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Review Article

An Empirical Overview of E-TPACK (Ethical Technological Pedagogical Content Knowledge) in Modern Education

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Abstract

The integration of ethics into technological pedagogical content knowledge (TPACK) has emerged as a critical framework in modern education, addressing the growing need for educators to navigate the ethical dimensions of technology-enhanced teaching. This paper examines the concept of Ethical Technological Pedagogical Content Knowledge (E-TPACK), focusing on its conceptual foundations, the development of assessment tools, and its implications for pre-service teacher education. We analyse existing scholarly works to identify key themes and gaps in the literature, thereby providing a comprehensive understanding of how E-TPACK is defined, measured, and applied in educational contexts. The review adopts a rigorous methodology, systematically synthesising peer-reviewed studies to trace the evolution of E-TPACK and its theoretical underpinnings. Findings reveal that E-TPACK is increasingly recognised as a vital competency for educators, yet its operationalisation remains inconsistent across studies, with limited attention to scalable assessment instruments. The paper highlights the significance of E-TPACK in preparing pre-service teachers to address ethical challenges in digitally mediated classrooms, though empirical evidence on its practical implementation is still nascent. We conclude by identifying directions for future research, emphasising the need for standardised frameworks and longitudinal studies to evaluate the long-term impact of E-TPACK on teaching practices. This paper contributes to the ongoing discourse on teacher education by consolidating dispersed knowledge and proposing actionable insights for policymakers and educators.

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INTRODUCTION

The rapid integration of digital technologies into education has transformed pedagogical practices, necessitating a re-evaluation of the competencies required for effective teaching. Technological Pedagogical Content Knowledge (TPACK), introduced by Mishra and Koehler (2006), has long served as a foundational framework for understanding how teachers integrate technology, pedagogy, and subject matter. However, as technology becomes increasingly pervasive in classrooms, ethical considerations—such as data privacy, algorithmic bias, and digital equity have emerged as critical yet underexplored dimensions of teacher knowledge (Moore and Ellsworth, 2013). This gap underscores the need for an expanded framework that explicitly incorporates ethical reasoning into TPACK, leading to the conceptualisation of Ethical Technological Pedagogical Content Knowledge (E-TPACK).

The background of E-TPACK is rooted in the intersection of technological advancements and the moral responsibilities of educators. While TPACK emphasises the interplay between technology, pedagogy, and content, it does not systematically address the ethical dilemmas inherent in technology-mediated learning environments (Foulger et al., 2016). For instance, the use of learning analytics raises questions about student surveillance, while AI-driven tools may inadvertently perpetuate biases in assessment (Khan, 2024). These challenges highlight the urgency of equipping teachers with the ethical knowledge to navigate complex digital landscapes. Moreover, global initiatives, such as UNESCO's emphasis on digital citizenship, further reinforce the importance of ethical considerations in education. Despite growing recognition of ethics in educational technology, significant research gaps persist. First, the conceptual boundaries of E-TPACK remain ambiguous, with varying definitions across studies (Gomez-Trigueros, 2025). Second, while some scholars have proposed assessment instruments for E-TPACK, these tools often lack empirical validation or scalability (Schmidt et al., 2009). Third, the practical application of E-TPACK in pre-service teacher education is underexplored, leaving unanswered questions about how to cultivate this competency effectively (Maxwell et al., 2016). These gaps hinder the development of a cohesive framework that can guide policy and practice. The motivation for this study lies in addressing these gaps by synthesising existing literature to clarify the concept of E-TPACK, evaluate its measurement tools, and assess its implications for teacher education. By doing so, this study contributes to the broader discourse on teacher competencies in the digital age, offering insights that can inform curriculum design, professional development, and policy formulation. The significance of this work extends beyond academia, as it has practical relevance for educators, administrators, and policymakers striving to foster ethically grounded technology integration in schools.

Motivation Grounded for the study

The E-TPACK represents an emerging field of inquiry, gaining rapid traction as educators and researchers grapple with the ethical complexities of technology integration in classrooms. The simultaneous focus on conceptual definitions, assessment instruments, and applications for teachers across all studies indicates a holistic approach to understanding E-TPACK, rather than fragmented explorations of isolated components. The uniformity in this concept presents both opportunities and challenges for the field. On one hand, it demonstrates contemporary relevance and suggests that E-TPACK is being examined through modern pedagogical and technological lenses. Again, the lack of longitudinal data makes it difficult to trace conceptual evolution or assess the maturation of theoretical frameworks. The absence of research studies may reflect either the novelty of E-TPACK as a distinct construct or the recent recognition of ethics as a critical dimension of technological pedagogical knowledge. The present research paper is structured around various interconnected dimensions to systematically analyse E-TPACK. The first dimension explores the conceptual foundations of E-TPACK, interrogating how scholars define and theorise this construct in relation to TPACK and broader ethical frameworks. The second dimension examines the development and validation of E-TPACK assessment instruments, focusing on their methodological rigour and applicability in diverse educational contexts. The third dimension investigates the role of E-TPACK in pre-service teacher education, evaluating its pedagogical implications and practical outcomes. Together, these dimensions provide a holistic understanding of E-TPACK's theoretical and empirical landscape.

This temporal clustering suggests that E-TPACK represents an emerging field of inquiry, gaining rapid traction as educators and researchers grapple with the ethical complexities of technology integration in classrooms. The simultaneous focus on conceptual definitions, assessment instruments, and applications for pre-service teachers across all studies indicates a holistic approach to understanding E-TPACK, rather than fragmented explorations of isolated components. The uniformity in this concept presents both opportunities and challenges for the field. On one hand, it demonstrates contemporary relevance and suggests that E-TPACK is being examined through modern pedagogical and technological lenses. On the other hand, the lack of longitudinal data makes it difficult to trace conceptual evolution or assess the maturation of theoretical frameworks. The absence of studies in this area may reflect either the novelty of E-TPACK as a distinct construct or the recent recognition of ethics as a critical dimension of technological pedagogical knowledge.

Conceptual Foundations of E-TPACK Framework

The conceptualisation of Ethical Technological Pedagogical Content Knowledge (E-TPACK) emerges as a critical extension of the TPACK framework, addressing the ethical dimensions of technology integration in education. The included studies collectively position E-TPACK as an interdisciplinary construct that bridges technological proficiency, pedagogical expertise, content mastery, and ethical reasoning. This synthesis reveals three dominant perspectives in defining E-TPACK as an integrated component of TPACK, as a standalone ethical

framework, and as a context-specific competency for digital learning environments.

The E-TPACK is an expansion of the TPACK model, arguing that ethical considerations should permeate all domains of technological pedagogical content knowledge rather than exist as a separate component. For instance, (Deng and Zhang, 2023) propose an "ethical infusion" model where moral reasoning becomes an inherent dimension of technological decision-making in teaching practices. This perspective emphasises the situated nature of ethical challenges, suggesting they cannot be addressed through standalone modules but must be integrated throughout teacher preparation programs. Contrasting views emerge from studies that position E-TPACK as a distinct knowledge domain. It develops a parallel framework where ethical knowledge interacts with but remains separate from technological, pedagogical, and content knowledge. This approach allows for explicit attention to moral philosophy and normative theories in teacher education, particularly regarding dilemmas involving student data privacy and surveillance technologies. It further differentiates E-TPACK by grounding it in critical pedagogy, framing ethical knowledge as a means to challenge systemic inequities perpetuated by educational technologies. Notably, a practice-oriented definition of E-TPACK, focusing on its manifestation in classroom contexts, conceptualises E-TPACK as "the ability to recognise and resolve ethical tensions that emerge during technology-mediated instruction," emphasising decision-making processes over theoretical knowledge. The divergence in these conceptualisations reflects ongoing debates about whether E-TPACK should be theorised as a cognitive framework, a moral orientation, or a set of situated practices.

Furthermore, the development of assessment instruments for Ethical Technological Pedagogical Content Knowledge (E-TPACK) has followed diverse methodological approaches, reflecting the multifaceted nature of the construct. These approaches often overlap in practice, with many studies employing multiple validation techniques to ensure instrument robustness. Again, different research teams have addressed the challenge of measuring this complex knowledge domain, with particular attention to balancing theoretical rigour and practical applicability. Deng and Zhang (2023) created a 35-item Likert-scale questionnaire that maps ethical considerations onto Mishra and Koehler's seven TPACK domains, while others developed a scenario-based assessment that evaluates teachers' ethical reasoning in technology-integrated lesson planning. These instruments demonstrate strong content validity but face challenges in distinguishing between ethical knowledge and general TPACK competencies. Notably, a novel approach by integrating privacy impact assessments into E-TPACK evaluation creates an instrument that measures both knowledge and practical implementation of ethical principles. This highlights the growing recognition of assessment instruments as not merely measurement tools but also as professional development resources that can shape ethical teaching practices. The diversity of these development approaches underscores the evolving nature of E-TPACK assessment while revealing persistent challenges in establishing cross-contextual validity and reliability.

Significance and Application of the E-TPACK Framework for Pre-Service Teachers

The integration of the E-TPACK framework into teacher education programs has demonstrated substantial potential for fostering ethical awareness and decision-making among pre-service teachers. It serves not only as evaluative measures but also as pedagogical instruments that scaffold the development of ethical competencies in technology-enhanced learning environments. The application of E-TPACK assessments aligns with broader efforts to prepare educators for the complex moral landscapes of digital classrooms, where issues such as data privacy, algorithmic bias, and digital equity require a nuanced understanding and proactive engagement. Furthermore, it also serves dual purposes: they diagnose gaps in ethical awareness while simultaneously shaping curriculum design to address emerging challenges in digital pedagogy. Maxwell et al.'s (2016) studies demonstrate that systematic assessment of E-TPACK enables teacher educators to move beyond generic digital literacy training toward targeted interventions that foster ethical decision-making capabilities.

A comprehensive analysis of E-TPACK assessment applications across pre-service teacher education contexts must be conducted, along with their implementation focus and methodological approach. Again, implementation challenges persist, particularly regarding assessment scalability and cultural contextualization. While scenario-based and reflexive methods show strong validity evidence, their resource-intensive nature limits adoption in large teacher education programs. Additionally, most existing E-TPACK tools originate from Western educational contexts, raising questions about their applicability across diverse cultural frameworks for ethical decision-making. These gaps point to critical areas for future instrument refinement and validation studies.

DISCUSSION

The synthesis of findings across the studies reveals several critical insights about Ethical Technological Pedagogical Content Knowledge (E-TPACK) as an emerging framework in teacher education. Taken together, the literature consistently positions E-TPACK as an essential expansion of the TPACK model, addressing the ethical voids left by its technological and pedagogical dimensions. This integration is not merely additive but transformative, requiring educators to engage with ethical reasoning as a foundational component of technology-mediated instruction rather than an afterthought. The conceptualisations of E-TPACK, while varied, converge on its role in fostering digital citizenship, equitable access, and responsible data practices—themes that emerge as non-negotiable in contemporary education. Theoretical implications of this synthesis suggest that E-TPACK challenges traditional boundaries between technical proficiency and moral pedagogy. This aligns with broader discourses in educational technology that critique the apolitical deployment of digital tools (Foulger

et al., 2016). However, contradictions arise in operationalising E-TPACK, particularly in studies advocating for embedded ethics (Deng and Zhang, 2023). These divergences may reflect disciplinary differences rather than fundamental incompatibilities, signalling opportunities for interdisciplinary dialogue. Practically, the findings underscore actionable strategies for teacher educators.

For policymakers, this implies a need to revise accreditation standards to mandate ethics-infused technology training, ensuring pre-service teachers graduate with competencies to navigate dilemmas like algorithmic bias or student surveillance (Khan, 2024). Schools and districts might leverage validated assessment instruments not only for evaluation but also as professional development tools, creating feedback loops that reinforce ethical growth. Methodological limitations of this review warrant consideration. The exclusive focus on English-language publications may overlook culturally situated ethical frameworks developing in non-Anglophone contexts (Frau-Meigs et al., 2017). Additionally, the concentration of studies in 2023, while indicative of the framework's novelty, limits longitudinal analysis of E-TPACK 's evolution or lasting impact. The predominance of theoretical and small-scale empirical works also raises questions about generalizability, particularly regarding the transfer of assessed competencies to classroom practice. These constraints suggest that current findings represent an initial rather than definitive understanding of E-TPACK.

Future research should prioritise longitudinal studies tracking how E-TPACK training influences teaching practices over time, especially in under-researched contexts like vocational or non-formal education. There is a critical need for cross-cultural validations of assessment tools to ensure their relevance across diverse educational systems. Another understudied area involves the role of technology designers in E-TPACK—how collaborations between educators and developers might co-create ethically grounded tools rather than positioning teachers as solely responsible for ethical adaptation. Finally, experimental studies comparing embedded versus standalone E-TPACK approaches could resolve current tensions in conceptualisation, providing evidence-based guidance for curriculum design. The collective evidence positions E-TPACK not as a peripheral competency but as a central pillar of 21st-century teacher preparation- Its integration signals a paradigm shift from viewing ethics as a constraint on technological innovation to recognising it as the very foundation of pedagogically sound and socially just technology use. While challenges in measurement and implementation persist, the consistency of ethical concerns across studies—from data privacy to equity—affirms their urgency in shaping the future of education.

CONCLUSION

This systematic review has examined the emerging framework of Ethical Technological Pedagogical Content Knowledge (E-TPACK), synthesising its conceptual foundations, assessment methodologies, and implications for pre-service teacher education. The findings underscore that E-TPACK represents a critical expansion of the TPACK model, addressing ethical dimensions that are increasingly vital in technology-mediated learning environments. While the reviewed studies demonstrate consensus on the importance of integrating ethical reasoning into teacher education, they also reveal significant variations in how E-TPACK is defined and operationalised. The theoretical contributions of this review highlight the need for a more cohesive framework that bridges disciplinary perspectives, ensuring that ethical considerations are not treated as an afterthought but as a fundamental aspect of technological and pedagogical decision-making. Practically, the synthesis suggests that case-based and reflective approaches show promise in cultivating ethical awareness among pre-service teachers, though scalable implementation remains a challenge. Future research should prioritise longitudinal studies to assess the long-term impact of E-TPACK training, as well as cross-cultural validations of assessment tools to ensure their applicability across diverse educational contexts. Additionally, interdisciplinary collaborations between educators, ethicists, and technology designers could further refine the framework, fostering ethically grounded innovations in pedagogy. By consolidating these insights, this review provides a foundation for advancing both scholarship and practice in teacher education, ensuring that ethical considerations remain central to the evolving landscape of technology integration.

REFERENCES

1. Mishra P, Koehler MJ. Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*. 2006;108(6):1017–1054.
2. Moore SL, Ellsworth JB. Ethics of educational technology. In: Spector JM, Merrill MD, Elen J, Bishop MJ, editors. *Handbook of research on educational communications and technology*. New York (NY): Springer; 2013. p. 113–127.
3. Foulger TS, Wetzel K, Lindsey L, Buss R, Pasquel S. Using TPACK as a professional development framework: Benefits, limitations, and exploration of other possible frames. In: *Proceedings of the Society for Information Technology & Teacher Education International Conference*; 2016 Mar; Savannah, GA. Chesapeake (VA): Association for the Advancement of Computing in Education (AACE); 2016. p. 2842–2849.
4. Khan WN. Ethical challenges of AI in education: Balancing innovation with data privacy. *AI EDIFY Journal*. 2024;1(1):1–13.
5. Frau-Meigs D, O'Neill B, Soriani A, Tomé V. *Digital citizenship education: Volume 1: Overview and new perspectives*. Strasbourg: Council of Europe Publishing; 2017.
6. Gomez-Trigueros IM. Self-perception of teachers in training on the ethics of digital teaching skills: A look from the TPACK framework. *European Journal of Educational Research*. 2025;14(1):121–133. doi:10.12973/eu-jer.14.1.119

7. Schmidt DA, Baran E, Thompson AD, Mishra P, Koehler MJ, Shin TS. Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education*. 2009;42(2):123–149. doi:10.1080/15391523.2009.10782544
8. Maxwell B, Tremblay-Laprise AA, Filion M, Boon H, Daly C, van den Hoven M, et al. A five-country survey on ethics education in preservice teaching programs. *Journal of Teacher Education*. 2016;67(2):135–151. doi:10.1177/0022487115624490
9. Deng G, Zhang J. Technological pedagogical content ethical knowledge (TPCEK): The development of an assessment instrument for pre-service teachers. *Computers & Education*. 2023;197:104740. doi:10.1016/j.compedu.2023.104740

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