

CALL Teacher Education: A Mixed-Methods Study on Iranian EFL Teacher Educators' Knowledge, Use, Challenges, and Strategies

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Article Info	Abstract
<p>Article type: Research Article</p> <p>Article history: Received September 20, 2025 Received in revised form December 22, 2025 Accepted December 28, 2025 Published online December 29, 2025</p> <p>Keywords: CALL, Mixed-methods study, CALL teacher education, teacher educators (TEs)</p>	<p>The rapid advancement of educational technology has transformed computer-assisted language learning (CALL) into a desideratum for teaching English as a foreign language (EFL) worldwide. Yet, scant attention has been paid to CALL teacher education courses and the voices of teacher educators (TEs) in this regard. Hence, this mixed-methods study inspected Iranian EFL TEs' knowledge and use of CALL, challenges they face in holding effective CALL teacher education courses, and strategies they use to update their CALL knowledge. To this end, 74 TEs working at Iranian universities and language institutes were selected via convenience and snowball sampling methods. A questionnaire was developed and administered to collect quantitative data. An interview protocol was developed, and interviews were conducted on 15 TEs to provide qualitative data. The questionnaire results showed that TEs possess a mediocre knowledge of CALL and thus use advanced CALL tools infrequently. In interviews, they highlighted some serious technology-related challenges, such as low and disruptive Internet connection, insufficient CALL knowledge, and limited updated facilities, to run effective CALL teacher education courses, but highlighted some strategies to deal with such challenges. The pedagogical implications of the findings are discussed.</p>

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Introduction

The global pandemic in the early 2020s and the ensuing compulsory closure of in-person educational institutions maximized the significance of technology-integrated education for keeping educational programs up and running all around the globe. With no exception, the field of second language learning felt the paramount need to rely indispensably on computer-assisted language learning (CALL) to adopt Internet-based distance learning (Barbour & Hodges, 2024). Such an augmented necessity of CALL and the ongoing advancements of educational technology have placed an onerous burden on language instruction stakeholders, particularly on teachers with their pivotal role in CALL pedagogy (Nazari & Xodabande, 2022), to stay technologically updated (Palacios-Hidalgo & Huertas-Abril, 2025).

As teachers and educators occupy a decisive role in realizing the full potential of CALL in their online and in-person classes for maximum instructional gains (Aşik et al., 2019), the need for effective CALL teacher education courses that can provide teachers with up-to-date knowledge on how to use technology in their teaching practice gains immediate significance. Research in general shows that language teachers have insufficient professional expertise as expected on how to use up-to-date CALL technology effectively in their teaching practice (e.g., Kessler & Hubbard, 2017; Kim, 2022; Meirovitz et al., 2022; Rayeji & Tabandeh, 2023). The main reason for such a rudimentary knowledge may be the fact that preservice and in-service teacher education courses are mostly bereft of essential expertise and skills for technology-enhanced instruction (Park & Son, 2022), making teachers rely mostly on their own personal experiences (Tafazoli & Meihami, 2023). Consequently, a pressing need exists for developing and running professional CALL teacher education courses to prepare competent and technology-savvy teachers for CALL courses (Nami, 2022).

Given the development and availability of advanced computerized technology worldwide and the recent proliferation of empirical research into CALL teacher education particularly in high-tech countries in North America, Europe, and East Asia (e.g., Egbert & Borysenko, 2019; Li, 2020; O'Dowd & Dooley, 2021; Palacios-Hidalgo & Huertas-Abril, 2025), it is therefore crucial to examine teacher educators' (TEs) current CALL knowledge and use in the Iranian English as a foreign language (EFL) context, where persistent difficulties in CALL implementation have been reported among both teachers and learners (Dashtestani & Hojatpanah, 2022; Nazari & Xodabande, 2022). Accordingly, this mixed-methods study aimed to examine Iranian EFL teacher educators' knowledge and use of CALL, the challenges encountered in delivering effective CALL teacher education courses, and the strategies adopted to maintain up-to-date CALL pedagogical knowledge. Accordingly, we formulated the following research questions to guide the design of the study:

- To what degree are TEs knowledgeable of and using CALL tools?
- What are the challenges of holding effective CALL teacher education courses faced by TEs?
- What strategies do TEs use to update their CALL knowledge?

Literature Review

CALL Teacher Education

According to Darling-Hammond (2006), effective teaching in any educational context requires teachers' proficiency in communicative skills and classroom management, as well as an understanding of the learning process, pedagogical content knowledge, learners' psychological factors, and sociocultural variables. The education of teachers possessing these skills lies in the hands of effective teacher education courses that use technology effectively to prepare technologically cognizant future teachers (Li, 2020). Relatedly, the rapid development of educational technology and the surge in distance instruction have also increased demands on language teachers to use up-to-date technology in their teaching practice to help language learners thrive continuously in their arduous process of language learning (Teimouri et al., 2020).

Given the indispensable role of teachers in utilizing CALL effectively in tandem with the goals of language courses (Park & Son, 2022), providing professional CALL teacher education courses gains immediate significance (Tafazoli & Meihami, 2023). As argued by Guichon and Hauck (2011), if CALL teachers are not provided with the necessary technology-enhanced instruction and awareness, they may rely on their own experiences to select and integrate inappropriate technologies into their teaching without proper professional knowledge, leading to ineffective CALL pedagogy. It is here that the role of efficacious CALL teacher education courses is emphasized because a successful CALL teacher education course should not only transfer knowledge from research to practice but also develop and improve teachers' ability to integrate technology into their language courses (Torsani, 2016).

Thus, the main function of CALL teacher education should be helping teachers know how to use different software and applications, develop knowledge of available technologies, and combine such tools with their methodology in a coherent instructional plan (Tafazoli & Picard, 2023). Research shows that, unlike teachers in many other educational fields, it seems that second language teachers are comparatively less inclined to use technology and relevant pedagogically sophisticated tasks in teaching various language skills and subskills (Meirovitz et al., 2022; Tabandeh et al., 2018). This necessitates the conduction of rigorous survey studies on the current status of CALL and the possible challenges teachers and/or TEs face in implementing CALL technology, and how effective CALL teacher education courses can help them overcome such challenges (Liu et al., 2017).

CALL Teacher Education: Research on TEs' Perspectives

CALL teacher education is a well-discussed area of inquiry in second language teaching literature with some edited volumes specifically targeting the concept (e.g., Tafazoli & Picard, 2023; Torsani, 2016). Nevertheless, notwithstanding the increasing body of knowledge in this regard, arriving at a sophisticated understanding of the content of CALL teacher education has remained controversial and debatable (Nazari & Xodabande, 2022), particularly due to the

variations in perceptions regarding implementing CALL in different sociocultural contexts (Ertmer et al., 2012). Furthermore, a disconcerting distinction seems to exist between CALL knowledge and skill (Hubbard & Levy, 2006), with the great bulk of research focusing on teachers' technology knowledge instead of how and with what challenges this knowledge is put into use in the classroom (Egbert & Borysenko, 2019).

As for the significance of educators' standpoints for educational researchers, Ajzen (1991) argues that their attitudes and perceptions are vital to any educational inquiry because their ideas and behaviors help researchers and curriculum developers understand their behavior more comprehensively. Research shows that there is a strong connection between educators' attitudes and their classroom practice (e.g., Gil-Flores et al. 2017). According to Torsani (2016), CALL teacher education research mostly comprises three different domains including theoretical and prescriptive inquiries aiming to survey the proficiency and competencies required for technological teachers (e.g., Guichon & Hauck, 2011), studying teachers' habits, attitudes, and abilities regarding the implementation of technology by teachers and its effectiveness (e.g., Egbert et al., 2002), and operative inquiries aiming to examine the most effective methods and techniques for CALL education (e.g., Debski, 2006). As for the methodology of CALL teacher education research, Torsani (2016) asserts that most studies in this area are qualitative in nature and rely primarily on interviews in case study designs (e.g., Liu & Kleinsasser, 2023). Indeed, as argued by Torsani (2016), the dominance of qualitative case studies has limited the generalizability of findings in this regard, so a mixed-methods design seems essential for integrating in-depth contextual insights from TEs with quantitative evidence, enhancing the robustness and broader applicability of the results.

A careful review of the literature on TEs' perceptions of the use of CALL technology in teacher education courses reveals limited research in this area (e.g., Aşik et al., 2019; Meihami, 2021; Nguyen et al., 2023; Palacios-Hidalgo & Huertas-Abril, 2025; Tafazoli & Meihami, 2023). As an example, in a multicultural study, Aşik et al. (2019) investigated the effectiveness of integrating technology in language teacher education courses in three EFL contexts of Turkey, Portugal, and Poland from the perspectives of TEs and preservice teachers. Utilizing a combination of qualitative and quantitative data, they observed that language teacher education programs seemed to emphasize CALL knowledge and hence implement CALL teacher education strategies in their educational programs, albeit not to their full potential. Yet, TEs in these contexts possessed mediocre CALL knowledge, which is also reported by Meihami (2021) in the Iranian EFL context, in which TEs are reported to lack adequate CALL knowledge to implement updated technological tools and applications in their teacher education courses. Likewise, Nguyen et al. (2023) studied how Vietnamese TEs fine-tuned their practices to incorporate CALL awareness and implementation in their educational courses. They observed that the main challenge for TEs is their limited professional knowledge and lack of educational resources regarding CALL and its applications in the teacher educational context. More recently, Palacios-Hidalgo and Huertas-Abril (2025) conducted a qualitative study and observed that Spanish EFL TEs tend to use technology to enhance EFL students' learning, but

also were concerned about diversity through CALL, especially by promoting independent work and personalizing learning through adapted materials adjusted to the learners' cognitive levels and additional time. Overall, all these studies show that serious steps should be taken to identify the barriers and challenges of implementing technology in teacher education courses by hearing the voices of TEs in different educational contexts.

The ongoing advancement of computerized technology and its application in education has put unrelenting pressure on second language stakeholders to implement CALL in their language programs (Barjesteh & Isaee, 2024; Meirovitz et al., 2022). This highlights the significance of implementing CALL teacher education courses to educate future second language teachers to use CALL efficiently in their pedagogy. Nevertheless, research examining TEs' perceptions in this area remains limited, as most prior studies have relied on qualitative or case study methodologies (e.g., Aşik et al., 2019; Huertas-Abril, 2025; Meihami, 2021; Nguyen et al., 2023), rather than mixed-methods designs capable of integrating qualitative and quantitative data for more comprehensive insights (Torsani, 2016). Accordingly, this study investigated the current status of CALL in the Iranian EFL context by exploring TE's knowledge and use of CALL tools, the challenges encountered in delivering effective CALL teacher education courses, and the strategies adopted to update their CALL knowledge.

Method

Design

This study followed a mixed-methods approach with an explanatory sequential design to investigate Iranian EFL TEs' knowledge, challenges, and strategies regarding CALL teacher education courses. This design includes a follow-up qualitative data collection to help explain the findings of the quantitative phase (Creswell & Creswell, 2018). First, in the quantitative phase, the participants were required to complete the questionnaire. Then, immediately afterwards, in the qualitative phase, a sample of the participants sat in the interview sessions.

Participants

A total of 74 TEs participated and completed the questionnaire (48 female and 26 male participants; $M_{age} = 39.25$, $SD_{age} = 3.46$; $M_{teaching experience} = 14.41$ years). They were selected via convenience and snowball sampling methods, as those participants who were asked to participate also recommended other potential participants. The participants belonged to different universities and language institutes in Iran, where they had at least three years of experience in teaching EFL teacher education courses. Among the participants, 29 held a Ph.D. degree in TEFL, English literature, or English translation studies, while 45 held a master's degree in the aforementioned fields. Fifteen TEs (8 female and 7 male participants) were also randomly selected from these participants to participate in the interview phase of the study, sharing their practical and expert opinions on the specific topics explored in the questionnaires. Ethical considerations were addressed by obtaining informed consent from all participants.

before data collection, and participants were assured that their responses from the questionnaires and interviews would be kept confidential and used solely for research purposes.

Instrumentation

In this study, two instruments were used for data collection: a questionnaire and a semi-structured interview. The questionnaire was developed through a systematic multi-stage process grounded in the theoretical frameworks and empirical findings of prior research on CALL and teacher education in educational and second language contexts (e.g., Asiri et al., 2021; Dashtestani & Hojatpanah, 2022; Tafazoli, 2022). Initially, an extensive pool of items (57 initial items) was generated based on a comprehensive review of relevant literature. This preliminary item pool was then subjected to multiple rounds of review and refinement by the researchers to ensure clarity, relevance, and representativeness. Subsequently, expert judgment was sought from three specialists in CALL and educational technology to evaluate the content validity, wording, and appropriateness of the items. Based on the experts' feedback, revisions were made, redundant or ambiguous items were eliminated, and necessary modifications were applied. This iterative process resulted in the final version of the questionnaire, including a total of 53 items in four sections. The first section (14 items) assessed TEs' CALL knowledge (e.g., *I am competent enough to use electronic dictionaries*), the second section (14 items) assessed the self-reported use of CALL tools (e.g., *I frequently use electronic dictionaries*), the third section (17 items) investigated the main challenges of running effective CALL teacher education courses (e.g., *Lack of funds to implement technology in teacher education courses is an important challenge faced by TEs*), and finally, the fourth section (8 items) examined TEs' strategies for updating their CALL knowledge (e.g., *Participating in CALL workshops is an effective strategy to update my CALL knowledge*). All questionnaire items were based on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The questionnaire took approximately 25 minutes to complete. The questionnaire was pilot-tested with 35 TEs who were different from the target sample of the study and demonstrated acceptable internal consistency reliability, as indicated by Cronbach's alpha ($\alpha = .83$). In addition, each section of the questionnaire showed satisfactory reliability: CALL knowledge ($\alpha = .78$), CALL use ($\alpha = .84$), CALL teacher education challenges ($\alpha = .85$), and CALL strategies ($\alpha = .81$).

As for the second instrument, an interview protocol was developed whose questions were based on the results of the quantitative phase of the study (the questionnaire results). Four questions were devised, each focusing on a theme: knowledge of CALL tools (*How familiar are you with necessary CALL tools and applications?*), use of CALL tools (*How often do you use CALL technology in your teacher education courses?*), challenges of holding effective CALL teacher education courses (*What are some main challenges you face in using CALL technology in your teacher education courses?*), and strategies to update CALL knowledge (*What strategies and activities do you do to update your CALL knowledge?*). To ensure the questions were valid and suitable, an initial test run was conducted with a teacher group comprising five different TEs from the study sample. Based on the results, the researchers

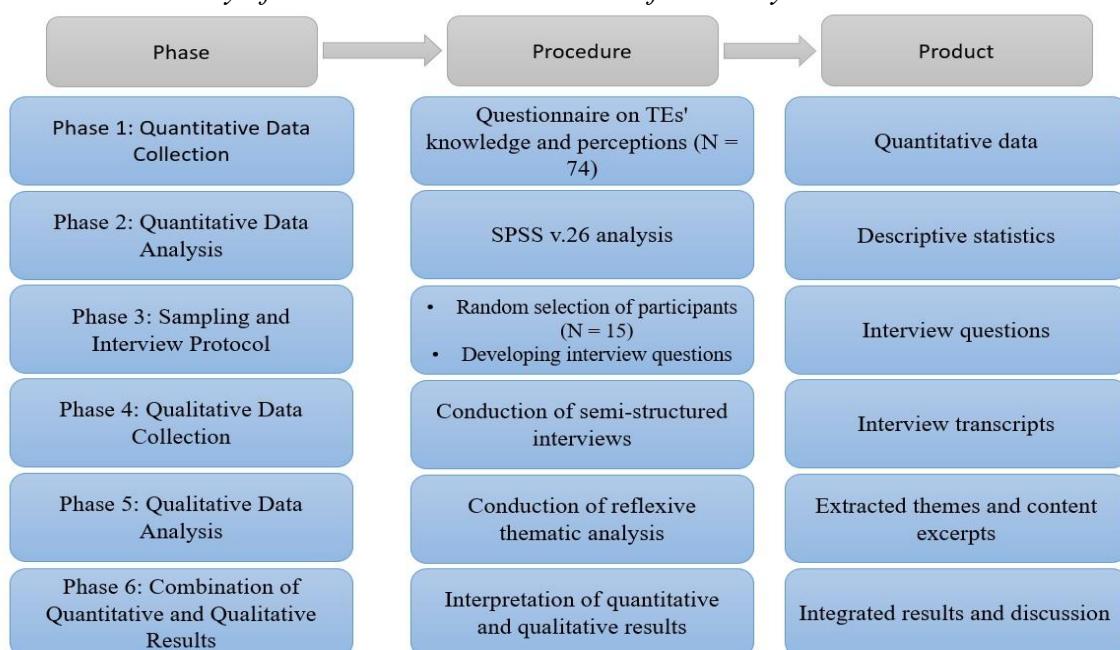
refined the questions in terms of content and form to make them as informative and unambiguous as possible. The interview sessions lasted about 10 minutes per participant.

Data Collection Procedure

To answer the research questions, quantitative and qualitative data were collected. To collect quantitative data (quantitative phase), 74 TEs were selected via convenience and snowball sampling methods from different universities and language institutes. The participants were then given either the print version of the developed questionnaire or the online version. After collecting the completed questionnaires' data and analyzing them accordingly, the interview questions were devised based on the participants' overall perceptions regarding CALL knowledge, use, challenges, and strategies reflected in the questionnaire results. Next, 15 TEs were randomly selected from the participants and were required to sit in the interview sessions (qualitative phase). The interviews were conducted either in person or by sending the questions to the teachers via WhatsApp for written responses. Finally, descriptive statistics were used to analyze the quantitative data, and thematic analysis was employed to examine the qualitative data. Figure 1 demonstrates a summary of the data collection procedure of the study.

Figure 1

Schematic Summary of Data Collection Procedure of the Study



Data Analysis

To analyze the quantitative data, the participants' responses to the questionnaire's items were subjected to analysis using SPSS v.26, and the mean and standard deviation values were obtained. The qualitative data gathered from interviews were subject to a robust, inductive thematic analysis based on Creswell and Creswell's (2018) framework, in which codes and

themes emerged from participants' comments. The interview responses were audio-recorded and then thematically analyzed via the seven steps of thematic analysis: (1) organizing and preparing the data for analysis, (2) familiarizing with the data, (3) coding the data, (4) generating initial themes from the codes, (5) developing and reporting the themes, (6) refining and labeling the themes, and (7) validating the accuracy of the findings. Regarding the reliability of the qualitative analysis, 50% of the qualitative data was coded randomly by a second coder (a colleague of the researchers), and the results of intercoder reliability analysis (Cohen's Kappa k) for extracted themes revealed a substantial collaborative agreement ($k = .76$) between the two coders. Moreover, to ensure the validity (credibility) of the findings, the extracted themes were shared with the participants (member checking) to warrant the accuracy of the findings (see the Appendix for a sample of extracted codes and themes).

Findings

The first research question addressed TEs' knowledge and use of CALL in their current teacher education practice. Table 1 presents an overview of the responses to the questionnaire. The mean range (M) 1-2.99 shows a low level of knowledge and use, 3-3.99 a moderate level, and 4-5 a high level.

Table 1

TEs' Knowledge and Use of CALL Tools and Applications

Items	Knowledge		Use	
	Mean	SD	Mean	SD
Electronic dictionaries	4.30	0.69	4.28	0.69
PowerPoint	4.11	0.87	3.59	1.06
Holding online classes	3.75	1.00	3.61	1.07
Wiki	2.86	1.18	2.74	1.00
Blogging	2.93	1.17	2.66	0.98
Interactive whiteboard	2.62	1.14	2.59	1.01
Testing software	2.27	1.02	2.50	1.19
Educational sites	3.42	1.07	3.38	1.12
Flipped learning	2.57	1.24	2.46	1.09
Podcasts	3.24	1.09	3.08	1.08
Online content creation	3.07	1.12	3.30	0.99
Language teaching software	3.11	0.98	3.07	1.13
Mobile applications	3.14	1.01	3.03	0.96
Computer games	2.34	0.98	2.95	1.05

Accordingly, the participants demonstrated a low-to-moderate level of knowledge about the majority of features, including efficient online content creation (e.g., blogging ($M = 2.93$) and websites ($M = 3.42$)), using advanced online teaching and assessment techniques (e.g., flipped classroom ($M = 2.57$) and online testing ($M = 2.27$)), using technological tools (e.g., interactive whiteboards ($M = 2.62$)), and running online classes ($M = 3.75$). On the contrary, they were

only adequately knowledgeable about and used electronic dictionaries ($M = 4.30$) and PowerPoint slides ($M = 4.11$). These descriptive findings also suggest that items with higher knowledge scores tend to have higher usage scores, indicating a close relationship between knowledge and self-reported use.

As for the results of the interviews, three broad themes emerged from the participants' comments: 'poor Internet access', 'unfamiliarity with the up-to-date educational software and applications', and 'inadequacy and unavailability of sufficient free applications'. For instance, the majority of the respondents indicated that they lacked sufficient knowledge of test-authoring software to design online tests and of how to implement flipped learning in online classes. A TE's comment reflects this issue:

Using online and computer-based language tests is a necessary component of CALL programs. Yet, I believe most TEs are not familiar with this technology and hence need training in this regard. (TE 3)

In sum, quantitative and qualitative results suggest that Iranian TEs possess mediocre knowledge of necessary CALL tools. On the other hand, due to the close association between TEs' CALL knowledge and their self-reported use of such knowledge in their teacher education practice, they infrequently used essential CALL technologies in their teaching practice. Regarding the second research question, that is TEs' attitudes toward challenges of holding effective CALL teacher education courses, lack of time ($M = 4.36$) and funds ($M = 4.01$), lack of student teachers' requests ($M = 4.31$), lack of digital facilities ($M = 4.11$), and absence of a needs-analysis ($M = 4.01$), lack of curriculum planners' awareness of the necessity of using technology in education ($M = 4.16$), and lack of TEs' motivation ($M = 4.12$) were highlighted as the main possible hindrances (see Table 2). Hence, most respondents believed that timing and funding are the strongest challenges concerning the design of CALL teacher education courses.

During the interviews, two main themes emerged from participants' comments: 'shortage of CALL experts', and 'technical issues'. They acknowledged that the biggest challenge in holding efficient CALL teacher training courses is the shortage of experts who are competent in both English language methodology and CALL technology. For example, one TE commented that:

Unfortunately, although TEs are generally competent in language teaching methodology and teaching student teachers the benefits and challenges of language instruction, they often lack sufficient knowledge of CALL and its application for educational purposes. (TE 13)

Table 2*Challenges of Holding Effective CALL Teacher Education Courses Faced by TEs*

Items	Mean	SD
Lack of funds	4.01	0.92
lack of time	4.36	0.96
Lack of a suitable place	3.78	0.93
Lack of awareness of the necessity of using technology in teacher education	3.66	0.98
Lack of digital facilities	4.11	0.85
Lack of expert trainers to train teachers	4.01	0.86
Lack of planning	3.99	0.97
Lack of student teachers' requests	4.31	0.55
Lack of student teachers' needs	3.85	0.93
Lack of TEs' desire to use technology for education	3.53	1.06
Lack of student teachers' desire to use technology for education	3.47	1.15
TEs' negative attitude towards using technology for teaching	3.22	1.24
The negative attitude of policymakers towards using technology for teaching	3.34	1.20
Ignoring TEs' opinions in educational planning	3.68	1.07
Absence of a needs analysis stage before educational planning	4.01	0.94
Planners' lack of awareness of the necessity of using technology in education	4.16	0.78
TEs' lack of motivation	4.12	0.81

As a solution to this problem, they suggested creating a new field of study in universities at the bachelor's or master's level to educate specialists who can address this challenge. For instance, some participants suggested that a CALL-oriented master's program in teaching English as a foreign language (TEFL) can be developed and offered to master's students to specifically educate and prepare EFL teachers who are also experts in CALL tools and applications. A TE's comment clarifies this point:

In the master's program in TEFL, we are theoretically and practically educated about how to become language teachers. Nevertheless, TEFL programs do not usually offer any courses about how to use technology to teach language. So, if CALL-based TEFL programs are devised and offered, future language teachers and TEs can be competent CALL practitioners. (TE 10)

The other obstacle in the way of implementing CALL teacher education courses is technical issues, such as low Internet quality and generally inadequate CALL facilities, which can pose difficulties in running these courses smoothly and efficiently. On the lack of updated facilities, one TE mentioned that:

Even if EFL teachers and TEs are passionate about updating their knowledge of CALL and using such knowledge in their teaching practice, the available facilities in institutes and universities do not allow them to do so because they are mostly outdated. (TE 7)

In terms of the third research question, which focused on different strategies used by TEs to brush up their CALL knowledge, they mostly preferred to attend blended CALL courses ($M = 4.56$) and in-service CALL-training courses ($M = 4.42$), participate in in-person CALL-training courses ($M = 4.17$) and webinars and seminars ($M = 4.14$), and take self-study measures ($M = 4.22$) in their bachelor's or master's programs (see Table 3). Participating in workshops was not their choice as a useful way of enhancing CALL awareness and knowledge.

Table 3*TEs' Strategies to Update their CALL Knowledge*

Items	Mean	SD
Participating in CALL workshops	2.47	1.04
Participating in in-service CALL courses	4.42	0.83
Participating in in-person CALL courses	4.17	0.86
Participating in online CALL courses	3.05	0.57
Taking self-study and self-preparation measures	4.22	0.83
Participating in blended CALL courses	4.56	0.77
Participating in CALL seminars	4.14	0.68
Participating in CALL webinars	4.14	0.85

Based on the results of the interviews, two key themes emerged: 'importance of motivation level' and 'importance of blended classes'. Firstly, they believed that the way classes are conducted is not the most important factor and that the fundamental issue is to improve the motivation level of TEs and the degree of importance they place on this matter. Relatedly, a TE commented:

As a TE, I feel the need to attend CALL teacher education workshops, as technology plays a significant role in today's education, with language teaching being no exception. This need highly motivates me to do so. (TE 9)

Secondly, they preferred blended CALL-training classes over in-person or online classes. Indeed, the sole online classes were the least favorable type of classes for the TEs. This preference is highlighted in the TEs' interviews as they expressed that blended courses would benefit from the advantages of both in-person and online classes while reducing their disadvantages. A comment by a TE elaborates on this preference:

In-person classes can provide a richer environment for emotional and communicative relationships between teachers and students compared to mere online classes. To benefit from the advantages of online classes and mix them with in-person classes, blended courses can be offered. (TE 9)

Finally, TEs attached significant importance to the role of self-study and self-improvement in boosting their CALL knowledge in their questionnaire responses. In the same vein, in

interviews, they expressed that aside from CALL-training programs and workshops offered by universities and language institutes, TEs need to take responsibility for their progress in CALL technology and do their best to enhance their CALL knowledge and practice via self-directed learning and training endeavors. A TE's comment clears this point:

TEs should take responsibility and do their best to stay updated with the latest educational technology. Even if such training courses and programs are not offered by their academic departments, they can stay updated by self-study and self-training using available online resources. (TE 3)

All in all, the quantitative and qualitative results of the study showed that Iranian EFL TEs have mediocre knowledge of CALL tools and applications and in accordance with this knowledge, they cannot use CALL technology efficiently in their teaching practice. Besides, they face many challenges in implementing effective CALL teacher education courses such as lack of funds and time, lack of updated facilities, and lack of sufficient CALL knowledge. Nevertheless, they tend to rely on different strategies to update their CALL knowledge such as participating in CALL courses and workshops as well as taking effective self-improvement measures.

Discussion

Investigating educators' perceptions plays a significant role in understanding the teaching status quo (Ajzen, 1991) as they can directly reflect their pedagogical classroom practice (e.g., Gil-Flores et al., 2017; Ozden et al., 2024). Therefore, given the significance of implementing CALL technology in today's EFL instruction and educating preservice and in-service teachers in this regard (Barjesteh & Isaee, 2024; Pokhrel & Chhetri, 2021), we undertook this mixed methods study to investigate Iranian EFL teacher educators' (TEs) knowledge and use of CALL, their challenges to hold effective CALL teacher education courses, and strategies they use to update their CALL knowledge and practice.

The first research question (RQ1) addressed TEs' knowledge and practice of CALL tools and applications. Their responses to the questionnaire showed that, whereas they have a low-to-moderate level of knowledge about cutting-edge CALL technology (i.e., computer games and gamified teaching/learning applications, interactive whiteboards, and testing software) and hence rarely use them, they are familiar with some older technologies, such as electronic dictionaries and PowerPoint slides. Relatedly, in interviews, they stated that although they are very positive about learning and using such technology in their teaching practice, they face three main obstacles, including poor Internet quality, unfamiliarity with up-to-date educational software and applications, and unavailability of advanced technology. Unlike some studies in general education in highly developed countries reporting sufficient technology knowledge by TEs (e.g., Ozden et al., 2024; Uerz et al., 2018; Val et al., 2024), the findings of the current study are in agreement with the results of several studies in the CALL context that reported insufficient knowledge in developing contexts (e.g., Aşik et al., 2019; Meihami, 2021; Nguyen et al., 2023; Palacios-Hidalgo & Huertas-Abril, 2025). For instance, Aşik et al. (2019) observed

that TEs in three EFL contexts (Turkey, Portugal, and Poland) have positive attitudes towards using CALL in teacher education courses, yet lack sufficient knowledge in this respect. This finding is also reported by Meihami (2021) in the Iranian EFL context. These findings show that EFL TEs, particularly in technologically less developed countries, generally possess inadequate updated CALL knowledge, primarily due to limited access to continuous professional development, infrastructural constraints, and the persistent digital divide (Val & López-Bueno, 2024). This lack of updated knowledge and the ensuing ineffective practice may contribute to inadequate CALL education and practice in teacher education courses and transfer automatically to the student teachers, causing unfamiliarity with appropriate and updated CALL tools and applications in future EFL teachers as well. Consequently, it seems that Iranian EFL TEs have to rely on older yet more familiar types of CALL technology due to their ease of availability and use, but eschew using more advanced technologies, which reflects on their teacher education practice in the classroom. This underscores the importance of CALL awareness and practice among EFL TEs and the need to offer CALL teacher education courses that enable EFL teachers to stay technologically up to date and develop the knowledge required for effective CALL use (Barbour & Hodges, 2024).

Motivational factors might also be at play. This study found that Iranian EFL TEs lack sufficient motivation to implement CALL in their teacher education practices, primarily due to the unavailability of advanced technology, increased workload, and the exclusion of their perspectives from curriculum planning. According to Park and Son (2022), educators' experiences with technology affect their tendency and motivation to learn and implement technology in their classrooms. This is a complex phenomenon as TEs' actual use of technology in the classroom is multi-faceted because their technical knowledge and skills alone do not ensure their willingness to use technology in the classroom. In this study, TEs stated that despite challenges and shortcomings, they are used to implementing some more traditional CALL tools, such as PowerPoint slides, and based on this experience, they are highly motivated to participate in different types of CALL-training courses to get acquainted with more cutting-edge CALL technologies. Therefore, this prior experience, as well as the need to use more recent technology, provides the necessary motivational drive for TEs to be more willing to increase their knowledge of CALL and apply it in their teacher education programs (Barbour & Hodges, 2024).

The second research question (RQ2) addressed the challenges TEs face in holding effective CALL teacher education courses. The participants stated that time constraints, lack of up-to-date digital facilities, lack of sufficient funds, weak and low-quality Internet connection, and absence of scrupulous needs analysis are the main challenges. Moreover, in interviews, they mentioned that the Iranian EFL context seriously lacks TEs who are experts in CALL. To tackle this problem, they suggested that a new field of study in CALL at the undergraduate or graduate levels can be developed to educate teachers as CALL experts. Generally, similar challenges have been echoed in the CALL literature in different language learning contexts, particularly in EFL ones in developing countries (e.g., Meihami, 2021; Nguyen et al., 2023; Tafazoli &

Meihami, 2023). For instance, Meihami (2021) reported that inertia, ignorance of training CALL educators, insufficient time to address CALL, inadequate facilities, and a lack of established methodology to administer CALL teacher education are among the main hindrances to conducting CALL teacher education in the Iranian context. As also reported in interviews in the current study, another challenge is the lack of EFL teachers' motivation to participate in CALL teacher education programs, probably due to their insufficient knowledge and unfamiliarity (Meihami, 2021). This can demotivate TEs to use and promote CALL in their teacher education courses. Also, the swift advancement of technology requires TEs to stay updated constantly, provided they are willing to implement CALL in their teacher education courses. This may also put TEs under extra stress and workload, hence making them avoid running CALL teacher education courses (Tafazoli & Meihami, 2023). Overall, it seems that there are a lot of technical and pedagogical challenges facing TEs in the Iranian EFL context, which can be dealt with through carefully designed CALL teacher education courses held by CALL experts (Nguyen et al., 2023).

Finally, the third research question (RQ3) focused on TEs' strategies to update their CALL knowledge and tackle perceived challenges. The questionnaire responses revealed that TEs prefer blended and in-person CALL courses, self-preparation endeavors, and in-service CALL workshops. Yet, in interviews, they stated that simply attending special courses is not sufficient, as what matters the most is the motivation created to attend such classes. They mentioned that blended or in-person courses are preferable because they could be more motivating and engaging for both preservice and in-service teachers. Scant research has investigated features of effective CALL teacher education programs and strategies to deal with challenges (Guichon & Hauck, 2011), but few recent studies generally reflect the findings of the current study. For example, in this study, TEs emphasized the role of self-preparation in addition to attending different types of CALL education courses, which is also echoed in the results of Aşik et al.'s (2019) study. Moreover, it was observed that TEs prefer blended and in-person CALL workshops and courses to online ones as they are more engaging and motivating. Similarly, Abdel Latif (2022) reported a similar tendency among TEs, as reflected on language blogs, stating that participating in blended CALL courses and workshops is one strategy employed by TEs to improve their CALL knowledge and practice. Overall, these mixed-methods findings suggest that, despite Iranian EFL teachers encountering significant challenges in updating their CALL knowledge and delivering effective courses, they are set to adopt a range of coping strategies to update their knowledge and enhance the use of CALL tools in teacher education courses. These findings underscore the need for reforms in CALL teacher education policies aimed at familiarizing TEs with CALL and updating their CALL knowledge, as well as promoting its effective integration into EFL teacher education courses.

Conclusion

In this mixed-methods study, we investigated Iranian EFL TEs' knowledge and practice of CALL as well as challenges of holding effective CALL teacher education courses and strategies

for CALL knowledge improvement. We administered a questionnaire and carried out semi-structured interviews, and analyzed the participants' answers to the questionnaire via descriptive statistics and their answers to the interview questions via reflexive thematic analysis. Overall, the findings indicate that Iranian TEs possess insufficiently updated CALL knowledge, which is reflected in their self-reported use of CALL technologies in their EFL teacher education courses. Such limitations in knowledge and use are particularly evident in CALL-based teaching methodologies, assessment practices, and the integration of up-to-date CALL technologies into teaching practice. Nevertheless, despite these shortcomings and challenges, TEs tend to employ a variety of efficient strategies, such as participating in in-person or blended CALL workshops and webinars, to enhance their CALL knowledge and practice in EFL teacher education courses.

These findings underscore the need for TEs to continuously update their CALL knowledge through self-directed professional learning, hands-on experiential activities, and project-based online or blended workshops and seminars, as sustained engagement with evolving digital pedagogies is essential for modeling effective technology integration and preparing future language teachers to meet the pedagogical demands of technology-enhanced learning environments. On the other hand, in light of the self-reported uses and challenges identified in this study, EFL education policymakers and curriculum developers should recognize the importance of integrating up-to-date, practice-oriented technologies into EFL instruction and accordingly design and implement effective CALL-focused teacher education courses and professional development workshops for TEs. By so doing, constructive and fruitful CALL teacher education courses can be offered to preservice and in-service EFL teachers who, in turn, can make use of CALL technology most effectively in their routine EFL teaching practice.

Ultimately, we encountered some limitations in conducting the study, which can be addressed in future studies. First, owing to the limited sample size and the mixed-methods design, which allowed qualitative data to enrich the quantitative findings, formal, statistical validation of the questionnaire via factor analysis was not feasible; therefore, content validity was assessed through expert judgment, while construct validity was not examined. Future research is encouraged to employ factor structure analyses, including exploratory and confirmatory factor analyses, to provide a more robust assessment of the questionnaire's construct validity. Moreover, we collected questionnaire and interview data, both of which reflect participants' self-reported perceptions, not their actual teaching behavior. Accordingly, future studies are encouraged to include classroom observations of CALL practices in teacher education courses, in addition to examining stakeholders' perceptions, to enable more robust comparisons. Moreover, we only focused on TEs as one of the main stakeholders in EFL teacher education programs. Palpably, there are other significant stakeholders such as student teachers, language institute managers, and educational policymakers who are directly involved in designing and offering teacher education courses and hence can impact the quality of CALL-based teacher education courses. Hence, future studies can include a wider range of participants to have a more exhaustive perspective on the matter.

Bio-data

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Appendix

A sample of codes and themes, extracted as a result of the thematic analysis of the data

Themes	Codes
- Poor Internet access	- Slow Internet speed - Frequent disconnections - Unstable network coverage - Limited access in certain regions - Difficulty using new software - Limited digital literacy - Inadequate training on applications - Lack of free educational software - Cost barriers for paid applications - Limited institutional subscriptions - Lack of trained CALL professionals - Insufficient technical support staff - Few training opportunities - Inadequate CALL workshops - Software malfunctions - Online platform crashes - Hardware failures
- Unfamiliarity with updated educational software and applications	- High motivation improves learning Low motivation hinders participation - Combining online and face-to-face learning - Flexibility in learning modes
- Inadequacy and unavailability of sufficient free applications	
- Shortage of CALL experts	
- Technical issues	
- Importance of motivation level	
- Importance of blended classes	