Integrating innovative technologies in Technology-Assisted Language Learning (TALL) environments: Insights, applications, and impacts

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1. Introduction

In recent years, the landscape of language education has undergone a profound transformation with the rapid and pervasive integration of technology (Hughes et al., 2023; Kohnke & Moorhouse, 2025; Law, 2024). Building on the foundations of computer-assisted language learning (CALL), technology-assisted language learning (TALL) has emerged as a more comprehensive paradigm that embraces a wide spectrum of digital innovations (Bahari, 2023; Bahari & Li, 2024; Ko, 2017; Liu & Fan, 2024; Zong & Yang, 2025). Today, the field extends far beyond static computer-based programs to include artificial intelligence (AI), generative artificial intelligence (GenAI), multimodal digital tools, immersive virtual and augmented reality environments, gamified applications, and mobile-assisted solutions (Chen et al., 2020; Derakhshan et al., 2024; Liu & Wang, 2024; Shen, Weng, et al., 2025; Teo et al., 2022; Xin & Derakhshan, 2025). These tools have opened up unprecedented opportunities to personalize learning pathways, foster authentic communication beyond classrooms, and create interactive experiences that mirror real-world language use (Chen et al., 2025; Derakhshan, 2025; Guo & Wang, 2025; Kohnke et al., 2025; Zhi & Wang, 2024).

At the same time, this transformation raises critical questions about pedagogy, equity, and sustainability (Chen et al., 2022). While advanced technologies offer unprecedented opportunities for personalized and interactive language learning, their integration also challenges traditional classroom practices, teacher roles, and assessment methods (Dai & Liu, 2024; Skevi et al., 2024). Teachers are often required to adapt rapidly to new digital tools, increase their digital literacy, redesign learning activities, and develop novel strategies to maintain learner engagement in increasingly multimodal environments (Corral-Robles et al., 2024; Garzón Artacho et al., 2020; Lee et al., 2025; Skevi et al., 2023; Tarazi & Ortega-Martín, 2023;

Wang et al., 2025). Students, meanwhile, must navigate complex learning ecosystems that demand digital literacy, self-regulation, and adaptability (Huang & Derakhshan, 2025; Wang et al., 2024), which can vary widely across socio-economic and cultural contexts. Furthermore, issues of accessibility and equity remain pressing, as not all learners have equal access to high-quality technological resources, potentially exacerbating existing educational gaps (Padmaja et al., 2025). Ethical considerations, including data privacy, algorithmic bias, and the potential overreliance on AI, further complicate the landscape (Derakhshan & Taghizadeh, 2025; Shen, Wang, et al., 2025). The post-pandemic acceleration of digital education and the rapid rise of generative AI have made these challenges particularly urgent, highlighting the need for critical reflection, evidence-based practices, and careful pedagogical planning.

In response to these pressing questions and emerging challenges, the present issue brings together cutting-edge empirical and review studies that address multiple dimensions of TALL. Collectively, the contributions examine how emerging technologies are reshaping second and foreign language (L2) classrooms, highlighting not only their pedagogical affordances but also the challenges of their integration. By engaging with the practical, instructional, and psycho-emotional aspects of TALL environments, this issue advances our understanding of the short- and long-term implications of technology integration in L2 education. The insights generated from this collection are expected to provide valuable guidance for educators, researchers, and policymakers who seek to harness the potential of advanced technologies—particularly AI and GenAI—to create more effective, engaging, and sustainable language learning experiences.

2. Contributions to the Special Issue

The articles featured in this special issue provide a multifaceted exploration of TALL, highlighting the diverse ways in which innovative technologies are transforming L2 education. To offer a coherent structure, the contributions are organized into three interrelated categories. The first encompasses empirical studies centered on language learners, investigating how advanced technological tools influence their motivation, engagement, and learning outcomes. The second category comprises empirical studies centered on language teachers, examining their perceptions, experiences, and adaptive strategies in integrating advanced instructional tools. The third category includes book reviews, which provide critical appraisals of recent publications, situating current research within the broader TALL landscape and offering reflective insights into emerging trends.

2.1. Empirical studies on learners in TALL environments

In the opening paper, Villarrubia Zúñiga, González-García, and Schmauss explore the use of Google Notebook LM to manage plurilingual learning through the Lean-Kaizen process, demonstrating how AI can support structured, personalized language development. Building on the theme of learning strategies, Mateo-Guillen, Pozo-Beamud, and González-Lloret investigate self-regulation strategies in foreign language virtual exchanges, highlighting how learners plan, monitor, and reflect on their performance in technology-mediated interactions. Continuing with the affective dimension, Liu and Guzmán provide a qualitative inquiry into

Chinese learners' emotions in technology-enhanced L2 education, offering insights into the emotional experiences that shape engagement and learning outcomes.

Extending the focus to AI-assisted L2 writing, Xu, Huang, and Teo adopt an activity theory perspective to examine EFL learners' strategies in AI-assisted English writing, revealing how learners navigate technological affordances to optimize their writing processes. In the follow-up inquiry, Lin, Yang, and Proietti Ergün focus on learners' learning involvement and emotions in classrooms integrating technology, emphasizing the interplay between engagement, affect, and instructional design. Shifting to language learners' attitudes and emotional well-being, Wang, Pan, and Kirmiz investigate the relationship between technology acceptance and anxiety among English majors, highlighting how learners' perceptions of technology influence their emotional experiences.

Turning to learners' beliefs and perceptions, Wang, Gao, Reynolds, and Wang employ Q-methodology to explore Chinese EFL learners' beliefs about AI-mediated informal digital learning, providing a nuanced understanding of learner perspectives and preferences. Complementing this line of inquiry, Lin examines the psycho-emotional dimensions of technology-mediated learning, investigating how digital tool efficacy, anxiety, motivation, and academic engagement interact in TALL environments. Focusing more specifically on academic engagement, Peng explores the contribution of AI to active learning among Chinese EFL learners, demonstrating the potential of AI to foster more participatory and interactive learning experiences. In a related study on learners' digital habits, Yang and Wang investigate the relationship between everyday technology usage, e-learning readiness, and emotion regulation, offering insights into how learners' technology practices influence their affective and cognitive engagement.

Broadening the perspective to pedagogical impact, Liu and Liu examine how advanced technologies transform teacher-student dynamics and improve learning outcomes. Addressing broader ethical and cultural concerns, Yu, Xu, and Irgatoğlu discuss the cultural and ethical implications of integrating advanced technologies, including inclusivity, identity, digital equity, and community engagement. Finally, Mashhadi, Validi, and Kavoosi explore the use of fanfiction in flipped classrooms to enhance Iranian EFL learners' writing fluency, demonstrating creative, learner-centered applications of technology.

Collectively, these studies illustrate the multifaceted ways in which advanced technologies, particularly AI and GenAI, influence students' learning strategies, emotional experiences, academic engagement, and outcomes, while also highlighting important cultural, ethical, and pedagogical considerations in TALL environments.

2.2. Empirical studies on teachers in TALL environments

In the first paper of this category, Torres-Casierra, López-Gil, and Mayora explore the integration of GenAI in English language teaching through the lens of the TPACK model, providing insights into how teachers' technological, pedagogical, and content knowledge intersect to inform effective AI adoption. In the next paper, Fan, Peng, and Lalli conduct a qualitative inquiry into digital adaptive learning platforms, examining how these tools reshape Chinese EFL teachers' instructional practices and pedagogical decision-making.

Continuing the focus on teachers' professional experiences, Qin and Niu adopt a longitudinal Q-methodology approach to investigate teachers' professional identities and

perezhivaniya in adopting technology-assisted language teaching, highlighting how personal and emotional experiences influence technology integration over time. Wu and Derakhshan further examine the internal and external factors driving L2 teachers to embrace AI, employing a phenomenological approach to uncover how personal and job resources facilitate or hinder technology adoption. Complementing these insights, Luo, Zhang, and Chen investigate the personal resources influencing Chinese teachers' technology acceptance, with a focus on cognitive flexibility, resilience, and self-efficacy, demonstrating the complex interplay between individual traits and digital instructional readiness.

In the follow-up inquiry, Liu and Kruk adopt a dual qualitative perspective from both teachers and learners to examine the advantages and challenges of incorporating emerging technologies in L2 classrooms, emphasizing the alignment and tension between teacher and learner experiences. On their part, Geng and Hodges provide further depth through teachers' voices, exploring the potentials and challenges of TALL in Chinese EFL contexts and highlighting practical, pedagogical, and contextual factors that shape technology integration. Subsequently, Zhao, Narasuman, and Ren examine EFL teachers' digital literacy and its relationship to self-efficacy and well-being in AI-based environments, underscoring the importance of teachers' competencies and affective states in shaping successful technology adoption. Finally, Liu and Mutlu investigate innovative approaches to professional development, exploring the interplay between TPACK, teacher motivation, engagement, and professional growth, offering actionable insights for designing effective teacher training programs.

Collectively, these studies illuminate the complex and multifaceted experiences of language teachers in TALL environments, highlighting how personal, professional, and contextual factors shape technology adoption, pedagogical innovation, and overall teacher development in increasingly digitalized L2 classrooms.

2.3. Book reviews

This special issue also features two book reviews that offer critical insights into contemporary research and practice in TALL. Mazandarani, Rajabi, and Soleymani evaluate "*Technology and English Language Teaching in a Changing World: A Practical Guide for Teachers and Teacher Educators*" (Lee, Zou, & Gu, 2024), a volume offering practical strategies for effectively integrating digital tools into language classrooms. The review underscores the book's capacity to bridge theory and practice, providing educators with actionable guidance to enhance their teaching effectiveness. Following this, Liang and Wang review "*Language Teacher Psychology in the Online Teaching Context: An Ecological Perspective*" by Honggang Liu (2024), providing a thorough examination of how ecological and psychological factors shape language teachers' experiences in online and digital teaching environments. The review emphasizes the book's contributions to understanding teacher cognition, motivation, and emotional dynamics, highlighting its relevance for supporting professional growth and well-being in technology-enhanced contexts. Together, these reviews complement the empirical studies presented in this issue, situating current research on TALL within a broader pedagogical and psychological framework while offering reflective insights for both scholars and practitioners.

3. Conclusions and the Way Forward

The contributions to this special issue offer a nuanced understanding of TALL from multiple vantage points. The empirical studies shed light on how language teachers negotiate identity, motivation, and professional development while adapting to AI and other advanced technologies, while also uncovering language learners' perspectives on both the benefits and challenges of emerging technologies. Complementing these findings, the two book reviews extend the discussion by foregrounding the psychological dimensions of teaching in online contexts and by offering practical pathways for effective technology integration. Collectively, these works suggest that the effective integration of technology in language education arises from the dynamic interaction of digital affordances, teachers' professional and psychological resources, and learners' cognitive and emotional engagement.

Looking ahead, several promising avenues merit further exploration. Future research should investigate how language teachers' psychological resources—such as resilience, self-efficacy, and cognitive flexibility—interact with contextual affordances to shape sustained technology adoption. Longitudinal and cross-cultural inquiries could yield deeper insights into how TALL practices evolve across diverse educational systems, while comparative studies of teachers' and students' perspectives may illuminate both convergences and divergences in their experiences. In addition, the rapid proliferation of unimodal and multimodal GenAI tools calls for critical engagement with the ethical, pedagogical, and emotional dimensions of their use in language classrooms. Pursuing these directions will enable researchers and practitioners to foster a more sustainable, equitable, and human-centered trajectory for technology-assisted language education.

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