Research Paper

Developing a Pedagogical Taste for Online Instruction with Teaching Projects through the Course of CALL Preparation

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Abstract

To prepare language teachers for technology-enhanced language instruction, relevant courses and programs should be designed. In practice, however, many of computer-assisted language learning (CALL) teacher education attempts fail to effectively prepare language teachers to integrate technology in the reality of their classrooms due to their purely theory-oriented lecture-based designs. Without an opportunity to put what is learned into practice prior to actual classroom instruction, teachers cannot be expected to acquire the knowledge for technology-assisted language instruction. Teaching practice projects have not received due attention in CALL teacher education research. To address this gap, a case study was conducted on a group of in-service English as a foreign language (EFL) teachers (N= 7) who were attending an online CALL course, to explore the extent to which practice can enhance their pedagogical knowledge of CALL. Each participant was required to take charge of an online session as the course instructor and practice defining the session, developing presentation materials, uploading the files, and directing and managing classroom discussions. Drawing on the data obtained from participants' post-teaching-practice journals and CALL Pedagogical Knowledge Questionnaire responses, it was observed that teaching projects in an online classroom combined with peer observation helped participants enhance their knowledge of learning management systems, digital materials development, technology-related potentials and drawbacks, and strategies for managing online sessions. The findings of this study provide implications for online CALL teacher education research.

Keyword:
teacher education, CALL, teaching practice, language teachers

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Introduction

Online classrooms have long made their way into various disciplines including second and foreign language education. The growing application of online education necessitates proper teacher preparation so that teachers are enabled to effectively function in these contexts. Considering the pivotal role that teachers play in delivering instruction in educational contexts, the success and/or failure of any pedagogical plan is in part reliant on their expertise and knowledge. Extending this to online and technology-enhanced education, it can be claimed that teacher education for technology-enhanced language instruction, widely referred to as computer-assisted language learning (CALL) professional development (PD), is an imperative for successful teaching attempts in online platfroms (see Arnold & Ducate, 2015; Healey et al., 2008; Tondeur et al., 2019).

Reviewing computer-assisted language learning (CALL) research more than two decades ago, Levy (1997) reported a lack of attention to teacher preparation for CALL. In 2008, Hubbard made a similar observation noting that language teachers are graduated from preparation courses with no or very limited knowledge of technology-enhanced language teaching and learning. Today, the same argument still applies to CALL teacher education. Empirical data on CALL teacher education, namely online CALL PD, for second and foreign language instruction remains scant (Nami, 2021). A careful review reveals that current CALL teacher education attempts "are not aligned with the necessary skills and strategies to prepare future language teachers for educational technology use" (Aşık et al., 2020, p. 2). As Hubbard (2008b) notes, teacher education courses and programs usually fall short of applying an effective and relevant methodology to prepare language teachers for technology-enhanced instruction. In many of these courses, there is an exclusive focus on the introduction of technology per se in highly teacher-centered classroom settings.

Furthermore, as Peter et al. (2012) note, CALL PDs are, by and large, drawing on lecture-based pedagogies for teacher preparation. Purely theory-oriented teacher-centered PD cannot effectively prepare teachers for technology integration into their classroom instruction (Nami, 2021). In such contexts, teachers mainly learn about the technical aspects of digital technologies (Kessler & Plakans, 2008). Dooly (2009) refers to this as a gap that exists between "the 'virtual reality' of teacher training and the 'too-real' reality of… teaching" (p. 365).

To address this problem, CALL PD courses and programs need to preserve more active roles for the participating pre- and in-service teachers. A careful review of related research (e.g., Kay, 2006; Nami, 2021; Wallace, 1991; Wang et al., 2010) reveals that real classroom practice is widely promoted as an activity that can actively engage teachers in the process of knowledge construction through the course of preparation. Despite this overarching emphasis on the contribution of real teaching experiences and practices to the development of teachers' pedagogical knowledge, studies that integrate practice opportunities into their design remain largely scant. It is even harder to find studies with a focus on teacher practice in online CALL teacher education research.

The present study features an attempt to shed more light on this less traversed research area. A qualitative case study was conducted with the participation of seven Iranian in-service language teachers who were attending an online CALL teacher preparation course. They were

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engaged in online teaching and classroom management practices throughout the course. The study was grounded on inquiry-based learning approaches and the constructivist notion of knowledge as a social construct. The next section offers a review of relevant research. It is followed by a detailed account of the methodological considerations, results, and discussion. The paper ends with a review of the concluding remarks and pedagogical implications of the study.

Literature review

Online CALL Teacher Education

Although CALL-related instructional models, theories, and studies have been phenomenally surging over the past decades, their integration into language teachers' actual classroom practice has not been as fast as anticipated (see Nazari & Xodabande, 2020). A careful review of CALL teacher education research reveals that online CALL teacher education, also referred to as online CALL PD, has begun to capture attentions over the past few years. In effect, the number of studies that offer a focus on fully or partially online CALL PD (e.g., Nami, 2021; Nazari & Xodabande, 2020; Tafazoli, 2021) remain largely scant compared to mainstream CALL teacher education research.

Nami (2021), for instance, explored the potential of technology-review projects and follow-up discussions for enhancing teachers' pedagogical knowledge of CALL in an online PD course. She observed that reviewing different technologies, platforms, and software and discussing the pedagogical applications for language instruction/learning helped teachers develop their technological knowledge as well as their understanding of the affordances and constraints of these technologies. Additionally, using presentation technologies such as podcasting and screencasting tools significantly contributed to teachers' knowledge of materials development and technology selection.

Nazari and Xodabande (2020), in another study, reported an online PD course involving five Iranian FL teachers. The PD course aimed at enhancing teachers' knowledge of mobile-assisted language learning (MALL) along with their perceptions toward it. Data were obtained from semi-structured interviews and classroom observations. All participating teachers found online PD productive for enhancing their pedagogical and theoretical knowledge of MALL. Nazari and Xodabande (2020) also reported a positive change in teachers' attitudes toward MALL after participating in the online PD course.

Drawing on essay data obtained from 12 in- and pre-service Iranian teachers attending an online CALL course, Tafazoli (2021) noted that language teachers largely highlighted the essence of effective online PD courses for technology-enhanced language instruction. Tafazoli's participants conceptualized technological knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), and technological pedagogical and content knowledge (TPACK) differently and the way they can be developed through the course of preparation. Tafazoli concludes that "online education needs to be accompanied by copious training" (p. 12).

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Practicing Teaching with Technology in CALL PD

According to Compton (2009), teaching in technology-enhanced contexts, namely online platforms, requires relevant pedagogical knowledge that might be different from teaching in conventional classroom settings. Technical knowledge of different digital tools and platforms, alone, cannot satisfy the pedagogical needs of teachers (see Hampel & Stickler, 2005). In addition to technological knowledge and the knowledge of subject matter content, teachers need pedagogical knowledge of using digital technologies for language instruction.

To help teachers develop relevant knowledge and skills for the effective integration of technology in their practices, CALL PD courses and programs need to be carefully designed. If this goal is achieved, the course or program can encourage teachers to integrate technology in their instruction in a creative manner (Jeong, 2017). Inspired by the social constructivist theories of learning (Vygotsky, 1978), it is suggested that knowledge cannot be constructed in a decontextualized learning context which focuses exclusively on introducing different technologies or their underlying theories (see Willis, 2001). As an essentially social construct, knowledge is developed and created through reflection, practice, and interaction with peers, the teacher, and instruction material.

It is through practices that promote reflection and interaction that pre- and in-service teachers can be expected to construction relevant pedagogical knowledge (see Cheng & So, 2012). Practice is one of the widely discussed requirements for effective teacher preparation. As Levy (1997) notes, "hands-on experience is encouraged wherever possible on the grounds of helping teachers… gain deeper insights into the strengths and limitations of the medium" (p. 296). In other words, active experimentation, in Arnold and Ducate's (2015) terms, is a crucial requirement of formal and informal CALL teacher education. It is widely suggested that teachers' prior experience in using technology, teaching with it, and managing the classroom through the course of preparation can positively associate with their effective technology-enhanced language instruction in the future. Korthagen (2001) notes that when teacher education is guided by teachers' real pedagogical needs and is built on practice, teachers are more likely to acquire the knowledge required for successful instruction. However, little is known about "the extent to which technology moves beyond its application in teacher education programs to the classroom level" (Nazari & Xodabande, 2020, p. 2). The present study was conducted to shed more light onto this research base to explore the possible impact of teaching practice in an online CALL PD on teachers' knowledge of teaching with technology. More specifically the following research question was addressed:

• How do CALL teaching practice projects through the course of preparation affect in-service teachers' pedagogical knowledge of technology-enhanced language instruction?

Methodology

A case study (mixed-method) research design was applied to explore the possible contribution of technology practice, namely defining an online session, developing presentation materials for it, and teaching and managing the classroom during that session to teachers' pedagogical knowledge

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of CALL. As Stake (1995) puts, case study is the most appropriate research design when the focus is on a detailed analysis of a particular process or performance of individuals.

Participants

Following convenience sample procedure, seven Iranian in-service language teachers with an age range of 31-46 and an average teaching experience of 13.5 years were selected for this study. Three of the participants were teaching English at private language institute, two were high school language teachers, and two participants taught English to Bachelors of Art and Science (BA/BS) students at university. Despite participants' experience in teaching English in conventional face-to-face mode, none had significant experience in using online platforms for teaching, developing digital materials for language learning, or using digital technologies for language instruction. Pseudonyms will be used to refer to the participants.

The researcher participated in the study as the course instructor and session moderator during those sessions in which participating teachers were in charge of teaching (i.e., teaching practice projects). Participants were informed that the online CALL PD course was a part of a research project and consented that their questionnaire responses can be analyzed and used as the main data source in the present study.

Online CALL Teacher Education Course

The online CALL teacher education course comprised 12 sessions. Each session lasted for two hours and was held online in the Adobe Connect environment. The first session was dedicated to the introduction of the course and its specifications. Participants received the course syllabus in PDF format via email prior to the onset of the course. During each session, in addition to a focus on theoretical considerations in technology-enhanced language instruction, different digital technologies, software, and platforms were introduced and reviewed. Teachers were required to practice using the technologies introduced in the syllabus prior to each session and be ready for classroom discussions. Participants had access to an asynchronous forum for sharing their questions and reflections throughout the course.

The topics that were focused on throughout the preparation course included: theories of online teaching, digital technologies and platforms for materials development (e.g., presentation technologies, authoring tools, e-book generators), digital game-based language learning, LMSs, online test-maker and quiz generators, audio/video communication technologies, online databases and dictionaries, netiquette rules, and social bookmarking. Furthermore, 10 to 15 minutes during each session was dedicated to a discussion of the key concepts related to digital technologies and CALL (e.g., the Web generations, Internet security, podcasting, e-assessment).

Online Teaching Practice Projects

In addition to classroom discussions and teachers' individual technology use, online teaching projects were defined in the design of this course in an attempt to provide participants with an opportunity to practice teaching online. From the fourth session onward, every one session in-between, the session was to be defined and held by one of the participants with the researcher playing the role of moderator. The rationale for starting from the fourth session was preserving

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some time for each individual to learn about online teaching, presentation, the live session platform, and digital technologies in order to not only reduce their tension for online instruction but also enhance the possibility of a more effective teaching experience. Teachers were granted admin access to the LMS so that they could define a session and have host access to different features of the live session when presenting.

The participants were also required to develop relevant presentation material to effectively address the focus of the session they were supposed to teach. They were free to choose the technology and modality of their preference for developing the presentation material. Hosts have access to the share-screen feature, whiteboard, and file-sharing mode in the live session platform. Files in PDF and Word format can be shared.

The researcher tried to keep her interference in the process of teaching and commenting to a minimum during the sessions which were taught and managed by the participating teachers. The rationale was providing them with opportunities to gain a better grasp of online teaching, technological glitches, classroom management issues, and helping them develop their knowledge and skills to effectively deal with the problems when they occur.

All seven participants developed PDF presentation files for their online teaching experience. The key concepts and main instructional points were highlighted and addressed in these presentation files. Depending on the focus of the course content in the session they were in charge of, each teacher also developed accompanying or online supplementary content. Pedram, for instance, introduced an online podcasting and audio recording platform while teaching podcatchers. He had created an instructional podcast teaching a language item. Teachers were invited to play the role of language learners and follow the directions provided in the podcast to carry out an online task. Mahvash, in another example, had designed online multiple-choice language items and invited peers to practice taking her online exam. These online teaching practice sessions usually engaged participants in a detailed discussion of the technologies introduced and practiced.

Instrumentation

Teachers' post-teaching-practice journals and an online CALL pedagogical knowledge questionnaire were applied as the main instruments for data collection to explore the possible impact of online teaching and classroom management as well as observing peer teaching practice on participants' pedagogical knowledge of CALL. What follows offers a detailed account of each of the instruments.

Teachers' post-teaching-practice journals

Each participant was required to write a journal following the session s/he defined and held in the LMS to reflect on the experience of teaching in an online course. All seven participants had prior experience in writing reflection journals. However, during the first session, the instructor provided information regarding post-teaching-practice journals. The participants were not required to follow a rigid outline for writing journals. The rationale was increasing the flexibility of the journal writing experience by facilitating the process of reflection on action for each individual.

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CALL pedagogical knowledge questionnaire

Nami (2015) CALL Pedagogical Knowledge Questionnaire was applied to track the changes in teachers' pedagogical knowledge of CALL at onset and at the end of the online CALL teacher education course. The questionnaire was administered twice: once prior to the beginning of the course and once after the final session.

The first section of the questionnaire collects Demographic information from participants. The second section is comprised of two subscales. The first one features 13 five-point Likert scale (1 = total novice, 2 = novice, 3 = average, 4 = slightly better than average, and 5 = expert) items that explore teachers' knowledge of technology use. Different technology types are addressed under 13 categories. These include the knowledge of effective use of: digital presentation software, social networking software (SNS), content and learning management systems (C/LMSs), authoring software, web/computer games, a/synchronous text communication software, automated writing and proofreading software, shared screen conversation software, audio/video recording and sharing software, test making software, online databases and encyclopedias, web browsers, and microworld simulations. The second subscale comprised nine 5-point Likert scales (1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, and 5 = strongly agree) items exploring teachers' knowledge of technology-enhanced language assessment (two items), materials development/selection (three items), classroom management (two items), and the affordances/constraints of technology (two items) for language instruction. Grounded on Ertmer and Ottenbreit-Leftwich's (2014) conceptualization of pedagogical knowledge of CALL, these sub-categories were taken as indicators of teachers' understanding of CALL pedagogical knowledge.

Conducting an exploratory factor analysis, Nami (2015) reported a factor loading range of 0.71-0.87 as an indication of a high convergent validity at the item level (Chai, 2010). Additionally, the researchers observed that the items collectively explained 73.81% and 67.83% of the cumulative variance (AVE) in the first and second subscales, suggesting an acceptable level of convergent validity at the construct level (Hair et al., 2006). The reported Cronbach's alphas for the two subscales of the questionnaire are 0.95 and 0.97, indicating an overall reliable estimate.

Data Analysis

Data obtained from pre- and post-treatment questionnaire responses were analyzed following descriptive data analysis procedure (i.e., frequencies). Participants' scores related to the first subscale of Section B in the questionnaire were taken as indicators of their knowledge of technology use. Respondents' scores could range from 13 to 65, with 13 indicating a total novice user, 14 to 26 indicating a novice user, 27 to 39 indicating an average user, 40 to 52 indicating a slightly better than the average user, and 53 to 65 indicating an expert user. Furthermore, to gain

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a more comprehensive understanding of participants' development progress, namely the knowledge areas developed, after attending an online CALL PD course, pairwise comparisons were conducted between the mean scores calculated for the first and second subscales of Section B questionnaire responses.

The content of participants' post-teaching-practice reflection journals was analyzed following a qualitative open content analysis strategy. In this codification approach, meaningful data chunks are extracted from the content (see Blair, 2015). In this open coding scheme, line-by-line arbitrary coding is avoided. Instead, participants' responses to interview questions and their reflections are re/read to identify meaningful content with similar focus from text-chunks which ranged from a sentence to larger text such as a paragraph. The extracted codes are reviewed and grouped under relevant categories which are then labeled.

Findings and discussion

Post-teaching-practice journals

Content analysis findings

Through a careful analysis of the content of seven journals, 48 codes were extracted. After finalizing the codes, similar codes were identified and grouped into six categories. Table 1 summarizes the categories, the frequency of the codes under each, and code descriptions from participants' journals. These included: (1) CALL related pedagogies, theories, and concepts, (2) technology and CALL-related constraints and knowledge of dealing with them, (3) knowledge of technology and CALL-related affordances, (4) technological knowledge, (5) knowledge about the required infrastructures for online classroom teaching, and (6) knowledge technology-enhanced materials development.

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Table 1
Thematic categories of post-teaching-practice reflection journals

Thematic categories	Frequency	Code description
CALL-related pedagogies, theories, and concepts	20	*In constructivism and problem-based approaches learners are mentally engaged in an activity.* (Sarah)
Technology and CALL-related constraints and knowledge of dealing with them	11	*To address the problem, the video streaming was disabled to further ease the communication.* (Shadi)
Knowledge of technology and CALL-related affordances	8	*Due to its user-friendly aspects, this medium was chosen to be used as a venue for asynchronous discussions during week 5.* (Mahvash)
Technological knowledge	4	*We should note that the software and tools that are introduced need to be compatible with different operating systems.* (Pedram)
Knowledge about the required infrastructures for online classroom teaching	3	*For effective online teaching experience, we must not forget learners with possible impairments. Some tools can be used as a sort of asset. For example, for learners who have visual impairment, Screen Magnifiers can be used.* (Lida)
Knowledge of technology-enhanced materials development	1	*Text-based materials which are imported to a virtual environment can't be responsive, instead we must substitute them with interactive materials which are more in accordance with the flexibility experienced in a virtual environment.* (Faranak)

The most frequent thematic unit belonged to the text-chunks that reflected participants' knowledge CALL-related concepts, theories, and pedagogical approaches (Freq. = 20). All of the participants reflected on different technology and CALL-related concepts in their post-teaching-practice journals. What makes these notes outstanding is that they were almost always followed by teachers' critical evaluation of CALL-related pedagogies and theories. This is clearly reflected in the following extract from Lida's reflection journal:

Digital game-based learning (DGBL) involves individuals in the process of experiential learning, while in TBLT, students are engaged in learning activities in order to communicate in real life situations… the end of tasks are defined but the end of games are determined by learners… the power of DGBL rests in dealing with intrinsic

motivation which is mostly ignored in foreign language learning… it should be considered as a new aspect of technology-enhanced language learning.

Introducing online games during her online teaching practice session, Lida compares digital game-based learning with task-based language teaching highlighting that DGBL can promote a sense of positive competition between learners that might not be achieved in ordinary tasks. This can encourage learners to get more engaged in the activity, given that the outcome of the online real-time collective games is determined by learners, unlike ordinary tasks the end of which is pre-determined.

The second most frequent thematic units identified in participants' journals were the text-chunks which reflected teachers' *concern about and knowledge for dealing with technology and CALL-related constraints* (Freq.=11) and those that highlighted the affordances of technology in general and CALL in particular (Freq.=8), respectively. Focusing on online aggregators for developing an online library of instructional and learning resources, Lida noted that they can be "time-efficient for classroom participants" as this facilitates sharing between the teacher and students in online classroom contexts.

Talking about the connection problem she experienced during her teaching experience, as another instance, Sarah highlighted the contributing role of technical support for overcoming such problems. She noted that "the support [which] was provided appeared to alleviate the inconveniences already occurred." Shirin, similarly, wrote that while the technical and connectivity glitches in online classrooms may inhibit teachers from pursuing particular tasks or activities, such as real-time (multimodal) game-based exercises, the problems can be insightful in that they inspire teachers to review their pedagogical plans and select more relevant ones:

The session began with facing one of the most fundamental technology constraints: Internet Connection due to some technical failures in the system. This [problem]… *prevented us from doing technical/practical tasks in the class…*[However, it] *provided the opportunity* [for us] *to reflect more deeply on theoretical and pedagogical aspects of the lesson plan. For instance, in such contexts, the activities that require reflection and more time can be left to be done individually out of the classroom and to be uploaded as screencasts.* (Brackets added)

These texts were not mere recounts of the problems these teachers or peers faced during the session they managed and taught, but were all followed by their reflective and critical evaluations of the problems and suggestions for addressing them.

Four journals contained accounts of teachers' knowledge about how to use different online tools and platforms or the LMS in general and/or for online instruction in particular. Shirin noted that "we installed Windows Media Encoder in the class and the students started working with it as they found it user-friendly enough."

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The fifth thematic category was labeled as learners' *knowledge of the required infrastructures for online classroom teaching*. Although the text-chunks that reflected such an understanding were not as common as the previous unit, their presence clearly reflects that practicing teaching in an online classroom has promoted teachers to reflect on what constitutes an effective session. Teacher1, for instance, wrote that teachers in online classrooms need to have access to

> *three types of support; technical, administrative, and peer Sometimes the technical and administrative supports might come from a single person, however, it is possible that even that one single person might not be at reach. In these cases, it is recommended that the teacher has a plan B to address possible challenges.*

The least frequent thematic unit was teachers' accounts of technology-enhanced materials development. Comparing and contrasting technology-enhanced materials development with digital materials adaptation and selection, Teacher4 noted that making decisions about each category largely depends on the way we define each and also "the level of adaptability" we expected to see in the materials.

Discussion of post-teaching-practice journals

The evaluative nature of the comments generated by participants in their post-teaching-practice journals reflect the contribution of technology-related practice to the development of what Wallace (1991) refers to as experiential knowledge. A careful look at the thematic units that highlighted the affordances and constraints of CALL and technology, for instance, revealed that all of the merits and disadvantages which were addressed in the reflection journals directly related to online real-time classroom instruction, live classroom features, and content delivery. In other words, the problems and affordances were context-specific, implying that *reflection on action* and *experiencing* (see Nami, 2021; Schön, 1983) provided participants with opportunities for developing context-related knowledge.

The reference participants made to technology and CALL-related concepts, theories, and pedagogies supports the idea that practice can develop teachers' conceptual as well as procedural knowledge. In other words, the evaluative comments and references made to different concepts clearly indicate that teachers were engaged in deep procedural thinking. Grounded on constructivist theories of learning (e.g., Vygotsky, 1978), it is argued that experiencing teaching in an online CALL PD course "situated teachers in a meaningful social context in which knowledge is shaped through individual… reflection" (Nami, 2021, p. 12).

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CALL Pedagogical Knowledge Questionnaire

Participants' ratings of their technological knowledge

Participants' responses to the first subscale of the questionnaire dealing with technology knowledge (TK) revealed that four teachers found themselves average technology users, while three rated themselves as novice technology users prior to attending the course. As indicated in Table 2, all participants reported an increase in their technological knowledge at the end of the course. The degree of such an increase, however, varied from one individual to another. Four teachers generally rated themselves are expert technology users after attending the CALL teacher education course; one teacher found her knowledge of technology use slightly better than average; and two of the participants rated their technological knowledge as average.

Table 2

Pre- and Post-Treatment Responses Obtained from the First (13-item) Subscale of the Questionnaire

No.	Participants	Pre-treatment score	Post-treatment score
1	Sarah	Novice	Average
2	Lida	Average	Expert
3	Shadi	Novice	Expert
4	Faranak	Average	*SBTA
5	Shirin	Average	Expert
6	Pedram	Average	Expert
7	Mahvash	Novice	Average

*SBTA: Slightly Better Than Average

The mean scores of the pre- and post-treatment responses for each of the 13 items were calculated to gain a more comprehensive understanding of the changes in participants' overall technological knowledge (see Figure 1). It can be seen that pattern of TK growth was different for different technology types. As indicated in Figure 1, the highest reported growth rate belonged to participants' knowledge of course and learning management systems (C/LMSs) and social bookmarking sites and technologies with a mean score of 1.2 for the pre-treatment responses rising to 3.4 in the post-treatment questionnaire in both categories.

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Figure 1

Pre- and Post-Treatment Questionnaire Responses of Participants in the Online CALL Teacher Education Course
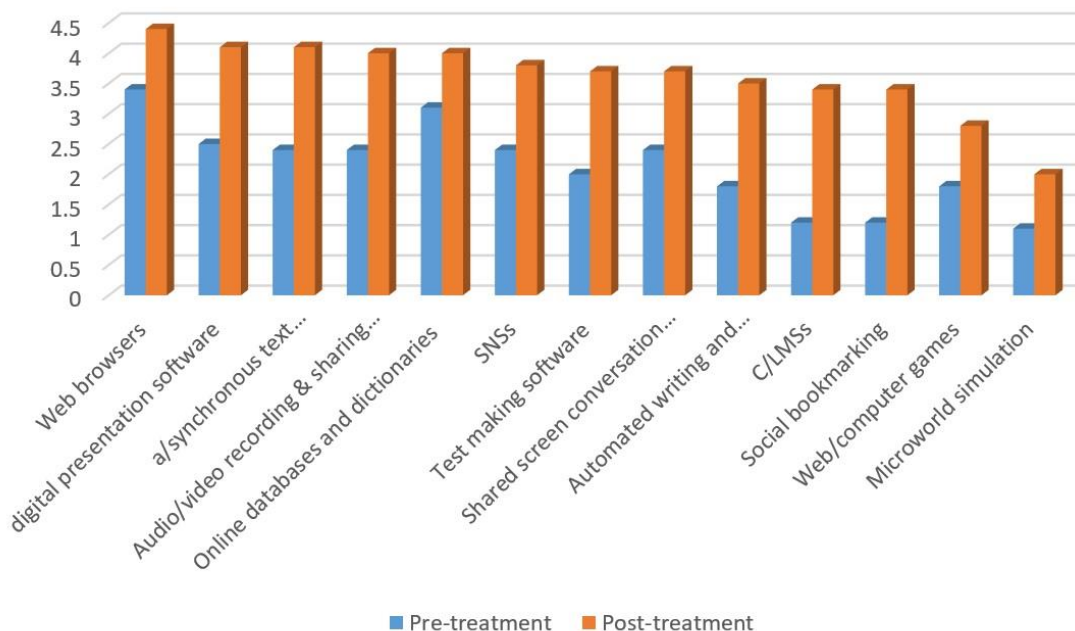
The second significant growth belonged to two categories with a 1.7 increase from the pre- to post-treatment questionnaire responses. These included: teachers' knowledge of using (1) test-making software and platforms (pre-treatment mean score = 2.0 and post-treatment score = 3.7) and (2) automated writing and proofreading software (pre-treatment mean score = 1.8 and post-treatment score = 3.5).

Participants' pedagogical knowledge of CALL

Table 3 summarizes the pairwise comparison of mean scores calculated for participants' responses to the second subscale of Section B in the questionnaire. As indicated in the table, the mean scores for all of the nine items were above 3 (the neutral point on the scale), indicating that participants found the experience productive in enhancing their pedagogical knowledge of CALL. A more detailed look at the responses reveals that of the three highly-rated items with mean scores of 4.73 (item 3), 4.33 (item 7), and 4.33 (item 9), two (i.e., items 7 and 9) focused on teachers' knowledge of materials development and selection. Item 7 related to teachers' knowledge of the potentials and drawbacks of technology in general and CALL in particular.

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Table 3
Mean Scores of Section B Second Subscale Items

Items	Focus	Pre-treatment	Post-treatment
1	e-assessment and computer-assisted language testing	2.80	4.05
2	e-assessment and computer-assisted language testing	2.80	3.80
3	Digital materials development and selection	3.33	4.73
4	Online and digitally-enhanced classroom management	3.15	4.16
5	The potentials and drawbacks of CALL and technology	3.06	4.16
6	Online and digitally-enhanced classroom management	3.06	4.16
7	The potentials and drawbacks of CALL and technology	3.16	4.33
8	Digital materials development and selection	2.70	4.10
9	Digital materials development and selection	3.10	4.33

*1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree

Discussion of questionnaire findings

Analyzing questionnaire data obtained from seven in-service language teachers, it was observed that teachers rated their technological and pedagogical knowledge of CALL generally higher after attending the online course. Given the fact that participants were at different levels of technology-related proficiency at the onset of the course, the observed difference in their reported technological knowledge in the post-treatment questionnaire was quite anticipated. Additionally, as each individual follows a different progression path through the process of learning, it is natural to observe differences in participants' TK.

As it was noted earlier, of 13 different digital technology categories, participants' rated their knowledge of working with C/LMS, social bookmarking sites, automated writing and proofreading software, and test-making technologies higher. This can be attributed to the nature of technology-enhanced practice they experienced through the course of preparation. The fact that each of the participating teachers was engaged in the process of defining an online session and developing relevant instructional materials might have better enhanced their understanding of C/LMSs and their potentials. Additionally, as discussed earlier, all of the participants developed supplementary materials using digital technologies. The most common supplementary content developed

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by teachers was online quizzes and tests. This might have contributed to the development of their knowledge regarding test-making technologies. Consistent with previous research on hands-on experience and technology use in teacher education (Nami, 2021; Hew & Brush, 2007; Hsu, 2012; Otero et al., 2007), the findings indicate that individual engagement with technology shapes and advances student teachers' understanding of the tools, i.e., their technological knowledge (Baskerville, 2012). Furthermore, each teacher usually introduced different technologies during her teaching and presentation experience, inviting peers to bookmark the sites and webpage for further use of reflection. This can describe the higher rating of the item related to teachers' knowledge of bookmarking sites and technologies.

The pairwise comparison of mean scores calculated for each of the 13 items in the first sub-scale of the questionnaire indicated that the degree of the reported progress after completion of the course was different for different technology types. The findings are inconsistent with Nami (2015). The lowest degree of progress reported by the participants in their online CALL preparation course, for instance, belonged to the category of test-making software. In-service teachers, in the present study, however, rater micro-world simulation the lowest in their questionnaire responses. Furthermore, the mean scores obtained from participants' responses in the present study were generally higher than those reported in Nami (2015).

The observed difference clearly relates to the nature of technology practice experienced in these two courses. Nami (2015) engaged their participants in lesson study or collaborative teaching projects at the end of the course. Online teaching practice was experienced throughout the course in the present study. This might have provided more extensive reflection time and better internalization opportunities for the participants.

It can be claimed that online teaching projects placed teachers at the heart of technology-enhanced teaching in online synchronous platforms. This way, they might have found opportunities to better understand how direct instruction should be intertwined with feedback generation, scaffolding, and problem-solving (see Arnold & Ducate, 2015). In other words, it is suggested that real teaching practice with technology can develop teachers' multitasking skills and their awareness regarding effective integration of such skills through the course of instruction.

The results also expand upon previous research on technology practice by providing evidence on the potential of real classroom practice for developing teachers' knowledge of digital materials development. As it was observed by the pairwise comparison of the mean scores obtained from teachers' responses to the second subscale, the highest post-treatment mean score belonged to teachers' rating of their knowledge of digital materials development. This can be directly attributed to their practice of design and development of digital content for their teaching session as well as observing samples of peers' work.

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It should not be forgotten that, in addition to experiencing teaching online in a live session platform, each participant had the opportunity to monitor six other presentations and teaching practices by peers. This might have promoted critical reflection as usually through the course of instruction, teachers were engaged in discussions, problem posing, evaluation of peers, and problem-solving. In other words, teachers "experience the learning situation in different ways… affecting the learning experience of their peers through their actions and choices" (Teräs, 2016, p. 270).

Conclusion

Given the fact that online teaching entails skills and knowledge areas that are not essentially the same as those used for teaching in physical face-to-face modes, teacher preparation for online language education requires the development of relevant online CALL PD courses. The present article featured a study which was conducted in response to this need. The findings revealed that practicing online teaching provides teachers with opportunities to experience classroom management and observe peers' practices. In other words, online teaching projects helped teachers learn how to put their knowledge of CALL into practice.

However, as the focus of the present study was restricted only to seven language teachers and questionnaire data, caution should be made when making too broad generalizations. Different findings might have been obtained if data was collected from multiple data sources in a longitudinal preparation course with more diverse participants. For knowledge to be internalized, ample development time is required. Hence, if the in-service teachers participating in the present study had more preparation time, different results would have been obtained. Additionally, those teachers who presented and taught in the final sessions of the course might have been somewhat advantaged over those who taught in the first half of the course given that the former had more preparation time and exposure to peer instruction. This might have provided them with more reflection opportunities and might have increased the quality of their performance in comparison to the latter group.

The findings offer significant pedagogical implications for curriculum designers and teacher educators who are engaged in CALL PD design and administration. To be effective, CALL teacher education attempts need to move beyond purely theory-oriented lecture-based designs and provide participating teachers with opportunities to get engaged in different teaching practices and projects. Flipping the PD design can free in-class time for more targeted question-and-answer periods, discussions, and projects work, which in effect paves the way for better internalization of the pedagogical knowledge and skills for technology-enhanced language instruction.

Declaration of Competing Interest

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The author declares that they have no competing interests.

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