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Learners' Technological Self-Efficacy in Language Learning: A Scoping Review

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Abstract: *Digital technologies have profoundly reshaped foreign and second language education, with technological self-efficacy (TSE) identified as a key psychological factor influencing learners' adoption and use of technological resources. Although, to date, no attempt has been made to synthesize these studies for cumulative knowledge building. To provide clarity on the state-of-the-art on TSE, this scoping review aims to systematically map empirical studies on language learners' TSE. This Preferred Reporting Items for Systematic Reviews and Meta-Analyses-informed scoping review article explores a dataset of 33 such studies taken from Web of Science, Scopus, ScienceDirect, and SpringerLink since 2010. Researchers manually coded these studies for data regarding publication outlets, country/region and research aims, research methods, findings and identified limitations. Findings reveal that most studies address the predictive, mediating, or moderating roles of TSE in language learning, with a particular focus on its effects on technology acceptance, learning engagement, and psychological outcomes such as anxiety and motivation. We close by identifying gaps in cumulative knowledge and suggesting directions for future research.*

Keywords—technological self-efficacy; digital technology; language learning; scope review; cognitive theory

1. INTRODUCTION

Over the past two decades, the rapid advancement of digital technologies has profoundly reshaped the landscape of foreign language and second language education. From the early stages of computer-assisted language learning and mobile-assisted language learning to the current generation of intelligent learning tools driven by generative AI, the continuous iteration of technological means has steadily expanded the possibilities for language instruction and acquisition (Khoso et al., 2025). Intelligent tutoring systems, speech recognition technologies, adaptive learning platforms, and large language models, such as ChatGPT are now capable of delivering highly personalized, interactive, and flexible learning experiences (Guo & Wang, 2025).

However, technological advancement alone does not automatically translate into improved learning outcomes. This necessitates examining various psychological and sociocultural factors that could influence students' adoption of technological resources for language learning (Wang et al. 2024). In other words, no matter how sophisticated digital tools may be, if learners lack the confidence and capability beliefs necessary to use them, these technologies are unlikely to be effectively implemented in educational practice (An et al., 2022). Among the technologies in widespread use, technological self-efficacy (TSE) was identified as the primary determinant of users' behavioral intention to adopt the technology (Huang et al., 2020).

Grounded in Bandura's (1997) social cognitive theory, self-efficacy is defined as "beliefs in one's capabilities to organize". In the field of human-technology interaction, this construct has been adapted as technological self-efficacy. In this study, technological self-efficacy is characterized as the belief in one's ability to use technology successfully for learning (Compeau & Higgins, 1995). TSE is a robust predictor of technology acceptance and actual usage (Celik & Yesilyurt, 2013). Learners with high TSE are more inclined to embrace digital tools for language acquisition (Hanif et al., 2018), perceive technology as a valuable learning resource (Pan, 2020), and demonstrate greater autonomy, engagement, and persistence in self-directed learning (Macfadyen & Dawson, 2010). They also tend to adopt a wider range of technology-mediated learning strategies and are more willing to explore emerging tools such as AI chatbots (Calafato, 2023). Therefore, technological self-efficacy noticeably affects students' technology related language learning behaviors (Mew & Honey, 2010). Given the increasing integration of digital technologies in language education, understanding TSE has become essential for both research and practice.

Despite syntheses available covering general L2 self-efficacy in language learning (Fryer et al., 2025), as well as syntheses teachers' computer self-efficacy (e.g., Scherer & Siddiq, 2015), to the best of our knowledge, there is, as yet, no specific systematic review of studies focusing specifically on language learners' technological self-efficacy in language education. By TSE, we refer to studies covering: a) use of TSE (including role as a predictor, outcome, mediator, or moderator); b) diverse forms of TSE (such as, computer

self-efficacy, digital self-efficacy, or AI self-efficacy); c) to any aspect of language learning.

While recent reviews have begun to address technology self-efficacy in language learning, they do so only passing. Khalid et al.'s (2026) focused literature review examines on AI-integrated professional development (PD) for pre-service teachers, explicitly identifying technological self-efficacy as a core outcome variable for evaluating the effectiveness of AI-related PD. Fryer et al. (2025) offered a critical systematic review of self-efficacy in second/foreign language (L2) learning, focusing more narrowly on methodological and theoretical underpinnings, together with a necessity for a complementary yet underexplored future research. Thus, no existing review has placed language learners' TSE at the core of its analysis. Therefore, the present study offers the first PRISMA-informed scoping review that concentrates exclusively on this topic. By systematically mapping empirical studies, coding their publication venues, countries/regions, research designs, measurement tools, theoretical frameworks, and key findings, this review extends prior syntheses by providing a comprehensive evidence base to guide future research and pedagogical practice for TSE in language learning.

2. METHOD

2.1 Research Design

We conducted a systematic literature review of empirical studies on technological self-efficacy in language learning contexts. To ensure transparent documentation of the review process, we adopted the PRISMA 2020 reporting standards (Page et al., 2021). As a set of evidence-based standards, PRISMA is designed to enhance the clarity and completeness of systematic review and meta-analysis reporting. A core component of this framework is the flow diagram, which documents the study selection process across identification, screening, and eligibility determination. This procedural record is presented in Figure 1.

2.2 Search Strategy

Systematic searches were carried out in Web of Science, Scopus, ScienceDirect and SpringerLink, which were accessed between 2010 and July 2026. These platforms were chosen for their rigorous journal selection policies and comprehensive coverage of educational psychology and applied linguistics. This timeframe was chosen to capture both early foundational studies on computer self-efficacy and more recent investigations into AI self-efficacy in language education.

The search string was adjusted slightly for each database to align with their indexing conventions. Major keywords incorporated 'technological self-efficacy', 'technology self-efficacy', 'computer self-efficacy', 'digital self-efficacy', 'AI self-efficacy', paired with 'language learning', 'L2', 'EFL', 'ESL', 'second language', foreign language'.

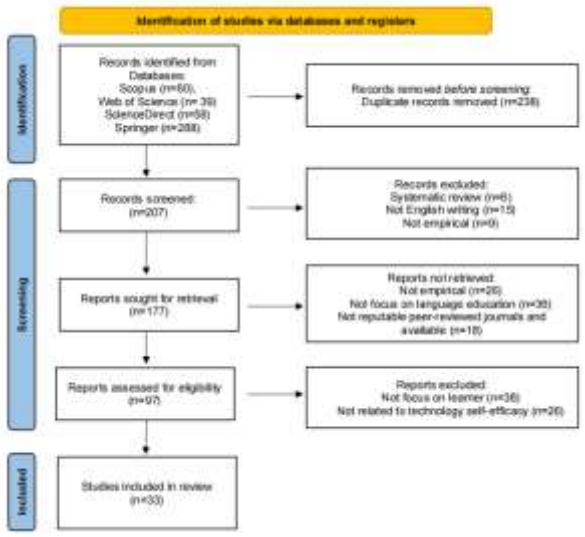

Fig.1 *Identification, Screening, and Inclusion.*

2.3 Inclusion Criteria

Studies were included if they met all of the following criteria: (a) Studies should be empirical; (b) Studies must focus on learner instead of other populations' (e.g., teacher); (c) Studies must specifically examined factors related to technological self-efficacy; (d) Studies must be published in reputable peer-reviewed journals and available; (e) Studies should be published in English.

2.4 Screening process

The preliminary search with the search string yielded 445 articles. The articles identified were imported into reference management software Zotero 9. Two authors participated in the screening processes.

In the first stage, the reviewers independently screened the titles and abstracts on the basis of the inclusion and exclusion criteria, narrowing the selection to 177 articles. Afterwards, they skimmed through the full texts of the remaining articles to further ascertain whether these articles satisfied the inclusion criteria. After careful selection, a total of 33 articles were included for further review.

Each article was then manually re-read in its entirety to determine: (1) authors, publication year, titles, and journals; (2) country/region, participants' educational level, target language(s); (3) stated research aims; (4) relevant rationales regarding the relationship between self-efficacy and other variables; (5) method and (6) reported study findings. We analyzed, summarized, and evaluated the data regarding frequency, percentages, and themes to address research questions.

3. RESULTS

3.1 Publication Outlets

An overarching quantitative sense of the field's growth is presented in Figure 2. While the popularity of technological self-efficacy as a research construct within language learning presents no clear trend for the first 15 years of this review, the subsequent five n years, suggest a dramatic increase.

The dataset includes 33 studies published across 25 distinct publication outlets. Journals with multiple TSE in language learning studies include Acta Psychologica (n = 4), Frontiers in Psychology (n = 3), and Scientific Reports, Learning and Motivation, Behavioral Sciences (n = 2 each), System and Educational Psychology(n=1 each). Twenty outlets were indexed in the Social Sciences Citation Index and four in the Science Citation Index Expanded.

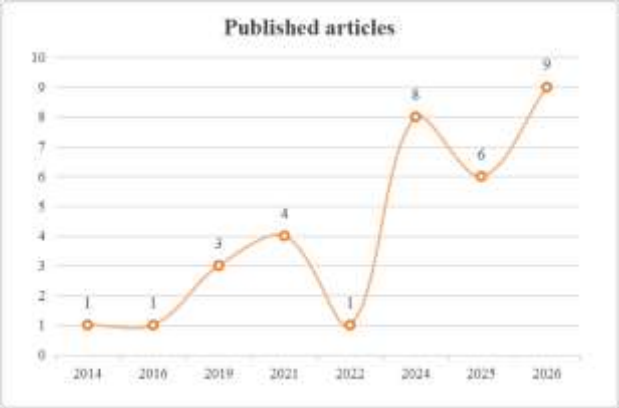

Fig.2 *The number of articles included in this review published since 2010*

3.2 Country/Region and Language Focus

A overwhelming majority targeted L2 English (n = 31). Only 1 study selected Turkish as a Foreign Language, along with 2 study allowed participants to freely choose their target language.The dominant L1 group is Chinese (n = 23), and Arabic (n = 4). with two study regarding Turkish and Spanish, along with individual studies covering Vietnamese, Korean, and Greek. One studies involved multilingual cohorts.

The reviewed research was predominantly conducted in Mainland China (n = 22), followed by Hong Kong (n = 1), Taiwan (n = 1). Other Asian countries/regions represented include South Korea and Vietnam with one representative study each. In the Middle East, studies came from Saudi Arabia (n = 3), Turkey (n = 1) and Egypt (n = 2). Western countries/regions represented include Chile (n = 2), New Zealand (n = 1) and Greece (n = 1). Clearly, a more balanced approach to research in this area is important for meaningful and sustainable contributions to be made in the future.

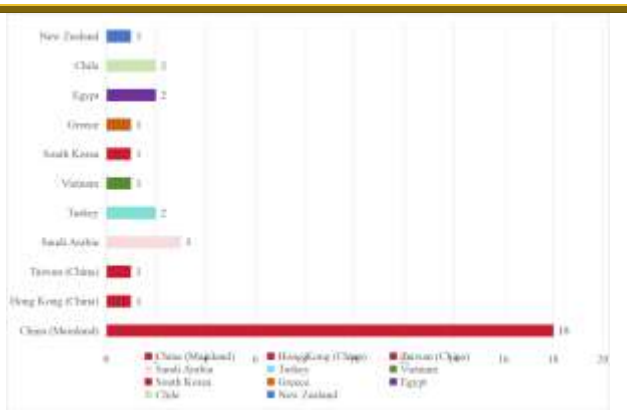

Fig.3 *Geographical Location of Featured Technological Self-Efficacy in language learning*

3.3 Research Aims

A broad set of research aims and questions were observed across the studies in our dataset, which can be categorized into several measures on how self-efficacy has been applied in analysis.

Most studies (n=18) aimed to evaluate the predictive effect of technological self-efficacy on a wide range of language learning-related variables. This included technology acceptance and usage behavior, such as learners' perceived usefulness, perceived ease of use, behavioral intention to use or satisfaction (e.g. Xu & Cui, 2026; Mekheimer, 2025). Some studies assessed psychological and cognitive variables (e.g. foreign language anxiety (e.g. Chen et al., 2024) and learning readiness (e.g. Hao, 2016), while others focused on targeted specific language skills such as English writing competence, vocabulary learning performance or grammar learning effectiveness (e.g. Kardaş, 2026; Bai et al., 2026).

Relatedly, several studies (n=4) situate self-efficacy chiefly as a mediating variable. External contextual factors, such as teacher support (e.g. Pan & Chen, 2021) and trust in AI (e.g. Guo & Zheng, 2026) or learning behaviors, such as digital media engagement do not act directly on learning outcomes (e.g. Dong, 2025), instead, transmitting through the psychological mediating pathway of technological self-efficacy.

Three studies positions technological self-efficacy as a moderating variable. Aims included mitigating negative factors' adverse effects on learning outcomes (e.g. Mekheimer, 2025) and amplifying the performance benefits of individual background characteristics (e.g., academic major).

A few studies compared (n=4) employs correlational designs, encompassing both technology-related variables and psycho-emotional variables. Finally, a smaller number of studies (n=2) focused on qualitative description of technological self-efficacy, centering on the construction process and current characteristics of technological self-efficacy. This includes how learners dynamically develop

technological self-efficacy through digital tool interactions (e.g. Chen & Buckingham, 2026) and the distribution of multi-dimensional readiness under a given teaching model (e.g. Hao, 2016).

Table 1: Self-efficacy use in analyses

Self-efficacy research use	Number of studies
Predicting variable	18
Mediator	4
Moderator	3
Correlational	4
Qualitative / Descriptive	2

3.4 Study Findings

Many studies (n=15) reported that technological self-efficacy exerts a universal and stable positive predictive effect on technology acceptance behavior and learning engagement. Learners with higher technological self-efficacy are more likely to perceive information technology as useful and easy to use (Guo & Zheng, 2026), and thus form stronger usage intentions (Kardaş, 2026) and learning strategies (Yang et al., 2026). This conclusion has been verified in various scenarios, including video conferencing platforms such as Zoom (e.g. Honggang et al., 2026; Xu & Deng, 2024), learning management systems (Xu & Xiong, 2026), mobile-assisted language learning tools (Bai et al., 2026), and generative AI such as ChatGPT (Wang et al., 2025)), indicating its good cross-situational stability.

It should be noted that several studies found no significant predictive effect, suggesting that this relationship may be moderated by specific task or sample factors. For example, Alharbi (2025) found that in the emergency teaching context, there was no significant correlation between foreign language speaking anxiety and computer self-efficacy.

A subset of studies compared TSE as both a mediator and a moderator. Among seven studies documenting significant indirect effects, consistent results demonstrate that external resources exert indirect impacts on learning outcomes by boosting learners' technological self-efficacy (Guo & Zheng, 2026). Regarding moderating effects, four studies report significant buffering effects. Specifically, technological stressors including AI over-dependency and digital fatigue heighten learning burnout through anxiety, yet technological self-efficacy buffers such adverse processes to sustain learners' psychological health and learning engagement.

Studies with qualitative methods reported learners' digital confidence is not static. It develops gradually through sustained interaction, trial-and-error, and reflective practice with digital tools. Its core marker lies in a developmental shift from tentative, reliant usage to strategic deployment, culminating in an internalized, self-directed sense of mastery.

3.5 Identified Issues

Recurring methodological limitations indicated challenges in ensuring robust study designs in our dataset. Particularly, the majority of studies predominantly relied on self-report questionnaires and cross-sectional research designs. Small sample sizes or limited participants were explicitly noted in a few studies (e.g., Mekheimer, 2025, n=3 qualitative participants; Alfadda & Mahdi, 2021, n=75). Many studies failed to fully account for other variables (e.g.participants' province of origin, household income, and parental educational attainment). With regards to research contexts, most studies centered on general technology tools or ubiquitous learning without differentiating effects across distinct technological platforms.

4. DISCUSSION AND CONCLUSION

This short review has examined the research aims, methodologies, findings, and limitations of 33 empirical studies on the role of technological self-efficacy in language learning. Overall, the data reveal a rapidly growing body of research conducted predominantly in Asian higher education contexts, employing varied designs to examine technological self-efficacy's relationships with technology acceptance, learning engagement, and psychological outcomes such as anxiety and motivation. Findings appear to suggest technological self-efficacy does serve as a consistent and robust positive predictor across diverse digital platforms, though issues remain around methodological consistency, including an over reliance on cross-sectional self-report designs, and a scarcity of longitudinal and qualitative approaches. Our synthesis confirms the broader trends noted by Fryer et al.'s (2025) heavy reliance on cross-sectional survey designs and convenience sampling from tertiary contexts, and aligns with the meta-analytic evidence reported by Xiong and Teo (2025). However, unlike these broader reviews that examine self-efficacy as one variable among many or focus on general L2 self-efficacy, our study contributes a dedicated and systematic analysis of technological self-efficacy for learners' language learning, mapping its distinct roles across diverse digital platforms and revealing variations in its predictive, mediating, and moderating effects. By focusing exclusively on technological self-efficacy, we were able to categorize studies by analytical role, technology type, and learning outcomes, providing a level of granularity not available in earlier syntheses. Furthermore, our scoping review highlights issues that have not been systematically charted before, including: a predominant focus on Chinese university EFL learners that constrains generalizability; insufficient differentiation across technology platforms; and weak integration with established L2 frameworks. In doing so, this study moves beyond descriptive overviews to establish a more comprehensive evidence base that can inform both future research and pedagogical practice.

Regarding pedagogical implications, the findings highlight the potential of technological self-efficacy to predict and sustain learners' technology acceptance and engagement by

building initial digital confidence through guided training and low-risk exploratory tasks. These insights can inform language education policies by embedding efficacy-building scaffolds into curriculum design, training teachers to affirm learners' digital competence in feedback, and implementing differentiated support strategies that address learners' varying levels of technological confidence.

Key priorities for future research include the need to move beyond a cross-sectional, self-reported survey design towards using a longitudinal design and valid research instruments, such as person-centered and experimental designs. Put differently, this involves exploring inter-variable relationships instead of pursuing regression predictions. The case for utilizing cross-sectional studies and maximizing their effectiveness has been well established by previous authors (Spector, 2019), and their insights warrant close attention. Secondly, more attention needs to be paid to larger sample size and statistical power. Thirdly, standard use of important controls, such as gender, age, and prior achievement should be paid attention. Fourthly, far more studies are needed to differentiate between types of technological tools.

Although this review provides systematic evidence on technological self-efficacy in language learning, several limitations warrant attention. First, restricting the search to journals from only four databases, some relevant articles might not have been reviewed. Future reviews in this area might consider broadening the search. Second, the search keyword combinations employed may have constrained the scope of retrieved studies. Again, a broader set of search string might be in a strong position to add to this review's conclusions.

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