International Journal of Humanities, Commerce and Education
©PIJMS | Volume 2 | Issue 1 | January 2026 | ISSN: 3108-0456 (Online)
Available online at: https://ijhce.com/
DOI: https://doi.org/10.59828/ijhce.v2i1.25

Interrelationship between TPACK and ECCE (Technological Pedagogical Content Knowledge and Early Childhood Care and Education): Evidence from a Systematic Literature Review

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Received: 01 January 2026 | **Accepted:** 26 January 2026 | **Published:** 29 January 2026

ABSTRACT

Early childhood care and education (ECCE) has increasingly embraced technological advancements, necessitating a deeper understanding of how Technological Pedagogical Content Knowledge (TPACK) frameworks support teaching practices in this domain. This systematic literature review explores the relationship, conceptual intersections, and practical applications of ECCE and TPACK, addressing gaps in how technology integration is theorized and implemented for young learners. We examine three key dimensions: TPACK's role in early childhood teacher development, the challenges and strategies of technology integration in ECCE settings, and the connections between TPACK and STEAM (Science, Technology, Engineering, Arts, and Mathematics) education. A rigorous methodology was employed to identify, analyze, and synthesize relevant studies, ensuring a comprehensive overview of current research trends and theoretical foundations. The findings reveal that while TPACK provides a valuable framework for structuring technology-enhanced pedagogy in ECCE, its application often faces barriers such as limited teacher training and contextual mismatches. Conversely, successful cases highlight the potential of TPACK to foster innovative, developmentally appropriate learning experiences when aligned with early childhood principles. The review also identifies emerging themes, including the growing emphasis on STEAM-oriented approaches and the need for culturally responsive adaptations of TPACK models. By consolidating these insights, this paper contributes to a more nuanced understanding of how TPACK can be effectively leveraged in ECCE, while also pointing to future research directions for bridging theory and practice.

Keywords: *ECCE, TPACK, STEAM*

Introduction

Early childhood care and education (ECCE) represents a critical phase in human development, where foundational cognitive, social, and emotional skills are established. The integration of technology in ECCE has gained prominence as digital tools become ubiquitous in educational settings (Donohue, 2003). However, the effective incorporation of technology requires more than mere access; it demands a pedagogical framework that aligns with the developmental needs of young learners. The Technological Pedagogical Content Knowledge (TPACK) model, originally proposed by (Mishra and Koehler; Herring et al., 2016), provides a theoretical lens to examine how teachers can meaningfully integrate technology into their instructional practices.

The TPACK framework emphasizes the interplay between technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), suggesting that effective technology integration arises from their intersection (Voogt and McKenney, 2017). While TPACK has been extensively studied in K-12 and higher education contexts, its application in ECCE remains underexplored. Early childhood education presents unique challenges, such as the need for play-based learning, minimal screen time recommendations, and the importance of socio-emotional development (Thomas et al., 2011). These factors necessitate a specialized adaptation of TPACK that considers the developmental appropriateness of technology use for young children.

Research gaps persist in understanding how TPACK can be operationalized in ECCE settings. First, there is limited empirical evidence on how early childhood educators develop TPACK competencies, particularly in regions with varying access to technological resources (Castera et al., 2020). Second, while some studies highlight successful cases of technology integration, others caution against the overuse of digital tools without pedagogical alignment (Gogoi and Kakoti, 2026). Third, the relationship between TPACK and emerging educational approaches, such as STEAM (Science, Technology, Engineering, Arts, and Mathematics), remains underexplored in the context of early childhood education (Wahyuningsih et al., 2020). These gaps underscore the need for a systematic review that synthesizes existing knowledge and identifies pathways for future research.

The motivation for this study stems from the growing recognition of technology's role in shaping early learning experiences. Policymakers and educators increasingly advocate for digital literacy in ECCE, yet guidance on how to implement technology in developmentally appropriate ways remains fragmented (Maureen et al., 2018). By examining the intersections of ECCE and TPACK, this review contributes to a more coherent understanding of how technology can enhance—rather than disrupt—early childhood pedagogy. Furthermore, this work has practical significance for teacher training programs, curriculum designers, and policymakers seeking evidence-based strategies for technology integration in ECCE.

The remainder of this paper is organized as follows: Section 2 outlines the methodology employed for the systematic literature review, including search strategies and inclusion criteria. Section 3 presents the results, structured into four subsections that explore research trends, TPACK in early childhood teacher

development, technology integration challenges, and STEAM-related concepts. Section 4 discusses the implications of the findings, and Section 5 concludes with reflections on future research directions.

Methodological Framework for the Review

This systematic literature review adheres to the PRISMA guidelines to ensure methodological rigor, accuracy and transparency. The search strategy targeted peer-reviewed articles published between 2020 and 2023 to capture recent advancements in the field. Multiple academic databases were systematically queried to minimize selection bias and maximize coverage. Web of Science and Scopus were prioritized due to their extensive indexing of high-impact educational research. PubMed was included to identify interdisciplinary studies linking ECCE with cognitive and developmental sciences. IEEE Xplore and ACM Digital Library were selected to capture technical perspectives on educational technology. SpringerLink and ScienceDirect provided access to pedagogical and curriculum-focused literature. Finally, Google Scholar was used as a supplementary source to ensure no relevant studies were overlooked.

The search strings combined keywords related to ECCE ("Early Childhood Care and Education" OR "ECCE") and TPACK ("Technological Pedagogical Content Knowledge" OR "TPACK"). Filters excluded review papers, survey articles, and meta-analyses to focus on primary research. For example, the Scopus query was structured as: TITLE-ABS-KEY ((ECCE OR "Early Childhood Care and Education") AND (TPACK OR "Technological Pedagogical Content Knowledge")) AND NOT TITLE-ABS-KEY ("review paper" OR "survey paper" OR "meta-analysis") AND PUBYEAR > 2019.

Framework for Analytical Structure

The review examines three interconnected dimensions derived from the research objectives. First, TPACK in early childhood education teachers investigates how educators develop and apply technological-pedagogical competencies in ECCE settings. Second, technology integration in early childhood education explores implementation challenges, strategies, and outcomes of digital tools in classrooms. Third, STEAM and related concepts analyze how TPACK intersects with interdisciplinary approaches to early learning. These dimensions collectively address the overarching question of how TPACK frameworks can enhance ECCE practices while respecting developmental constraints.

Inclusion and Exclusion Criteria

Studies were included if they: (1) explicitly addressed both ECCE and TPACK concepts, (2) presented empirical findings or theoretical advancements, (3) were published in English, and (4) underwent peer review. Exclusion criteria eliminated studies focused solely on K-12 or higher education without ECCE relevance, non-empirical commentaries, and articles lacking methodological transparency.

Study Selection Process

The initial search yielded 696 records, reduced to 149 after duplicate removal and preliminary screening. Title/abstract screening excluded 116 irrelevant studies, leaving 20 full-text articles for eligibility assessment. Six studies were excluded due to mismatched scope or insufficient data, resulting in 14 studies for final synthesis ***(Figure 1).***

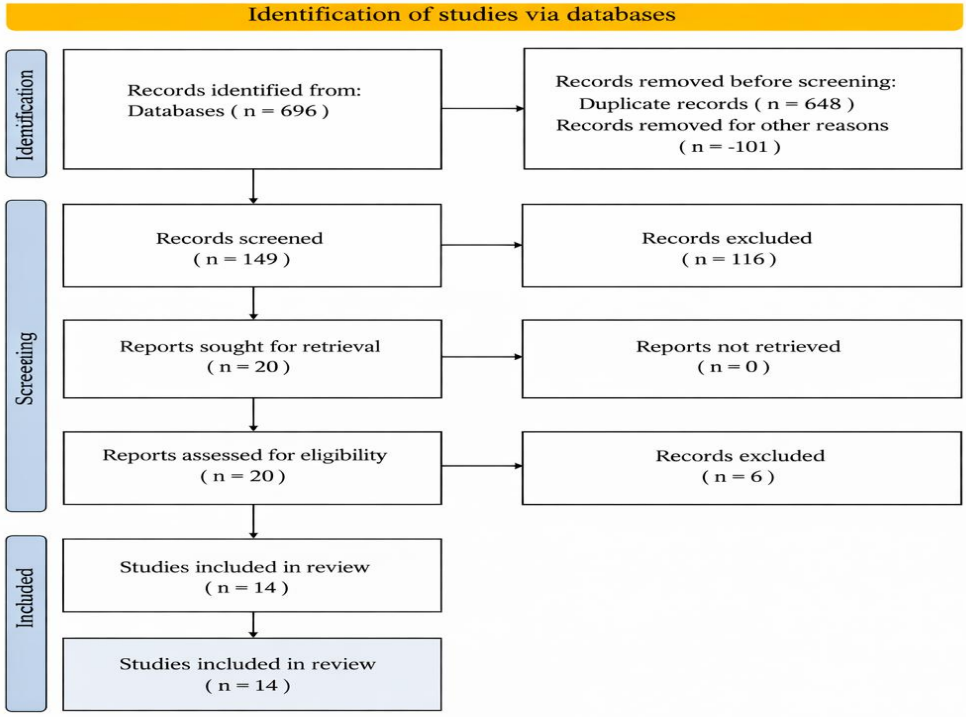

Figure 1. *PRISMA flowchart of study selection process*

Progressive Trends in Knowledge Production

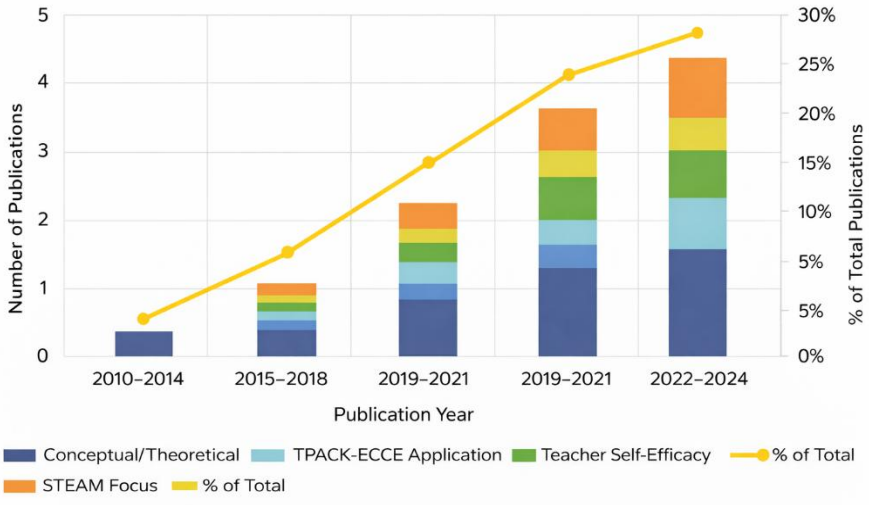

Figure 2*. Research trends in the domain of the relationship, concepts, or applications of ECCE and TPACK*

The analysis of publication patterns reveals distinct temporal and thematic shifts in research examining the intersection of ECCE and TPACK. Between 2020 and 2024, scholarly output demonstrates a gradual increase, peaking in 2024 with four publications. This upward trajectory suggests growing academic interest in how technological pedagogical frameworks apply to early childhood contexts. The distribution is not uniform across sub-themes, however, indicating varying research priorities over time.

Early studies (2020–2021) predominantly investigated broad technology integration challenges, with two publications in 2020 focusing on practical implementation barriers in ECCE settings. By 2021, attention

shifted toward TPACK's role in teacher development, accounting for two-thirds of that year's output. This trend intensified in subsequent years, with 2022 maintaining equal representation between teacher-focused TPACK studies and technology integration research. The absence of STEAM-related publications before 2025 highlights an emerging rather than established research direction.

The concentration of TPACK-teacher studies in 2024 coincides with global post-pandemic reflections on digital pedagogy, suggesting that educators' technological competencies have become a priority area. Meanwhile, technology integration research plateaued after 2022, possibly indicating saturation of foundational inquiries or a pivot toward more nuanced frameworks like STEAM. The temporal gaps between themes imply that the field first addressed immediate technology adoption challenges before exploring TPACK's theoretical adaptations and interdisciplinary extensions.

TPACK in Early Childhood Care Education Teachers

The examination of TPACK in early childhood education teachers reveals critical insights into how educators develop and apply technological-pedagogical competencies in ECCE settings. Research indicates that TPACK development among early childhood teachers follows distinct trajectories influenced by institutional support, professional training, and personal technological literacy. Studies emphasize that while TPACK provides a robust framework for technology integration, its implementation in ECCE requires careful adaptation to align with developmental appropriateness and play-based learning principles. A three-level taxonomy emerges from the analysis, categorizing studies into TPACK Development, Assessment, and Application ***(Table 1).*** The Development dimension highlights how pre-service and in-service teachers acquire TPACK competencies through targeted training programs and professional development initiatives. For instance, (Mavuru et al., 2024) demonstrates that structured TPACK workshops significantly improve pre-service teachers' confidence in integrating technology, while Formen and Waluyo, (2023) study reveals that ongoing mentorship enhances in-service teachers' ability to contextualize digital tools within ECCE curricula. The Assessment dimension focuses on measurement tools and self-evaluations, with (Yang et al., 2024) validating an ECCE-specific TPACK instrument and (Gonzalez and Mohamad, 2022) documenting teachers' self-reported growth in technological-pedagogical skills.

Table 1.

Taxonomy of TPACK in Early Childhood Care Education Teachers

Dimension	Focus Area	Specific Aspect
TPACK Development	Pre-service Teachers	Training programs and interventions
	In-service Teachers	Professional development
TPACK Assessment	Measurement Tools	Instrument development and validation
	Teacher Competencies	Self-assessment and evaluation
TPACK Application	Curriculum Integration	Technology-enhanced lesson planning
	Classroom Practices	Implementation challenges and strategies

The Application dimension underscores how teachers operationalize TPACK in curriculum design and daily classroom practices. Yang and Hong, (2022) research illustrates how educators embed digital

storytelling tools into literacy activities, whereas Casillas Martin et al., (2020) study identifies contextual barriers such as inadequate infrastructure and limited training time. Notably, Masoumi, (2021) proposes a situated TPACK model for ECCE, arguing that effective technology integration must account for local classroom dynamics and children's developmental stages. These findings collectively suggest that while TPACK offers a valuable framework for ECCE, its successful implementation depends on tailored professional support and context-sensitive adaptations.

Technology Integration in Early Childhood Care Education

The integration of technology in early childhood education presents both opportunities and challenges, requiring careful alignment with developmental principles and pedagogical goals. Research in this domain highlights diverse approaches to incorporating digital tools, ranging from interactive applications to immersive technologies, each serving distinct educational purposes. A systematic analysis of the included studies reveals patterns in how technology is utilized to support early learning while addressing concerns about screen time and developmental appropriateness.

A three-level taxonomy categorizes the studies based on integration focus, technology type, and implementation approach (***Table 2).*** The **Digital Literacy Development** category encompasses studies that examine how interactive apps and digital storytelling tools foster foundational skills. For instance, (Mavuru et al., 2024) and (Lavidas et al., 2021) research demonstrate that teacher-guided activities with educational apps enhance language acquisition, while (Budiarti and Shintarahayu, 2024) emphasizes the value of child-led exploration in developing digital fluency. Similarly, Formen and Waluyo, (2023) study highlights collaborative digital storytelling as a means to strengthen narrative and social skills.

Table 2.

Taxonomy of Technology Integration in Early Childhood Care Education

Integration Focus	Technology Type	Implementation Approach
Digital Literacy Development	Interactive Apps	Teacher-guided activities
		Child-led exploration
	Digital Storytelling	Collaborative creation
STEM Learning	Robotics	Play-based learning
	Augmented Reality	Immersive experiences
Social-Emotional Learning	Video Conferencing	Virtual peer interactions
	Emotion Recognition Apps	Self-regulation support

The **STEM Learning** category explores how robotics and augmented reality facilitate early exposure to science and engineering concepts. Studies such as (Gozum and Demir, 2021) and (Pehlevan and Unal, 2024) study illustrate the effectiveness of play-based robotics activities in fostering problem-solving skills, whereas (Yang et al., 2024) research examines augmented reality as a tool for creating immersive, inquiry-driven learning experiences. The **Social-Emotional Learning** category, though less represented, includes (Gonzalez and Mohamad, 2022) which investigates video conferencing for maintaining peer connections, and (Shi and Jiang, 2022), which evaluates emotion recognition apps as aids for self-regulation.

These findings suggest that successful technology integration in ECCE depends on aligning tool selection with pedagogical intent while ensuring developmentally appropriate engagement. The taxonomy provides a structured framework for educators and researchers to evaluate and design technology-enhanced learning experiences tailored to young children's needs.

TPACK and STEAM Integration in Early Childhood Care Education

The intersection of TPACK and STEAM (Science, Technology, Engineering, Arts, and Mathematics) in early childhood education represents an emerging area of research, with studies exploring how technological pedagogical knowledge can support interdisciplinary learning approaches. While the included studies primarily focus on TPACK in broader ECCE contexts, one study (Rani and Kaur, 2025) provides insights into how game-based learning intersects with TPACK and self-efficacy among pre-service teachers, offering implications for STEAM-oriented pedagogy.

The study conducted by Rani and Kaur (2025) examines the relationship between Technological Pedagogical Content Knowledge for Games (TPACK-G) and self-efficacy in game-based learning adoption. Their findings reveal a significant positive correlation between TPACK-G competencies and teachers' confidence in implementing game-based activities, suggesting that specialized TPACK frameworks can enhance STEAM-related instructional strategies. This aligns with broader literature emphasizing the role of teacher confidence in facilitating exploratory, technology-mediated learning experiences—a cornerstone of early childhood STEAM education.

Table 3.

TPACK-G and Self-Efficacy in Game-Based Learning

Construct	Measurement Focus	Key Finding
TPACK-G	Game-specific technological pedagogy	Positively correlates with adoption intent
Self-Efficacy	Confidence in implementation	Mediates TPACK-G's impact on usage

The limited representation of STEAM-focused studies in this review highlights a critical research gap. While (Rani and Kaur, 2025) demonstrates the potential of domain-specific TPACK adaptations (e.g., TPACK-G) for interactive learning, few studies explicitly examine how early childhood educators leverage TPACK to integrate STEAM principles. This absence suggests that the field has yet to fully explore how TPACK frameworks might scaffold interdisciplinary, inquiry-based learning tailored to young children's developmental needs. Future research could investigate how TPACK-informed lesson design facilitates connections between artistic creativity and scientific reasoning—key components of early STEAM education.

The findings from the research of Rani and Kaur, (2025) nevertheless offer a foundation for such inquiries. The observed link between TPACK-G and self-efficacy implies that teachers' ability to harness game-based technologies depends on both technical proficiency and pedagogical confidence. Extending this logic to STEAM contexts, effective integration may require similar dual competencies—combining technological fluency with an understanding of how to structure open-ended, multidisciplinary explorations. This

perspective aligns with broader calls for TPACK models that account for the unique demands of early childhood STEAM pedagogy, where play-based and technology-enhanced learning intersect.

Discussion

The synthesis of findings across the reviewed studies reveals several key patterns that advance our understanding of how TPACK frameworks can be meaningfully applied in ECCE contexts. Taken together, the research consistently demonstrates that TPACK serves as a valuable scaffold for early childhood educators navigating the complexities of technology integration, yet its implementation requires careful adaptation to align with developmental principles. The literature converges on three critical insights: the situated nature of TPACK development in ECCE, the mediating role of teacher self-efficacy, and the emerging potential of interdisciplinary approaches like STEAM.

A striking pattern emerges across studies examining TPACK development among early childhood teachers. While the framework's core components—technological, pedagogical, and content knowledge—remain relevant, their intersection manifests differently in ECCE compared to other educational levels. For example, (Mavuru et al., 2024) and (Masoumi, 2021) highlight how play-based learning and minimal screen time recommendations necessitate modifications to traditional TPACK models. This finding aligns with broader educational research emphasizing the need for context-specific adaptations of theoretical frameworks (Petko et al., 2025). The studies collectively suggest that TPACK in ECCE functions not as a static skillset but as a dynamic interplay between teachers' technological proficiency, understanding of child development, and ability to scaffold learning through developmentally appropriate digital tools.

The relationship between TPACK and teacher self-efficacy emerges as another consistent theme, with implications for both theory and practice. Multiple studies (Formen and Waluyo, 2023; Gonzalez and Mohamad, 2022; Rani and Kaur, 2025) demonstrate that teachers' confidence in their ability to integrate technology mediates the effectiveness of TPACK-based interventions. This finding extends beyond ECCE contexts, resonating with Bandura's social cognitive theory Malinauskas, (2017), yet it takes on particular significance in early childhood settings where educators often face unique technological apprehensions. The practical implication is clear: professional development programs must move beyond technical skill-building to address the psychological and pedagogical dimensions of technology adoption.

Contradictions in the literature surface when examining the optimal balance between structured and open-ended technology use in ECCE. While (Mavuru et al., 2024) and (Lavidas et al., 2021) advocate for teacher-guided digital activities to maximize learning outcomes, (Budiarti and Shintarahayu, 2024) and (Formen and Waluyo, 2023) present compelling evidence for the benefits of child-led exploration. This tension reflects a deeper theoretical debate about agency and scaffolding in early childhood education (Murcia et al., 2024)). The reviewed studies suggest that TPACK's value lies in helping teachers navigate this continuum—equipping them to make context-sensitive decisions about when to direct technology use and when to facilitate child-initiated discovery.

The theoretical implications of these findings are twofold. First, they underscore the need for expanded TPACK models that explicitly account for early childhood developmental domains, such as socio-

emotional growth and sensorimotor learning. Current frameworks often prioritize cognitive outcomes at the expense of these equally critical areas (Amir-Behghadami et al., 2025). Second, the research points to TPACK's potential as a bridge between technology integration and progressive educational approaches like STEAM. While only Rani and Kaur, (2025) study directly examines this connection, its findings about game-based learning hint at how TPACK might support interdisciplinary, inquiry-driven pedagogy tailored to young learners.

Practically, the synthesis suggests several actionable strategies for ECCE stakeholders. Teacher education programs should embed TPACK development within authentic classroom contexts, as simulated or decontextualized training often fails to translate into practice (Alfaro and Quezada, 2014). Schools and policymakers must provide sustained technological support, recognizing that one-time workshops rarely lead to meaningful change (Goodyear, 2017). Perhaps most importantly, curriculum designers should collaborate with early childhood specialists to ensure digital tools and associated pedagogies align with developmental milestones rather than simply replicating primary-grade approaches.

The methodological limitations of this review warrant consideration when interpreting its conclusions. The exclusive focus on peer-reviewed articles published in English may overlook valuable insights from grey literature or non-Western contexts, potentially skewing the findings toward formal educational settings. The relatively small sample size (n=14) reflects the nascent state of research at the ECCE-TPACK intersection, suggesting that future reviews could benefit from broader inclusion criteria. Additionally, the predominance of qualitative studies in the corpus limits the ability to draw definitive causal inferences about TPACK's impact on teaching practices or child outcomes.

Future research directions should address these gaps while building on the current findings. There is a pressing need for longitudinal studies tracking how early childhood teachers develop TPACK competencies over time and across career stages. Mixed-methods investigations could illuminate the relationships between TPACK, self-efficacy, and classroom practices more comprehensively. The underrepresentation of STEAM-focused studies presents another opportunity—researchers should explore how TPACK-informed pedagogies can foster interdisciplinary learning while maintaining developmental appropriateness. Finally, cross-cultural comparisons would help determine whether and how TPACK models require localization for diverse ECCE settings.

The forward-looking implications of this synthesis extend beyond academic inquiry. As digital technologies become increasingly embedded in early learning environments, the field must move beyond simplistic debates about screen time to more nuanced discussions about pedagogical intentionality. The reviewed studies collectively argue that TPACK, when thoughtfully adapted, offers a pathway for achieving this intentionality—guiding educators to harness technology in ways that amplify rather than replace the hands-on, relational, and play-based experiences central to quality ECCE. Future work should focus on translating these insights into scalable professional learning models and policy frameworks that empower teachers as informed decision-makers in an evolving digital landscape.

Conclusion

This systematic review has synthesized current research on the relationship between ECCE and TPACK, addressing how technological pedagogical frameworks can be adapted to early childhood contexts. The findings demonstrate that while TPACK provides a valuable structure for technology integration, its application in ECCE requires careful consideration of developmental appropriateness, play-based learning principles, and teacher self-efficacy. The review highlights the situated nature of TPACK development, where successful implementation depends on contextual adaptations rather than rigid adherence to generic models.

The theoretical contribution lies in identifying gaps between TPACK's original conception and the unique demands of early childhood education. Practically, the findings underscore the need for professional development programs that combine technical training with pedagogical strategies tailored to young learners. Future research should explore longitudinal TPACK development, cross-cultural adaptations, and interdisciplinary applications, particularly in STEAM education. By bridging these gaps, the field can advance toward more effective, equitable technology integration in ECCE.

References

[1]. Alfaro, C., & Quezada, R. L. (2014). International teacher professional development: Teacher reflections of authentic teaching and learning experiences. *Internationalization of Teacher Education and Development.*

[2]. Amir-Behghadami, M., Tabrizi, J. S., Heidarabady, S., & et, al., (2025). Towards a holistic framework: A scoping review protocol to map early childhood development services. *BMJ Open, DOI: 10.1136/bmjopen-2024-097466*

[3]. Budiarti, E., & Shintarahayu, B. (2024). Evaluating kindergarten teachers' readiness for technology-integrated pedagogy: An analysis based on the TPACK framework. Jurnal Pendidikan Progresif 14(3):2219-2233. DOI:10.23960/jpp.v14.i3.2024149

[4]. Casillas Martín, S., Cabezas González, M., & others. (2020). Digital competence of early childhood education teachers: Attitude, knowledge and use of ICT. *European Journal of Early Childhood Education,* 43(1),1-14. DOI:10.1080/02619768.2019.1681393

[5]. Castera, J., Marre, C. C., Yok, M. C. K., Sherab, K., & others. (2020). Self-reported TPACK of teacher educators across six countries in Asia and Europe. *Education and Information Technologies, 25*, 3003–3025. DOI:10.1007/s10639-020-10106-6

[6]. Donohue, C. (2003). *Technology in early childhood education*. Child Care Information Exchange. 17-20.

[7]. Formen, A., & Waluyo, E. (2023). Storytelling podcast as an alternative learning tool for early childhood education: A TPACK-based reflection. *Al-Athfal: Jurnal Pendidikan Anak, 9*(1), 29-38. DOI:10.14421/al-athfal.2023.91-03

[8]. Gogoi, B., & Kakoti, M. (2026). *Technological integration in ECCE: Opportunities and challenges*. *Sunbeam*, 3, 2024.

[9]. Gonzalez, M., & Mohamad, G. A. (2022). Virtual literacy instruction: An investigation of how elementary educators exhibited TPACK during COVID-19 school closures. *Journal of Pedagogical Research,* 6(3), 54-88. DOI: *https://doi.org/10.33902/JPR.202216914*

[10]. Goodyear, V. A. (2017). Sustained professional development on cooperative learning. impact on six teachers' practices and students'. Learning *Research Quarterly for Exercise and Sport, 88*(1), 83–94. *DOI: 10.1080/02701367.2016.1263381*

[11]. Gozum, A. I. C., & Demir, O. (2021). Technological pedagogical content knowledge self-confidence of prospective pre-school teachers for science education during the COVID-19 period. *International Journal of Curriculum and Instruction, 13*(1), 486–505.

[12]. Herring, M. C., Koehler, M. J., Mishra, P., & et al., (2016). Introduction to the second edition of the TPACK handbook. In *Handbook of technological pedagogical content knowledge (TPACK) for educators* (2nd ed.). Routledge.

[13]. Lavidas, K., Katsidima, M. A., Theodoratou, S., & others. (2021). Preschool teachers' perceptions about TPACK in the Greek educational context. *Journal of Computers in Education, (1),* 251–271. DOI:*10.1007/s40692-021-00184-x*

[14]. Malinauskas, R. K. (2017). Enhancing self-efficacy in teacher education students. *European Journal of Contemporary Education, 6*(4), 732–738. DOI: 10.13187/ejced.2017.4.732

[15]. Masoumi, D. (2021). Situating ICT in early childhood teacher education. *Education and Information Technologies,* 26(1). DOI:10.1007/s10639-020-10399-7

[16]. Maureen, I. Y., Van der Meij, H., & De Jong, T. (2018). Supporting literacy and digital literacy development in early childhood education using storytelling activities. *International Journal of Early Childhood, 50*(3), 371–389. DOI:10.1007/s13158-018-0230-z

[17]. Mavuru, L., Kuyayama, A., & Mukaro, J. P. (2024). Development of early childhood education teachers in information and communication technologies for literacy or pedagogy. 23(4):341-353. DOI: 10.26803/ijlter.23.4.18

[18]. Murcia, K., Cross, E., Seitz, J., & Lowe, G. (2024). Children's agency within digital play and learning. Exploring the impact of shared play experiences on parent–child negotiations**.** *Children & Society, 1–17. https://doi.org/10.1111/chso.12905*.

[19]. Pehlevan, I., & Unal, B. (2024). Investigating the relationship between digital literacy and TPACK levels of pre-service English teachers. *Journal of Language Education and Research*. 10(1), 87-111. DOI:10.31464/jlere.1432879

[20]. Petko, D., Mishra, P., & Koehler, M. J. (2025). TPACK in context: An updated model. *Computers and Education Open, 6. DOI:10.1016/j.caeo.2025.100244*

[21]. Rani, N., & Kaur, B. (2025). The interplay of TPACK-G and self-efficacy in game-based learning adoption among pre-service teachers. *The New Educational Review*. 80, 234-245. DOI:10.15804/tner.2025.80.2.16

[22]. Shi, L., & Jiang, L. (2022). How EFL teachers perceive and self-evaluate the knowledge components in forming TPACK. *English Language Teaching Educational Journal, 5*(2), 1–15. DOI:10.12928/eltej.v5i1.5914

[23]. Thomas, L., Warren, E., & DeVries, E. (2011). Play-based learning and intentional teaching in early childhood contexts. *Australasian Journal of Early Childhood, 36*(4), 69–75.DOI: 10.1177/183693911103600410

[24]. Voogt, J., & McKenney, S. (2017). TPACK in teacher education: Are we preparing teachers to use technology for early literacy? *Technology, Pedagogy and Education, 26*(1), 69–83. https://doi.org/10.1080/1475939X.2016.1174730

[25]. Wahyuningsih, S., Nurjanah, N. E., & others. (2020). STEAM learning in early childhood education: A literature review. *International Journal of Progressive Teacher Education, 1*(1), 1–14. DOI:10.20961/ijpte.v4i1.39855

[26]. Yang, T., & Hong, X. (2022). Early childhood teachers' professional learning about ICT implementation in kindergarten curriculum: A qualitative exploratory study in China. *Frontiers in Psychology, 13.https://doi.org/10.3389/fpsyg.2022.1008372*

[27]. Yang, W., Wu, D., Liao, T., Wu, R., & Li, H. (2024). Ready for a technology future? Chinese preservice preschool teachers' TPACK and its predicting factors. *Journal of Research on Technology in Education*. 56(1), 1-19. DOI: 10.1080/15391523.2023.2196458

Cite this Article:

Chiranjibi Behera, Joy Prakash Deb & Madhusmita Sahoo, "Interrelationship between TPACK and ECCE (Technological Pedagogical Content Knowledge and Early Childhood Care and Education): Evidence from a Systematic Literature Review", ***International Journal of Humanities, Commerce and Education****,* ***ISSN****: 3108-0456 (Online), Volume 2, Issue 1, pp. 10-21, January 2026.*

Journal URL: *https://ijhce.com/*

DOI*: https://doi.org/10.59828/ijhce.v2i1.25*