachers demonstrated increasing confidence in applying digital technologies during teaching, particularly following the acceleration of digital transformation after the COVID-19 pandemic. Similarly, Nguyen et al. (2024) found that digital competence among Vietnamese citizens has steadily improved, although substantial differences remain across age groups, educational backgrounds, and geographical regions.

Nevertheless, several challenges continue to constrain teachers' digital competence development in Vietnam. Many teachers still encounter difficulties in designing digital learning resources, integrating technology into pedagogy, applying digital assessment methods, utilizing learning analytics, and ensuring cybersecurity and digital ethics. Professional development opportunities also vary considerably among schools and localities due to disparities in infrastructure, financial resources, and institutional support.

Although previous studies have examined specific aspects of digital competence, current research remains fragmented and often focuses on individual technologies or particular educational levels. There is still limited research that comprehensively analyzes teachers' digital competence development by integrating international theoretical frameworks, national educational policies, and practical implementation in Vietnam. Addressing this gap is essential for proposing evidence-based recommendations to support sustainable educational digital transformation.

3. Methodology

3.1. Research Design

This study employed a qualitative research design based on a comprehensive literature review and policy analysis. Rather than collecting primary empirical data, the study synthesized existing theoretical and empirical evidence to examine the current status of digital competence development for general education teachers in Vietnam. A qualitative approach was considered appropriate because the research aimed to interpret policy orientations, identify common themes in previous studies, and propose recommendations for strengthening teacher professional development within the context of educational digital transformation.

3.2. Data Sources

The study relied exclusively on secondary data collected from multiple authoritative sources to ensure comprehensiveness and reliability. The reviewed documents included:

International frameworks and policy documents published by UNESCO, the European Commission, OECD, and the World Bank;

National policies and legal documents issued by the Government of Vietnam and the Ministry of Education and Training concerning digital transformation and teacher professional development;

Peer-reviewed journal articles indexed in Scopus and Web of Science focusing on digital competence, teacher professional development, educational technology, and digital transformation;

Previous empirical studies conducted in Vietnam regarding teachers' digital competence and educational digital transformation.

The combination of international and national sources enabled the study to compare global trends with the Vietnamese educational context.

3.3. Data Collection

Relevant publications were identified through searches in major academic databases, including Scopus, Web of Science, SpringerLink, ScienceDirect, Taylor & Francis, and Google Scholar. Keywords used in the search process included digital competence, teacher digital competence, DigCompEdu, teacher professional development, educational digital transformation, Vietnam, and general education teachers. Publications released primarily between 2017 and 2025 were prioritized to capture recent developments in digital transformation and teacher education.

Documents were selected according to three inclusion criteria:

They addressed digital competence or teacher professional development.

They were published in peer-reviewed journals or issued by reputable international organizations or governmental agencies.

They provided theoretical, empirical, or policy evidence relevant to Vietnam or comparable educational contexts.

Duplicate records and publications lacking academic rigor or direct relevance were excluded from the review.

3.4. Data Analysis

The collected documents were analyzed using qualitative content analysis (Mayring, 2000). The analysis involved four stages:

Document classification, whereby publications were grouped according to research themes, theoretical frameworks, methodologies, and geographical contexts;

Thematic coding, in which recurring concepts related to digital competence, professional development, policy implementation, challenges, and proposed solutions were identified;

Comparative analysis, comparing international frameworks such as DigComp and DigCompEdu with Vietnam's current policies and implementation practices;

Synthesis and interpretation, integrating findings to identify research trends, existing gaps, and policy implications for strengthening teachers' digital competence in Vietnam.

This analytical process enabled the study to construct a comprehensive understanding of the current landscape of teacher digital competence development while identifying priorities for future policy and practice.

3.5. Research Framework

Based on the literature review, the study developed an analytical framework consisting of four interconnected dimensions:

Theoretical foundations of digital competence, including definitions, conceptual frameworks, and international standards;

Policies and implementation practices for developing teachers' digital competence in Vietnam;

Current challenges and influencing factors, including institutional, technological, and individual determinants;

Recommendations for sustainable professional development, emphasizing policy improvement, school leadership, professional learning communities, digital infrastructure, and continuous teacher training.

This framework guided the analysis and organization of the research findings presented in the subsequent sections.

4. Research Results

4.1. International Frameworks for Teachers' Digital Competence

Over the past decade, numerous international organizations have developed digital competence frameworks to guide teacher professional development. Although these frameworks differ in terminology and structure, they share common objectives of enabling teachers to integrate digital technologies effectively into teaching, learning, assessment, and professional collaboration.

Among them, the European Commission's DigCompEdu framework has become one of the most influential references for teacher digital competence. It conceptualizes digital competence as a multidimensional construct encompassing pedagogical, technological, ethical, and professional dimensions rather than merely technical ICT skills (Redecker, 2017). UNESCO has similarly emphasized digital literacy and teacher competency standards as essential components of achieving Sustainable Development Goal 4 and promoting equitable quality education.

Table 1. Comparison of Major International Digital Competence Frameworks for Teachers

Framework	Organization	Main Components	Implications for Teacher Development
DigComp	European Commission	Information literacy; Communication; Content creation; Safety; Problem solving	General digital competence for citizens
DigCompEdu	European Commission	Professional engagement; Digital resources; Teaching and learning; Assessment; Empowering learners; Facilitating learners' digital competence	Comprehensive framework for teacher professional development
ICT Competency Framework for Teachers (ICT-CFT)	UNESCO	Professional understanding; Curriculum and assessment; Pedagogy; ICT application; Organization and administration;	Integration of technology into educational reform

		Teacher professional learning	
OECD Digital Education Perspective	OECD	Digital pedagogy; Digital leadership; Continuous professional learning; Innovation	Whole-school digital transformation

Table 1 demonstrates that recent international frameworks increasingly move beyond technological proficiency toward pedagogical innovation, professional collaboration, digital ethics, and lifelong professional learning. This shift indicates that digital competence is becoming an integral component of teachers' professional competence rather than an isolated technological skill.

4.2. Current Situation of Digital Competence Development for General Education Teachers in Vietnam

Vietnam has accelerated educational digital transformation through a series of national policies promoting digital teaching, online learning, digital educational resources, and school management information systems. Consequently, many schools have invested in digital infrastructure and organized professional development activities for teachers.

Recent studies indicate that Vietnamese teachers have substantially improved their ability to use digital technologies for lesson preparation, online teaching, communication, and classroom management. The COVID-19 pandemic significantly accelerated teachers' adoption of digital platforms and learning management systems (Huong et al., 2024). Nevertheless, the level of digital competence remains uneven among teachers, schools, and localities.

Existing literature identifies several strengths:
 Increasing awareness of digital transformation;
 Wider adoption of learning management systems;
 Greater use of digital teaching resources;
 Improved online collaboration among teachers.
 However, important limitations remain:
 Unequal access to professional development opportunities;
 Limited pedagogical integration of digital technologies;
 Insufficient competence in learning analytics and AI-supported instruction;
 Limited knowledge of cybersecurity, digital citizenship, and data privacy.

Table 2. Current Strengths and Challenges in Developing Teachers' Digital Competence in Vietnam

Strengths	Challenges
Strong national policy support	Uneven digital competence across regions
Increasing digital infrastructure	Limited pedagogical application of technology
Growing availability of online professional development	Inadequate continuous professional development

Strengths	Challenges
Greater experience with online teaching	Limited use of learning analytics and AI
Improved digital resource sharing	Digital safety and ethics remain insufficient

The evidence suggests that Vietnam has established a favorable policy environment for digital transformation; however, strengthening teachers' pedagogical digital competence remains a major priority.

4.3. Factors Influencing Teachers' Digital Competence Development

The reviewed studies consistently indicate that teachers' digital competence is influenced by multiple interrelated factors operating at individual, institutional, and policy levels.

At the individual level, teachers' motivation, self-efficacy, previous digital experience, and willingness to engage in lifelong learning strongly affect competence development. Institutionally, school leadership, digital infrastructure, collaborative culture, and professional learning communities provide essential support for technology integration. At the national level, educational policies, funding mechanisms, and teacher professional standards establish the broader environment for sustainable digital transformation.

These findings suggest that improving teachers' digital competence requires a systemic approach rather than isolated training activities.

4.4. Strategies for Strengthening Digital Competence Development for General Education Teachers in Vietnam

The literature indicates that sustainable development of teachers' digital competence requires a comprehensive approach involving government agencies, teacher education institutions, schools, and teachers themselves. Rather than relying solely on short-term ICT training, professional development should become a continuous process aligned with teachers' professional standards, school improvement, and national digital transformation strategies.

At the policy level, the Ministry of Education and Training should continue refining teacher professional standards by explicitly incorporating digital competence indicators aligned with international frameworks such as DigCompEdu while adapting them to Vietnam's educational context. National policies should also promote equitable access to digital infrastructure, particularly in disadvantaged and rural areas, to reduce regional disparities in teachers' opportunities for professional development.

Teacher education institutions should redesign pre-service and in-service training programs by integrating digital pedagogy, artificial intelligence, digital assessment, learning analytics, cybersecurity, and digital ethics into teacher education curricula. Professional development should emphasize authentic classroom applications rather than technical software training alone.

School leaders play a critical role in creating supportive environments for teachers' continuous professional learning. Schools should establish professional learning communities, encourage peer mentoring, organize collaborative lesson design, and facilitate the sharing of digital teaching resources. School leadership should also promote innovation by recognizing teachers' digital achievements and encouraging experimentation with emerging educational technologies.

At the individual level, teachers should adopt lifelong learning as a professional responsibility. Continuous self-directed learning through MOOCs, online professional communities, webinars, micro-credential programs, and action research enables teachers to update their knowledge and respond effectively to rapid technological change. The growing application of artificial intelligence also requires teachers to develop competencies in selecting, evaluating, and ethically using AI-supported educational tools.

Table 3. Proposed Strategies for Developing Teachers' Digital Competence in Vietnam

Stakeholder	Major Strategies	Expected Outcomes
Ministry of Education and Training	Develop national digital competence standards; integrate digital competence into teacher professional standards; strengthen national policies	Consistent national framework for teacher digital competence development
Provincial Departments of Education	Organize continuous professional development; provide technical support; monitor implementation	Improved regional capacity and reduced disparities
Teacher Education Institutions	Integrate digital pedagogy, AI, digital assessment, cybersecurity, and learning analytics into teacher education programs	Better preparation of pre-service and in-service teachers
Schools	Establish professional learning communities; strengthen instructional leadership; encourage innovation and collaboration	Sustainable school-based professional development
Teachers	Engage in lifelong learning; participate in online professional communities; utilize AI responsibly; continuously improve digital pedagogy	Continuous enhancement of professional digital competence

The proposed strategies emphasize that developing teachers' digital competence should be regarded as a long-term systemic reform rather than isolated technology training. Collaboration among policymakers, educational institutions, school leaders, and teachers is essential for achieving sustainable educational digital transformation.

5. Discussion

The findings demonstrate that digital competence has become one of the fundamental competencies required of teachers in the twenty-first century. Consistent with DigCompEdu and UNESCO's ICT Competency Framework for Teachers, digital competence extends beyond operational ICT skills to encompass pedagogical integration, professional collaboration, digital resource development, assessment, digital ethics, and continuous professional learning (Redecker, 2017; UNESCO, 2018). This multidimensional perspective reflects the transformation of teachers' professional roles from knowledge transmitters to facilitators of technology-enhanced learning.

The Vietnamese context shares many similarities with international trends. Recent educational reforms have significantly accelerated teachers' adoption of digital technologies, particularly following the COVID-19 pandemic. Increased access to learning management systems, online teaching platforms, and digital educational resources has enhanced teachers' confidence in using technology during instruction (Huong et al., 2024). However, the literature also reveals persistent disparities in digital competence across geographical regions, school conditions, and teacher characteristics, indicating that technology access alone does not guarantee meaningful pedagogical transformation.

Another important finding concerns the shift in professional development approaches. Traditional ICT training programs focusing primarily on technical skills are no longer sufficient to prepare teachers for digital transformation. International evidence increasingly supports continuous, collaborative, and practice-based professional learning models that combine formal training, mentoring, professional learning communities, online learning, and reflective practice (Lucas et al., 2021; Mattar et al., 2022). Similar approaches could substantially improve the effectiveness of teacher professional development programs in Vietnam.

The emergence of artificial intelligence presents both opportunities and challenges for teacher professional development. AI-powered educational tools can support lesson planning, assessment, personalized learning, and administrative tasks, thereby improving teaching efficiency. Nevertheless, teachers also require new competencies related to ethical AI use, data privacy, critical evaluation of AI-generated content, and responsible digital citizenship. These competencies are likely to become increasingly important components of future teacher professional standards.

6. Conclusion

Digital transformation is fundamentally reshaping educational systems worldwide, requiring teachers to continuously develop the competencies necessary to effectively integrate digital technologies into teaching, learning, assessment, and professional collaboration. This study reviewed the theoretical foundations, international frameworks, and current practices of digital competence development for general education teachers, with particular attention to the Vietnamese context.

The review indicates that digital competence has evolved from a technology-oriented concept to a comprehensive professional competence encompassing pedagogical knowledge, digital resource management, assessment, communication, collaboration, digital ethics, cybersecurity, problem-solving, and lifelong learning. International frameworks, particularly DigCompEdu and UNESCO's ICT Competency Framework for Teachers, provide valuable references for designing teacher professional development programs and evaluating digital competence systematically.

The findings also reveal that Vietnam has established an increasingly supportive policy environment for educational digital transformation through national digital transformation strategies and educational reform initiatives. Schools have expanded the use of digital technologies, online learning platforms, and digital educational resources, while teachers have demonstrated growing awareness and confidence in applying technology in instructional activities. Nevertheless, significant challenges remain, including disparities in digital competence among teachers and regions, insufficient pedagogical integration of technology, limited application of learning analytics and artificial intelligence, and unequal access to continuous professional development opportunities.

To address these challenges, the study proposes a comprehensive strategy involving multiple stakeholders. National authorities should establish coherent digital competence standards aligned with international frameworks while considering Vietnam's educational context. Teacher education institutions should redesign pre-service and in-service training programs by integrating digital pedagogy, artificial intelligence, digital assessment, cybersecurity, and data literacy. Schools should strengthen instructional leadership, establish professional learning communities, and promote collaborative professional development. Meanwhile, teachers themselves should actively engage in lifelong learning and continuously update their professional competencies to adapt to rapidly evolving digital technologies.

Although this study provides a comprehensive synthesis of existing literature and policy documents, it is limited by its reliance on secondary data. Future research should employ large-scale empirical investigations to assess teachers' digital competence across different educational levels and regions of Vietnam. Longitudinal studies examining the effectiveness of various professional development models and the educational applications of artificial intelligence would also provide valuable evidence for policymaking and educational practice.

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