

Understanding the Evolution of Teaching Style Through Techno-Pedagogical Competence: Exploring Teachers' Professional Practice in Digital Learning Environments

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ABSTRACT

The increasing integration of digital technologies into education has significantly transformed teachers' instructional practices and professional responsibilities. In this changing educational landscape, techno-pedagogical competence has become a key factor influencing the evolution of teaching style. This study explores how teachers' teaching styles have evolved through the development of techno-pedagogical competence in digital learning environments. A qualitative systematic literature review was employed using secondary data collected from peer-reviewed journal articles, scholarly books, and international reports published between 2020 and 2026. The reviewed literature indicates that teaching style has shifted from a teacher-centred approach to a more learner-centred, technology-supported, and collaborative model. The findings further suggest that teachers with stronger techno-pedagogical competence demonstrate greater instructional flexibility, improved classroom interaction, and enhanced professional confidence. However, challenges such as limited technological infrastructure, insufficient professional development, and unequal access to digital resources continue to affect effective technology integration. The study highlights the importance of continuous professional learning and institutional support in strengthening teachers' professional practice. It concludes that techno-pedagogical competence is not only a technological requirement but also a professional capability that shapes the continuous evolution of teaching style in contemporary education. The findings provide useful implications for teacher educators, school leaders, and policymakers seeking to improve the quality of teaching in digital learning environments.

Keywords: Teaching Style, Techno-Pedagogical Competence, Digital Learning, Professional Practice, Teacher Education, Technology Integration.

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INTRODUCTION

Digital transformation has become one of the most influential forces shaping contemporary education. The rapid advancement of educational technologies, online learning platforms, artificial intelligence, and interactive digital resources has fundamentally changed the ways teachers plan lessons, deliver instruction, assess learning, and interact with students. As a result, effective teaching now requires more than strong subject knowledge; it also demands the ability to integrate technology with appropriate pedagogical strategies to create meaningful learning experiences. Teaching style has traditionally been viewed as a

relatively stable pattern of instructional behaviour influenced by teachers' beliefs, experience, personality, and classroom practices. However, the expansion of digital learning environments has challenged this traditional perspective. Modern teachers are expected to adapt their instructional approaches to meet the diverse learning needs of digitally connected students. Consequently, teaching style is increasingly understood as a dynamic professional practice that evolves through continuous learning, technological adaptation, and pedagogical innovation.

In this context, techno-pedagogical competence has emerged as an essential component of teacher professionalism. It refers to teachers' ability to integrate technological knowledge with pedagogical approaches

and subject expertise to enhance teaching and learning. Rather than focusing solely on technical skills, techno-pedagogical competence emphasizes the effective use of digital tools to promote student engagement, collaboration, creativity, critical thinking, and meaningful learning.

The transformation of teaching style is closely associated with teachers' professional practice. Digital technologies have expanded teachers' responsibilities beyond classroom instruction to include digital content creation, online communication, technology-supported assessment, collaborative learning facilitation, and continuous professional development. These evolving responsibilities require teachers to become flexible, reflective, and innovative practitioners capable of responding to rapidly changing educational demands. Although numerous studies have investigated digital competence, technology integration, and online teaching, limited attention has been given to understanding how techno-pedagogical competence contributes to the evolution of teaching style through teachers' professional practice. Existing research often examines these concepts independently rather than exploring their interconnected relationship within digital learning environments. Therefore, a comprehensive qualitative synthesis of recent literature is needed to explain how teachers' instructional practices evolve in response to technological and pedagogical developments.

The present study addresses this need by reviewing recent scholarly literature to examine the relationship between techno-pedagogical competence and the evolution of teaching style. By integrating contemporary theoretical perspectives and empirical evidence, the study seeks to provide a clearer understanding of how digital competence reshapes teachers' professional practice and supports effective teaching in the twenty-first century.

2. Review of Literature

Trust and Whalen (2020) reported that teachers' ability to integrate digital technologies became essential for maintaining effective instruction during the transition to online learning. The study emphasized that techno-pedagogical competence enhances instructional adaptability and teacher confidence.

König et al. (2020) found that teachers with higher digital competence adapted more successfully to online teaching, highlighting the importance of prior technological experience and pedagogical preparedness.

Tondeur et al. (2021) concluded that continuous professional development is a key factor in strengthening teachers' techno-pedagogical competence and encouraging innovative teaching practices.

Cabero-Almenara et al. (2022) found that techno-pedagogical competence positively influences

instructional innovation, digital assessment, and student engagement. Teachers with stronger TPACK competencies were more successful in creating interactive and meaningful learning experiences.

Sijali and Poudel. (2025) conducted a systematic literature review and concluded that the techno-pedagogical approach enhances learning effectiveness, digital literacy, and learner engagement. They emphasized integrating techno-pedagogy into everyday classroom practice.

Jana and Chattopadhyay (2026) identified techno-pedagogical competence as a core professional capability for educators in the digital age. Their study emphasized that institutional support, collaborative professional learning, and continuous training significantly enhance teachers' professional practice and instructional innovation.

Deb (2026) reviewed two decades of TPACK research and concluded that integrated technological, pedagogical, and content knowledge enables teachers to design more flexible, learner-centred, and technology-supported teaching practices. The review further highlighted collaborative learning and design-based approaches as effective strategies for developing techno-pedagogical competence.

3. Research Gap

Although previous studies have extensively examined digital competence, technology integration, TPACK, and teachers' professional development, these variables have largely been investigated independently. Limited research has specifically explored how techno-pedagogical competence contributes to the evolution of teaching style through teachers' professional practice using a qualitative systematic literature review. Moreover, there is insufficient synthesis of recent evidence (2020–2026) that integrates these constructs within a single conceptual perspective. Therefore, the present study addresses this gap by providing a comprehensive qualitative synthesis of contemporary literature to explain the evolving relationship between techno-pedagogical competence and teaching style in digital learning environments.

4. Research Objectives

The study aims to:

1. Examine the role of techno-pedagogical competence in the evolution of teaching style.
2. Explore how digital learning environments influence teachers' professional practice.
3. Identify key themes emerging from recent literature related to techno-pedagogical competence and teaching style.
4. Develop a conceptual understanding of the relationship between techno-pedagogical competence and the evolution of teaching style.

5. Research Questions

The study addresses the following research questions:

RQ1: How has teaching style evolved in digital learning environments?

RQ2: What role does techno-pedagogical competence play in teachers' professional practice?

RQ3: What themes emerge from recent literature regarding the relationship between techno-pedagogical competence and teaching style?

RQ4: How does techno-pedagogical competence contribute to the continuous evolution of teaching style in contemporary education?

6. Theoretical Framework

This study is grounded in two complementary theoretical perspectives: the Technological Pedagogical Content Knowledge (TPACK) Framework and Constructivist Learning Theory. These theories provide a conceptual basis for understanding how teachers integrate technology into pedagogical practice and how this integration contributes to the evolution of teaching style.

6.1 Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework, proposed by Mishra and Koehler (2006), explains that effective teaching requires the integration of Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). Rather than viewing technology as an isolated skill, the framework emphasizes its meaningful integration with pedagogy and subject content to enhance learning.

In digital learning environments, teachers are expected to select appropriate technological tools, design interactive learning activities, facilitate collaboration, and conduct technology-supported assessments. These responsibilities require teachers to develop techno-pedagogical competence that extends beyond technical proficiency.

Within this study, TPACK provides the primary theoretical lens for explaining how teachers gradually modify their instructional practices and develop more flexible, learner-centred teaching styles.

Key Components of TPACK

- **Content Knowledge (CK):** Understanding of the subject being taught.
- **Pedagogical Knowledge (PK):** Knowledge of instructional methods and classroom management.
- **Technological Knowledge (TK):** Ability to use digital technologies effectively.
- **Technological Pedagogical Knowledge (TPK):** Integration of technology with teaching strategies.
- **Technological Content Knowledge (TCK):** Appropriate use of technology to represent subject content.
- **Technological Pedagogical Content Knowledge (TPACK):** Balanced integration

of technology, pedagogy, and content for effective teaching.

The interaction among these components enables teachers to redesign instructional practices according to students' learning needs and technological opportunities.

6.2 Constructivist Learning Theory

Constructivist Learning Theory argues that learners actively construct knowledge through experience, interaction, and reflection. Learning becomes more meaningful when students participate in collaborative activities, problem-solving, and authentic learning situations.

Digital technologies support constructivist learning by enabling discussion forums, collaborative projects, multimedia resources, simulations, and interactive assessments. Consequently, teachers shift from being knowledge transmitters to learning facilitators.

From this perspective, techno-pedagogical competence allows teachers to create learning environments where students actively engage in knowledge construction, thereby contributing to the evolution of teaching style.

6.3 Theoretical Proposition

Based on these theoretical perspectives, the study proposes that:

Higher levels of techno-pedagogical competence encourage the evolution of teaching style by enabling teachers to adopt learner-centred instructional practices, integrate digital technologies effectively, and continuously improve their professional practice.

7. Methodology

7.1 Research Design

This study adopts a qualitative systematic literature review (SLR) design to explore the evolution of teaching style through techno-pedagogical competence in digital learning environments. The systematic literature review method was selected because it enables a comprehensive synthesis and critical interpretation of existing scholarly evidence without collecting primary data. The study focuses on identifying, analysing, and integrating previous research to develop a conceptual understanding of how techno-pedagogical competence influences teachers' professional practice and teaching style.

7.2 Research Approach

The study follows an interpretivist qualitative research approach, which aims to understand and interpret patterns, concepts, and relationships emerging from existing literature. Instead of testing hypotheses, this approach seeks to explain how teachers' instructional practices have evolved within digital learning environments. It provides an in-depth understanding of the phenomenon by synthesizing findings from previous studies and identifying common themes across the literature.

7.3 Data Source

The study is based entirely on secondary data. Relevant

literature was obtained from peer-reviewed journal articles, scholarly books, book chapters, conference proceedings, and reports published by recognized educational organizations. To ensure the relevance and quality of the review, priority was given to studies indexed in Scopus, Web of Science, ERIC, ScienceDirect, and SpringerLink. The review primarily includes publications published between 2020 and 2026, reflecting recent developments in digital education and techno-pedagogical competence.

7.4 Data Collection

Data were collected through a systematic review of published literature. Relevant studies were identified using keywords such as Teaching Style, Techno-Pedagogical Competence, Digital Learning, Technology Integration, Teacher Professional Practice, and TPACK. Boolean operators (AND and OR) were used to refine the search process. The selected studies were screened based on their relevance to the research objectives, publication quality, and methodological rigor. Only English-language, peer-reviewed publications focusing on teachers and technology integration were included in the final review.

7.5 Data Analysis

The collected literature was analysed using thematic analysis. Initially, all selected studies were carefully reviewed to identify recurring concepts related to teaching style and techno-pedagogical competence. Similar concepts were coded and grouped into broader themes. The themes were then interpreted to explain how techno-pedagogical competence contributes to the evolution of teaching style and teachers' professional practice in digital learning environments. This analytical process enabled the development of a coherent conceptual understanding based on the synthesized evidence.

8. Findings

The thematic analysis of the selected literature revealed four interrelated themes that explain how techno-pedagogical competence contributes to the evolution of teaching style in digital learning environments. The findings indicate that teaching style is not a fixed professional characteristic but a dynamic process shaped by technological integration, continuous learning, and institutional support.

Theme 1: Teaching Style as an Evolving Professional Practice

The reviewed studies consistently demonstrate that teaching style has evolved from traditional teacher-centred instruction to learner-centred and technology-supported practices. Digital technologies have encouraged teachers to redesign classroom activities, promote collaborative learning, and create interactive learning experiences. Rather than functioning as the primary source of knowledge, teachers increasingly act as facilitators who guide students in constructing knowledge through discussion, inquiry, and digital

collaboration.

This transformation suggests that teaching style is continuously reconstructed in response to technological innovation and changing educational expectations.

Theme 2: Techno-Pedagogical Competence Strengthens Professional Practice

The findings indicate that techno-pedagogical competence significantly enhances teachers' professional practice. Teachers who effectively integrate technology with pedagogy demonstrate greater confidence in instructional planning, classroom management, digital assessment, and learner engagement.

The literature further suggests that techno-pedagogical competence enables teachers to make informed instructional decisions rather than simply using digital tools. Consequently, professional practice becomes more adaptive, reflective, and responsive to students' diverse learning needs.

Theme 3: Continuous Professional Learning Supports Pedagogical Transformation

Another prominent finding is the importance of continuous professional learning in the development of teaching style. Teachers who regularly participate in workshops, online training programmes, professional learning communities, and self-directed learning opportunities are more likely to adopt innovative instructional practices.

The reviewed studies indicate that reflective practice encourages teachers to evaluate their instructional approaches, modify teaching strategies, and integrate emerging technologies more effectively. Therefore, professional learning serves as a key mechanism through which techno-pedagogical competence continues to develop over time.

Theme 4: Institutional Support Facilitates Technology Integration

The analysis highlights that institutional support plays a significant role in developing teachers' techno-pedagogical competence. Educational institutions that provide reliable digital infrastructure, technical assistance, leadership support, and regular training create favourable conditions for pedagogical innovation.

Conversely, limited technological resources, inadequate institutional support, and insufficient professional development opportunities often restrict teachers' ability to transform their instructional practices. The findings therefore suggest that successful technology integration depends upon both individual competence and organizational support.

Theme 5: Challenges Influence the Pace of Teaching Style Evolution

Despite the growing importance of digital education, several barriers continue to influence the development of techno-pedagogical competence. The literature identifies inadequate technological infrastructure,

limited institutional support, insufficient professional training, and unequal access to digital resources as the most common challenges.

These barriers do not necessarily prevent pedagogical innovation but often slow teachers' ability to adopt technology effectively. The findings therefore suggest that sustainable improvement requires both individual commitment and institutional investment in digital education.

9. Discussion

The findings of this review demonstrate that techno-pedagogical competence is a central driver of teaching style evolution in contemporary education. The transition from teacher-centred instruction to learner-centred pedagogy reflects broader changes in educational philosophy, where technology is integrated to enhance learning rather than simply deliver content. The review also highlights that effective technology integration depends on teachers' ability to combine technological knowledge with sound pedagogical strategies. This finding supports the TPACK framework, which emphasizes the integration of technological, pedagogical, and content knowledge as the foundation of effective teaching. Teachers who possess this integrated knowledge are more capable of designing engaging and meaningful learning experiences.

Furthermore, the findings align with Constructivist Learning Theory, which views learning as an active process supported by interaction, collaboration, and reflection. Digital learning environments provide opportunities for implementing constructivist teaching practices through collaborative activities, technology-supported assessment, and student participation.

Overall, the reviewed literature suggests that the evolution of teaching style is a continuous professional process rather than a one-time instructional change. Strengthening techno-pedagogical competence through professional development, institutional support, and reflective practice can help teachers respond more effectively to the demands of digital education while improving the quality of teaching and learning.

10. Educational Implications

The findings have important implications for teacher education and educational practice.

- First, teacher education programmes should integrate techno-pedagogical competence throughout pre-service and in-service training to prepare teachers for digital learning environments.
- Second, schools and higher education institutions should provide continuous professional development opportunities that focus on both pedagogical innovation and technology integration.

- Third, educational leaders should establish supportive institutional environments by ensuring access to digital infrastructure, technical support, and collaborative professional learning opportunities.
- Finally, policymakers should incorporate techno-pedagogical competence into teacher competency frameworks and professional standards to strengthen teaching quality and promote sustainable digital education.

11. Limitations of the study

This study is based exclusively on secondary data obtained through a qualitative systematic literature review. Consequently, the findings depend on the scope and quality of existing research and do not include primary empirical evidence from teachers.

Future research may employ qualitative interviews, classroom observations, or mixed-method designs to examine how techno-pedagogical competence influences teaching style across different educational contexts. Comparative studies involving teachers from different countries and educational levels may also provide deeper insights into the evolving nature of professional teaching practice.

Conclusion

The present study explored the evolution of teaching style through techno-pedagogical competence by synthesizing recent literature on teachers' professional practice in digital learning environments. The review demonstrates that teaching style has evolved from traditional teacher-centred instruction to learner-centred, technology-supported, and collaborative pedagogical practices. This transformation reflects the increasing need for teachers to integrate technological knowledge with pedagogical expertise in response to changing educational contexts.

The findings further reveal that techno-pedagogical competence extends beyond the effective use of digital tools. It represents a comprehensive professional capability that enables teachers to design meaningful learning experiences, enhance student engagement, and respond flexibly to diverse learning needs. Teachers who continuously develop their techno-pedagogical competence are better positioned to adopt innovative instructional strategies and improve the quality of teaching.

The study also highlights the importance of continuous professional development and institutional support in promoting effective technology integration. Regular training opportunities, collaborative learning communities, and access to digital resources contribute significantly to the development of teachers' professional competence. At the same time, challenges such as inadequate infrastructure and unequal access to technology continue to influence the pace of pedagogical transformation.

Overall, the study concludes that techno-pedagogical competence is a key factor in the continuous evolution of teaching style and should be considered an essential component of teacher professionalism in contemporary education.

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