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ICT Teaching Competency and Development Needs of Pre-service EFL Teachers in China: A Mixed-Methods Study

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Abstract. It has become essential to integrate information and communication technology (ICT) into teacher education. However, there is little evidence of ICT teaching competency gaps and the development needs of pre-service teachers of English as a foreign language (EFL). This study investigated pre-service EFL teachers' ICT teaching competency, examined their readiness to engage in blended learning as learners themselves, and identified key areas for further development. A convergent mixed-methods design was adopted. Quantitative data were collected from 203 Chinese pre-service EFL teachers using the ICT Teaching Competency Self-Assessment Scale and Blended Learning Readiness Scale, and qualitative data were collected through semi-structured interviews with six teacher educators. The findings indicate that pre-service EFL teachers reported a moderate level of teaching competency in ICT. Basic Technological Literacy had the highest mean score, whereas Technology-Supported Teaching had the lowest, indicating that the pre-service teachers faced challenges in applying ICT in pedagogically meaningful practices. Participants also reported moderate readiness to engage in blended learning, and comparatively even lower online learning readiness. The qualitative findings expose teacher-centered instruction, limited teaching practice opportunities, insufficient ICT integration modeling and inadequate pedagogically oriented training as perceived constraints on competency development. Three key areas requiring further development were identified:

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integrating ICT more strongly in teaching practices, enhancing readiness to engage in online learning, and providing more practice-based learning opportunities. The findings provide empirical evidence to inform curriculum design and ICT-related training in pre-service EFL teacher education.

Keywords: ICT teaching competency; mixed methods; blended learning readiness; China; needs analysis

1. Introduction

With the widespread application of digital technologies in education, familiarity with information and communication technology (ICT) integration has become a fundamental requirement for language teachers (Redecker, 2017; UNESCO, 2018), particularly in English as a foreign language (EFL) context. Contemporary learning environments, including blended and technology-enhanced learning settings, require teachers to not only be competent in using ICT (Aslan & Zhu, 2015), but also able to effectively integrate ICT in pedagogical practices, learning support and classroom interaction (Koehler & Mishra, 2009).

Pre-service EFL teachers generally possess basic technological literacy (Aslan & Zhu, 2015; Yan et al., 2018). However, evidence consistently indicates that they struggle to translate technological knowledge into pedagogically meaningful classroom practices (Redecker, 2017; Tondeur et al., 2012). In particular, their higher-order competencies, such as critical thinking, innovation and learner-centered technology integration are insufficiently developed (UNESCO, 2018). These findings indicate a persistent gap between technological literacy and pedagogically meaningful ICT integration and highlights the need to identify competency areas of pre-service EFL teachers that require further development. Addressing this gap is particularly important in EFL contexts, where technology is increasingly used to facilitate language input, communication, collaboration and access to authentic learning resources.

Using blended learning has become increasingly prevalent in teacher education; blended learning combines the advantages of face-to-face instruction and online learning and provides learners with greater flexibility (Graham, 2006; Kaliisa et al., 2019). Successful participation in blended learning environments requires readiness in areas such as technological competence, self-directed learning skills, learner control, and positive attitudes toward online learning (Hung et al., 2010).

Studies have indicated that blended learning readiness is an important factor in learners' engagement and success in technology-supported learning environments (Rasheed et al., 2020). In this study, ICT teaching competency concerns pre-service teachers' ability to use and integrate ICT to support teaching and learning (Ren et al., 2018), rather than competency in teaching

ICT as a subject. Examining pre-service teachers' blended learning readiness may provide insights into their preparedness for technology-enhanced teacher education that is designed to support ICT teaching competency development.

Although studies have investigated pre-service teachers' ICT teaching competency and have identified various challenges related to technology integration, most research has focused on competency levels (Yan et al., 2018), perceptions (Aslan & Zhu, 2015; Ridha & Fithriani, 2023) or implementation barriers (Tondeur et al., 2012). Comparatively little attention has been paid to systematically identifying the competency gaps and development needs of pre-service EFL teachers in technology-enhanced language teaching contexts. There is little evidence about the competency domains that require greater developmental attention in teacher education programs (Zeng et al., 2025).

Instead of describing overall competency levels, a needs analysis approach is necessary to identify specific areas requiring further development and provide evidence that can be used to design targeted teacher education interventions. Furthermore, few studies have integrated the perspectives of both pre-service teachers and teacher educators to identify ICT competency development needs. In this study, preservice teachers provided evidence of their current competency levels and learning readiness, while teacher educators offered contextual insights into instructional practices and development constraints. Integrating these perspectives can provide a more comprehensive understanding of ICT teaching competency development needs. Consequently, further empirical evidence is needed to inform the design of targeted ICT-related training programs for pre-service EFL teachers.

Recent reviews emphasize the need for more targeted competency development and curriculum support for pre-service EFL teachers, in response to evolving digital and linguistic demands (Pradas-Esteban & Tabuenca-Cuevas, 2024). Therefore, this study aimed to investigate pre-service EFL teachers' ICT teaching competency, examine their blended learning readiness, identify key competency gaps and development needs, and explore implications for teacher education programs. Through convergent mixed methods needs analysis; this study integrates quantitative evidence from pre-service EFL teachers and qualitative insights from teacher educators to provide a comprehensive understanding of ICT teaching competency development needs.

By moving beyond measuring competency levels, this study contributes empirical evidence on how to identify specific ICT-related developmental needs and translate them into targeted teacher education practices. The findings provide an empirical basis for informing technology-enhanced

teacher education interventions that address the identified competency gaps of pre-service EFL teachers. To achieve these objectives, the following questions were proposed:

Research Question 1: What is the current level of ICT teaching competency of pre-service EFL teachers?

Research Question 2: To what extent are pre-service EFL teachers prepared to participate in blended learning as learners?

Research Question 3: What are the key ICT teaching competency gaps and development needs of pre-service EFL teachers?

2. Literature Review

2.1 ICT Integration in Teacher Education

Integrating ICT in teacher education is received increasing attention worldwide. Studies consistently highlight its potential to enhance instruction quality, promote learner engagement and prepare pre-service teachers for technology-rich educational environments (Aslan & Zhu, 2015; Kingsley et al., 2026; Laudari & Maher, 2019; Leba & Temaja, 2023). Studies have also examined the educational benefits of ICT integration in EFL and teacher education contexts. For example, Ridha and Fithriani (2023) report that using ICT enhances the motivation, collaboration, and creativity of pre-service English teachers. Similarly, Elmahdi et al. (2025) found that ICT-supported instruction contributed to improving language performance, learning satisfaction and learner autonomy. In the context of pre-service EFL teacher education, Vo et al. (2020) report that ICT was perceived as a valuable tool for enhancing classroom engagement and improving instructional efficiency.

Despite the recognized benefits of ICT integration, effective implementation in teacher education remains challenging. Studies report that pre-service teachers often receive overly theoretical ICT-related training with few opportunities for authentic classroom application (Vo et al., 2020). In some teacher education programs, technology integration courses focus mainly on basic technological tools and fail to develop pedagogical skills for integrating ICT meaningfully in classroom instruction (Limbong et al., 2024). Furthermore, the availability of technological tools alone does not guarantee effective technology integration in teaching practices. Therefore, effective ICT integration depends not only on access to technology, but also on teachers' ability to use digital technologies for meaningful teaching and learning. This recognition highlights the importance of developing ICT teaching competency during teacher education.

2.2 ICT Teaching Competency of Pre-Service Teachers

Literature uses a variety of terms to describe teachers' ability to integrate ICT in teaching and learning practices, such as ICT competence (UNESCO, 2018), digital teaching competence (Redecker, 2017), and ICT teaching competency (Ren et al., 2018). Although the terminology varies, these concepts generally

emphasize teachers' knowledge, skills and attitudes in relation to applying digital technologies to support teaching and learning. However, pre-service teachers differ from in-service teachers in terms of teaching experience and professional identity. Therefore, competency frameworks designed for in-service teachers may not fully reflect the characteristics and developmental needs of pre-service teachers.

In Chinese education informatization research, the concept of ICT teaching competency has been widely discussed in relation to pre-service teacher education (Ren et al., 2018; Yan et al., 2018; Wang et al., 2023). Yan et al. (2018) and Ren et al. (2018) argue that pre-service teachers' ICT teaching competency should extend beyond basic technical operation skills to include the ability to support teaching and learning through ICT integration. Given their dual roles as future teachers and current learners, pre-service teachers have to develop competencies related to both technology-supported teaching and technology-supported learning.

Based on these perspectives, this study adopts the definition proposed by Ren et al. (2018), which defines ICT teaching competency as pre-service teachers' ability to use ICT effectively in both learning and teaching contexts. In this sense, the term refers to the use and integration of ICT to support teaching and learning, rather than to the teaching of ICT as a subject. Unlike TPACK, which relates to integrating technological, pedagogical, and content knowledge for teaching, the ICT Teaching Competency Framework of Pre-service Teachers (ICTTCF-PST) recognizes pre-service teachers' dual roles by incorporating technology-supported learning alongside technology-supported teaching (Ren et al., 2018; Yan et al., 2018).

Compared with broader digital competency frameworks such as DigCompEdu and UNESCO ICT-CFT, the ICTTCF-PST is specifically designed for pre-service teachers and better reflects their developmental characteristics and training needs during teacher preparation. Therefore, the framework of this study provides an appropriate conceptual and measurement basis for examining ICT teaching competency needs. Studies suggest that pre-service EFL teachers face challenges developing ICT teaching competency, particularly regarding pedagogical integration, technological support and contextual resources (Laudari & Maher, 2019; Limbong et al., 2024). These challenges highlight the importance of examining specific ICT teaching competency gaps of pre-service EFL teachers, which are discussed in Section 2.3.

2.3 ICT Teaching Competency Gaps of Pre-service EFL Teachers

Although ICT has become an essential component of contemporary language education, the literature suggests that many pre-service EFL teachers are not yet fully prepared to integrate technology effectively in teaching and learning. While they generally demonstrate positive attitudes toward

technology and possess basic digital skills, their ability to apply ICT in pedagogically meaningful ways remains limited. For example, Malaysian ESL pre-service teachers recognized the importance of digital literacy, learner knowledge and 21st-century competencies such as critical thinking, collaboration and problem-solving for effective teaching in the digital era (Pazilah et al., 2024). Similarly, studies have shown that pre-service teachers are often confident about performing basic technology-related tasks but are less capable of using technology to facilitate meaningful learning experiences (Aslan & Zhu, 2015).

One recurring issue concerns the gap between technological knowledge and actual classroom implementation. Although pre-service teachers receive ICT-related training during their teacher education programs, many find it difficult to apply technology in authentic teaching contexts. Cengiz and Kaçar (2024) found that participation in an online teaching project contributed to the development of pre-service EFL teachers' TPACK. However, participants still faced challenges in integrating technological, pedagogical and content knowledge during lesson planning and instruction. Similarly, a study conducted in Indonesia found that pre-service EFL teachers were theoretically prepared to integrate technology, yet their classroom practices were often constrained by contextual factors such as limited technological infrastructure and insufficient support during teaching practicum (Limbong et al., 2024). These results suggest that technological preparedness does not necessarily translate into effective technology integration in real teaching situations.

Research has also identified weaknesses in higher-order ICT teaching competencies. Beyond basic technical literacy, pre-service EFL teachers often struggle to use technology to support autonomous learning, collaborative learning, critical thinking and technology-supported instructional practices, including lesson design, classroom implementation and assessment. For instance, Vo et al. (2020) found that, although Vietnamese pre-service English teachers had completed a technology-related course, most of them relied primarily on PowerPoint during teaching practicum and demonstrated only limited levels of technology integration. The authors argue that the program provided insufficient opportunities for students to learn how to apply technology to specific language teaching tasks and contexts.

Taken together, these studies suggest that pre-service EFL teachers often possess basic technological skills but continue to struggle to apply technology to support learning processes and pedagogically meaningful teaching practices. These findings indicate the need for a systematic needs analysis to identify ICT teaching competency gaps and areas requiring further development and to inform targeted teacher education programs.

2.4 Research Gaps and the Need for Needs Analysis

Although studies have provided valuable insights into ICT integration by pre-service EFL teachers, several limitations remain. Research has largely focused on pre-service teachers' experiences, perceptions, and implementation challenges related to ICT integration in particular educational contexts (Leba & Temaja, 2023; Limbong et al., 2024; Pazilah et al., 2024; Vo et al., 2020). While these studies have revealed various ICT teaching competency gaps and challenges, they provide limited evidence of the competency domains that require further attention in teacher education programs.

Furthermore, many studies have examined ICT integration through specific theoretical lenses, such as TPACK, digital literacy or technology adoption. As a result, these studies often focus on particular aspects of ICT competence instead of providing a comprehensive understanding of pre-service teachers' developmental needs, which highlights the need for systematic needs analysis to identify competency gaps and areas requiring further development.

To address these limitations, needs analysis serves as an important approach for identifying competency gaps and informing decision-making in education. It helps identify teachers' professional development needs and supports the design of targeted and context-sensitive training interventions (Moeini, 2008). Recent studies have emphasized the importance of systematically examining pre-service teachers' digital training needs in response to rapid development of educational technologies (Hughes et al., 2023). Furthermore, needs analysis is considered a fundamental stage in curriculum and instructional design because it helps align educational programs with learners' actual needs and expectations (Wijayanto et al., 2023).

Therefore, this study investigated the ICT teaching competency needs of pre-service EFL teachers through a mixed method needs analysis approach. By examining current ICT teaching competency levels, readiness for blended learning, and teacher educators' perspectives on competency development, the study aimed to provide a more holistic understanding of competency gaps and the contextual factors associated with ICT teaching competency development. The findings are expected to provide empirical evidence for designing targeted ICT-related training and evidence-based teacher education interventions.

3. Methodology

3.1 Research Design

This study adopted a convergent parallel mixed-methods design (Creswell & Plano Clark, 2018), in which quantitative and qualitative data were collected independently during the needs analysis phase, analyzed separately and

integrated during the interpretation stage. This design was selected to obtain a comprehensive understanding of ICT teaching competency and development needs of pre-service EFL teachers from multiple perspectives. Quantitative data were collected through questionnaires administered to 203 pre-service EFL teachers to examine their perceived ICT teaching competency levels, and their perspectives, as learners, regarding blended learning readiness. In parallel, qualitative data was gathered through semi-structured interviews with six teacher educators to explore their perspectives regarding challenges, current practices and developmental needs related to ICT teaching competency.

The qualitative data provided a complementary perspective to the quantitative findings. Semi-structured interviews were chosen for their flexibility to elicit rich, context-specific insights. To mitigate potential limitations such as interviewer bias, response variability and social desirability bias, a standardized, open-ended interview guide was piloted before data collection. All interviews were conducted by the first author, who was trained in non-leading probing techniques; to foster candid responses anonymity and confidentiality were re-emphasized before each session. Furthermore, analytical rigor and objectivity were maintained through reflexive thematic analysis, supported by researcher reflexivity journals and peer debriefing throughout the coding process.

During the interpretation stage, findings from both strands of data were compared and synthesized to identify areas of convergence and complementarity between pre-service teachers' self-reported competency and teacher educators' perspectives. The integration of the two data sources enabled a more comprehensive understanding of ICT teaching competency gaps and the development needs of pre-service EFL teachers.

3.2 Participants

The study involved 203 pre-service EFL teachers: 24 men and 179 women. They were first- and second-year undergraduate students enrolled in an English education program at a teacher education institution in southern China. These students were selected because they were at the initial stage of teacher preparation and had not yet undertaken extensive teaching practicum experiences. Participants were selected using a convenience sampling approach based on institutional availability, while ensuring the sample remained highly relevant and aligned with the target population of pre-service EFL teachers. All participants were undergoing training to become secondary school EFL teachers, as shown in Table 1.

Additionally, six teacher educators from English teacher education programs at three teacher-training universities in China were selected using purposive sampling for the qualitative phase. They were chosen because of their expertise in pre-service EFL teacher education and their teaching experience.

Their areas of specialization included EFL education, EFL pedagogy, English literature, translation and curriculum design. All instructors had extensive experience of pre-service EFL teacher training, each with more than 10 years of teaching experience, as shown in Table 2.

Table 1: Profile of the students in the questionnaire

Category	Frequency	Percentage (%)
Gender		
Male	24	11.8%
Female	179	88.2%
Age		
18-19 years	82	40.4%
20-21 years	119	58.6%
22-23 years	1	0.5%
24 years and above	1	0.5%
ICT gadgets you own		
Smartphone	203	100%
Laptop	133	65.5%
Computer	71	34.9%
Tablet	38	18.7%
Internet access		
Yes	203	100%
No	0	0%

Table 2: Profiles of instructors in the semi-structured interviews

N	Code	Expertise	Gender	Degree	Years of experience
1	R1D	EFL Education	F	Doctoral	19
2	R2X	EFL Pedagogy	F	Master's	19
3	R3XY	English Literature	F	Master's	16
4	R4LY	Translation	F	Doctoral	10
5	R5Y	EFL Pedagogy	F	Master's	25
6	R6Z	Curriculum Design	M	Master's	31

The two participant groups were selected to provide complementary perspectives during the needs analysis phase. The pre-service EFL teachers

self-reported information regarding their perceived ICT teaching competency and blended learning readiness, whereas the teacher educators contributed professional perspectives based on their experience preparing pre-service EFL teachers. Although the teacher educators did not evaluate the individual competency levels of the surveyed students, their extensive experience in English teacher education enabled them to provide contextual insights into ICT teaching competency challenges, instructional practices and support needs.

3.3 Instruments

3.3.1 The Questionnaire

The questionnaire used in the study consisted of two instruments: the ICT Teaching Competency Self-Assessment Scale (ICT-TC) and the Blended Learning Readiness Scale (BLR), which measured pre-service EFL teachers' self-perceived ICT teaching competency and blended learning readiness, respectively.

3.3.1.1 ICT Teaching Competency Self-Assessment Scale

To evaluate pre-service EFL teachers' ICT teaching competency, this study adopted the ICT-TC scale developed by Yan et al. (2018) and based on the ICT Teaching Competency Standards for Pre-service Teachers framework. The scale was specifically designed for pre-service teachers in the Chinese teacher education context and reflects their dual roles as learners and future teachers (Ren et al., 2018; Yan et al., 2018). The questionnaire consists of two sections: (1) Demographic and background information; and (2) Three competency dimensions: Basic Technological Literacy, Technology-Supported Learning, and Technology-Supported Teaching. The competency items were measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Before data collection, experts in educational technology and EFL teacher education reviewed the instrument to ensure its relevance and alignment with the research objectives. Since the original Chinese version was adopted without modification, no translation procedure was required.

3.3.1.2 Blended Learning Readiness Scale

The BLR scale, which was adapted from the instrument developed and validated by Shakeel et al. (2023), was used to assess pre-service EFL teachers' blended learning readiness. The scale consists of seven dimensions and uses a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In the present study, the adapted BLR scale consisted of 34 items across seven dimensions. To ensure the linguistic accuracy and contextual appropriateness of the Chinese version, the scale underwent translation and expert review. Three bilingual experts with expertise in pedagogy, curriculum design and blended learning reviewed the translated items. Minor wording revisions were made based on their feedback before administration.

The reliability of both instruments was assessed using Cronbach's alpha coefficients. In the pilot study ($n = 30$), the ICT-TC scale demonstrated satisfactory internal consistency ($\alpha = .891$), while the BLR scale achieved an overall coefficient of .827. Based on the pilot study results and expert feedback, the final questionnaire administered in the main study contained 60 ICT-TC items and 34 BLR items. In the main study, Cronbach's alpha coefficients were .875 for the ICT-TC scale and .823 for the BLR scale. Reliability coefficients for all dimensions are presented in Table 3. Overall, both instruments demonstrate satisfactory internal consistency across the pilot and main studies.

Table 3: Reliability coefficients of the instruments

Dimension	Number of items	Pilot α	Main study α
Overall	60	.891	.875
Basic Technological Literacy	17		.846
Technology-Supported Learning	17		.801
Technology-Supported Teaching	26		.813
Overall	34	.827	.823
Blended Learning Readiness Scale			
Attitude Toward Learning Flexibility	5		.829
Openness to (New) Technology	5		.868
Attitude Toward Online Learning	5		.782
Attitude Toward Face-to-Face Classroom	5		.925
Basic Skills in Using Technology	5		.864
Attitude Toward Study Management	5		.834
Readiness Toward Blended Learning	4		.935

3.3.2 The Interview Protocol

A semi-structured interview protocol was employed to explore teacher educators' perspectives on pre-service EFL teachers' ICT teaching competency, including perceived competency levels, instructional practices, challenges and potential areas for improving current teacher education approaches. Teacher educators were selected because they possessed extensive experience in preparing for future EFL teachers and could provide professional insights into competency gaps and developmental needs.

Each interview lasted approximately 60 to 90 minutes and was conducted face-to-face at a location convenient for the participants. With participants' consent, the interviews were audio-recorded and subsequently transcribed for analysis. The interviews were conducted in Chinese, the participants' native language, to facilitate accurate expression of their professional experiences. The first author translated the interview transcripts and selected quotations into English and cross-checked the translations against the original Chinese transcripts to ensure the meaning had been preserved.

To enhance the credibility and trustworthiness of the interview data, the interview protocol was reviewed and refined through expert feedback to ensure the questions were relevant and appropriate. The researcher was an English teacher at the institution where the student participants were enrolled, and the six teacher educators were professional peers, some of them were also colleagues. The researcher acknowledged this prior professional relationship during data collection and interpretation. The transcripts were returned to participants for member checking to enhance accuracy and credibility. Data collection continued until thematic saturation was reached. To ensure confidentiality, all participants were assigned anonymized codes.

3.4 Data Analysis

Quantitative data collected from the questionnaires were analyzed using Statistical Package for the Social Sciences (SPSS) Version 23. Descriptive statistics, including means and standard deviations, were computed to examine pre-service EFL teachers' ICT teaching competency and blended learning readiness. Dimensions with comparatively lower mean scores were examined further alongside qualitative findings to identify competency gaps and areas requiring further development. Mean scores were interpreted according to the criteria proposed by Best and Kahn (2006), as presented in Table 4, where scores of 1.00–2.33, 2.34–3.66, and 3.67–5.00 represented low, moderate, and high levels of competency or readiness, respectively.

Table 4: Mean score interpretation	
Mean score range	Interpretation
1.00–2.33	Low
2.34–3.66	Moderate
3.67–5.00	High

Source: Best and Kahn (2006)

The qualitative data were analyzed using a thematic analysis approach and following the six-phase framework proposed by Braun and Clarke (2006), namely (1) Familiarization with the data; (2) Generating initial codes; (3) Searching for themes; (4) Reviewing themes; (5) Defining and naming themes; and (6) Producing the report. An inductive thematic analysis approach was adopted, which allowed themes to emerge from the interview data rather than being predetermined by existing frameworks. NVivo 12 was

used to organize data and support coding during the analysis process. The coding process was conducted by the first author, who served as the primary analyst.

The researcher, first, became familiar with the interview transcripts and identified meaningful statements related to ICT teaching competency, instructional practices, challenges the participants faced and their support needs. The researcher then generated initial codes and compared them to identify similarities and differences across participants' responses. Related codes were grouped into broader categories and reviewed through repeated examination of the transcripts before codes were refined into themes representing participants' perspectives.

To enhance credibility, the researcher systematically documented coding decisions and iteratively reviewed emerging themes. Because a single researcher conducted the coding, inter-coder agreement was not calculated. Quantitative findings regarding comparatively lower competency and readiness dimensions were compared with themes emerging from the interviews to identify areas of convergence and complementarity. Integrated interpretations were then developed to identify ICT teaching competency gaps and key areas requiring further development.

4. Results

This section presents the findings of a survey of 203 pre-service EFL teachers who reported self-perceived ICT teaching competency and blended learning readiness, as well as the data gathered in interviews with six instructors regarding ICT teaching competency development.

4.1 ICT Teaching Competency

The first research question of the study is: What is the current level of ICT teaching competency of pre-service EFL teachers? To address this question, the mean scores and standard deviations were calculated, as shown in Table 5.

Table 5: Mean scores of ICT teaching competency dimensions

Dimensions	M	SD	Level
Basic Technological Literacy	3.36	.501	Moderate
Technology-Supported Learning	3.29	.541	Moderate
Technology-Supported Teaching	3.08	.581	Moderate
Total mean score	3.24	—	Moderate

Based on the interpretation criteria proposed by Best and Kahn (2006), pre-service EFL teachers reported an overall moderate level of ICT teaching competency ($M = 3.24$). All three dimensions were also within the moderate range. Basic Technological Literacy recorded the highest mean score

($M = 3.36$, $SD = 0.501$), followed by Technology-Supported Learning ($M = 3.29$, $SD = 0.541$), while Technology-Supported Teaching had the lowest mean score ($M = 3.08$, $SD = 0.581$). This pattern indicates that pre-service EFL teachers reported stronger competence in Basic Technological Literacy and relatively weaker competence in Technology-Supported Teaching.

At the item level, variation was identified across different dimensions. In the Basic Technological Literacy dimension, scores ranged from 2.67 to 4.56, with higher scores observed in items related to ethical awareness and responsible technology use, such as awareness of information security regulations ($M = 4.56$, $SD = 0.717$) and maintaining a positive online communication environment ($M = 4.43$, $SD = 0.789$). In the Technology-Supported Learning dimension, respondents reported that they performed relatively well at selecting appropriate online resources ($M = 4.05$, $SD = 0.756$). However, no items in the Technology-Supported Teaching dimension reached a high level, with the highest mean score being 3.46. This pattern indicates relatively lower self-reported competency in applying ICT for teaching-related purposes.

4.2 Blended Learning Readiness

The second research question of the study is: What is the level of blended learning readiness of pre-service EFL teachers? To answer this question, the mean scores and standard deviations were calculated, as presented in Table 6.

Table 6: Mean scores of blended learning readiness

Dimension	M	SD	Level
Attitude Toward Learning Flexibility	3.91	.586	High
Openness to (New) Technology	3.76	.528	High
Attitude Toward Online Learning	3.38	.522	Moderate
Attitude Toward Face-to-Face Classroom	3.76	.523	High
Basic Skills in Using Technology	3.52	.459	Moderate
Attitude Toward Study Management	3.53	.502	Moderate
Readiness Toward Blended Learning	3.58	.581	Moderate

As shown in Table 6, pre-service EFL teachers reported moderate to high levels of blended learning readiness across the seven dimensions. Among the seven dimensions, Attitude Toward Learning Flexibility recorded the highest mean score ($M = 3.91$, $SD = 0.586$), followed by Openness to (New) Technology ($M = 3.76$, $SD = 0.528$) and Attitude Toward Face-to-Face Classroom ($M = 3.76$, $SD = 0.523$). In contrast, Attitude Toward Online Learning had the lowest mean score ($M = 3.38$, $SD = 0.522$). The remaining dimensions, including Attitude Toward Study Management ($M = 3.53$, $SD = 0.502$), Basic Skills in Using Technology ($M = 3.52$, $SD = 0.459$), and Readiness

Toward Blended Learning ($M = 3.58$, $SD = 0.581$), were within the moderate range. Overall, pre-service EFL teachers reported moderate but uneven readiness for blended learning, with comparatively lower readiness in Attitude Toward Online Learning.

4.3 Interview Findings

To complement the quantitative findings, semi-structured interviews were conducted with six teacher educators to explore their perspectives on pre-service EFL teachers' ICT teaching competency development. The qualitative findings provided contextual insights into the challenges, current practices and factors influencing ICT teaching competency development from teacher educators' perspectives. Overall, four main themes emerged from the inductive thematic analysis. Table 7 presents representative codes and categories, along with illustrative quotations from multiple teacher educators, to show how the themes are grounded in the interview data.

Table 7: Themes, representative codes and categories, and illustrative quotations from teacher educator interviews

Themes	Representative codes/categories	Illustrative quotations
Challenges in integrating ICT in teaching practices	Limited ICT teaching competency; insufficient instructional design skills; reliance on basic ICT applications	"Lack of skills in instructional design...nor in developing teaching slides" (R1D) "Very limited ICT teaching ability" (R4LY)
Traditional pedagogical approaches and limited instructional support	Teacher-centered institution; theory-practice gap; limited student agency	"Theory-first, practice-later structure" (R1D) "Traditional teacher-centered instruction" (R3XY)
Barriers and support needs for effective ICT integration	Need for practice opportunities; insufficient teaching resources and facilities; need for assessment and pedagogical support	"Time for learning and practice opportunities" (R2X) "Teaching resources and hardware facilities" (R1D)
Positive attitudes toward ICT and blended learning	Perceived student readiness; familiarity with digital technology; positive expectations for blended learning	"Students' familiarity with digital technology supports blended learning" (R5Y) "Blended learning is very promising" (R6Z)

4.3.1 Theme 1: Challenges in Integrating ICT in Teaching Practices

A prominent theme identified from the interviews is pre-service EFL teachers' limited ability to integrate ICT in pedagogical practices. Participant R1D noted that pre-service EFL teachers experienced difficulties with instructional design and technology-supported teaching. Participants R2X, R4LY and R6Z, similarly, perceived their ICT teaching competency as being

relatively limited. R1D, furthermore, observed that pre-service EFL teachers tended to focus on familiar lesson types during teaching practice, indicating uneven development of different instructional skills.

4.3.2 Theme 2: Traditional Pedagogical Approaches and Limited Instructional Support

Participants also identified traditional pedagogical approaches and limited instructional support as challenges associated with ICT integration. Participants R2X and R3XY indicated that pre-service EFL teachers tend to rely heavily on teacher-centered methods and had limited exposure to effective models of technology-enhanced instruction during their teaching practice activities. Furthermore, R1D observed that pre-service EFL teachers often followed a “theory first and practice later” teaching approach, which may constrain their ability to apply ICT in authentic teaching contexts.

4.3.3 Theme 3: Barriers and Support Needs for Effective ICT Integration

Participants identified several forms of support that were needed for effective ICT integration. R2X emphasized the need for sufficient time and opportunities for learning and practice, while R1D highlighted the importance of teaching resources and hardware facilities. Participants also identified assessment-related support needs, including support in learning how to conduct formative assessment in teaching. These findings indicate a need for practical, resources and instructional support to develop ICT teaching competency.

4.3.4 Theme 4: Positive Attitudes Toward ICT and Blended Learning

Despite these challenges, participants expressed generally positive attitudes regarding the importance of ICT teaching competency and were optimistic about implementing blended learning. As Participant R5Y noted, pre-service EFL teachers’ familiarity with digital technology provided a supportive foundation for blended learning. Similarly, Participant R6Z expressed a positive attitude regarding the potential of blended learning to address challenges in current instructional practices. The interview findings suggest that teacher educators perceived pre-service EFL teachers as generally receptive to technology integration and blended learning despite facing practical and pedagogical challenges.

4.4 Integrated Development Needs

The third research question addressed the key ICT teaching competency gaps and areas requiring further development for pre-service EFL teachers. By integrating the quantitative and qualitative findings, the study identified three key areas requiring further development. Table 8 presents the joint display and illustrates the relationships among quantitative results, qualitative evidence and integrated interpretations, and corresponding development implications.

Table 8: Joint display of quantitative and qualitative findings on ICT teaching competency development needs

Quantitative findings	Qualitative evidence	Integrated interpretation	Development implication
Technology-Supported Teaching received the lowest mean score of the three ICT teaching competency dimensions	Teacher educators reported that pre-service EFL teachers mainly used ICT for basic functions and had limited opportunities to design ICT-supported learning activities	Gap between basic ICT knowledge and pedagogically meaningful ICT integration	Provide practice-oriented ICT integration training and ICT-supported lesson design opportunities
Online Learning Readiness relatively lower	Teacher educators expressed positive attitudes toward blended learning but highlighted the need for additional guidance and support in technology-enhanced learning practices	Positive acceptance of blended learning does not necessarily indicate sufficient readiness for effective online learning engagement	Design structured blended learning activities with appropriate online learning support
Lower Technology-Supported Teaching competency	Limited authentic teaching practice	Need more ICT-supported teaching practice	Provide authentic or simulated ICT-supported teaching practice opportunities

The following paragraphs elaborate on each identified area of development. First, Technology-Supported Teaching, particularly the integration of ICT into teaching practices, was identified as a key area requiring further development. The results in Section 4.1 indicate that Technology-Supported Teaching received the lowest mean score of the three competency dimensions, with pre-service EFL teachers reporting lower competence in applying ICT to instructional design and teaching activities than for Basic Technological Literacy and Technology-Supported Learning. This finding was supported by the interview findings, because teacher educators noted that pre-service teachers often used technology only for basic functions such as presenting slides or displaying materials, rather than facilitating meaningful learning and student engagement. Together, the quantitative and qualitative findings indicate a gap between technological knowledge and pedagogical application.

Second, online learning readiness was identified as another area requiring further development. As shown in Section 4.2, participants expressed positive attitudes toward learning flexibility and openness to technology, but their online learning readiness scores were comparatively lower than those for several other dimensions. Interview participants also reported generally

positive attitudes toward ICT and blended learning. Considered together, these findings suggest that comparatively weaker online learning readiness coexisted with generally positive attitudes toward technology and blended learning. The findings highlight the importance of examining online learning engagement, self-regulation and digital interaction skills in blended learning contexts.

Third, more opportunities for practice-based learning in ICT-enhanced teaching are needed. The questionnaire results indicate that participants reported lower competency in Technology-Supported Teaching than for Basic Technological Literacy and Technology-Supported Learning, and the interview findings explained this gap further. Teacher educators indicated that pre-service teachers were often exposed to theoretical knowledge about ICT but had limited opportunities to apply it in authentic or simulated teaching contexts. They also highlighted the lack of effective instructional models and practical guidance for integrating ICT into subject-specific teaching. The integrated findings highlight the importance of practice-oriented experiences that help transform technological knowledge into effective teaching competence. Overall, the integrated findings reveal three major development areas: ICT integration in teaching practices, online learning readiness, and practice-based learning opportunities.

5. Discussion

This study examined the current level of ICT teaching competency of pre-service EFL teachers and identified their developmental needs. It also investigated their readiness to engage in blended learning as learners, which was examined as a supporting condition for competency development. To achieve these aims, the study adopted a mixed-methods approach to collect and integrate data from pre-service EFL teachers and teacher educators.

Quantitative data were collected through questionnaires administered to 203 pre-service EFL teachers, focusing on their ICT teaching competency and blended learning readiness. In parallel, qualitative data were gathered through semi-structured interviews with six teacher educators to provide complementary perspectives on the challenges and development needs associated with ICT teaching competency. Finally, integrating the quantitative and qualitative results provided a comprehensive understanding of the developmental needs for enhancing pre-service EFL teachers' ICT teaching competency.

5.1 ICT Teaching Competency Gaps

The findings indicate that pre-service EFL teachers reported moderate ICT teaching competency but still had areas requiring further development to meet the demands of technology-enhanced language teaching. This finding highlights that basic technological literacy alone is insufficient for effective ICT integration, because technology-enhanced teaching requires teachers to

connect technological knowledge with pedagogical purposes. This interpretation aligns with studies that report that pre-service teachers often struggle to move from basic digital literacy to pedagogically meaningful technology integration (Çebi & Reisoğlu, 2020; Lu et al., 2025; Shen & Yang, 2020; Tondeur et al., 2012).

A closer examination of the three competency dimensions reveals an imbalance, with scores decreasing progressively from Basic Technological Literacy to Technology-Supported Learning and Technology-Supported Teaching. This pattern is consistent with the national benchmark reported by Wang et al. (2023) for 20 normal universities, suggesting a similar pattern for the three dimensions of ICT teaching competency. The result indicates that pre-service EFL teachers are relatively stronger in Basic Technological Literacy and Technology-Supported Learning but require further development in applying ICT for pedagogical purposes.

The relatively high Basic Technological Literacy score may be partly associated with participants' widespread access to digital devices and internet connectivity. As indicated by the demographic data, smartphone ownership was at 100%, while over half the participants owned laptops, and all reported having internet access. However, as Lu et al. (2025) note, high accessibility does not automatically translate into professional ICT integration competence. This finding may indicate that participants were more familiar with everyday digital use than with advanced multimedia and software applications required for instructional design.

While the internal structure of dimensions aligns with national trends reported by Wang et al. (2023), the absolute scores in the present study were lower for all three dimensions. This difference may reflect variations in institutional context, technology-related support and opportunities for ICT integration in different teacher education settings. Given that this study was conducted in a normal private-sector college in an economically developing province, institutional context may be one consideration when interpreting these differences. However, because the study did not directly compare institutional types, these differences should be interpreted cautiously. These findings highlight the importance of considering institutional context when planning ICT teaching competency development.

A notable gap identified by this study concerns technology-supported teaching, which received the lowest mean score of the three dimensions. This indicates that pre-service teachers face challenges in integrating ICT in pedagogical practices, including selecting appropriate digital tools and designing effective technology-supported instruction. This quantitative finding is contextualized further by the interview findings, according to which teacher educators perceived that pre-service EFL teachers experienced difficulties in instructional design and technology-supported teaching.

Several teacher educators also characterized their own ICT teaching competency as relatively limited. This finding aligns with Rakerda et al. (2025), who report that pre-service teachers often struggle to translate their technological knowledge into pedagogical application, particularly within the TPACK framework.

Taken together, these findings reveal a progression gap from basic technological awareness to pedagogical application. While pre-service EFL teachers reported relatively strong foundational ICT knowledge, they need further support to translate this knowledge into effective teaching practices. This pattern may also be partly explained by the developmental stage of pre-service teachers, who often have limited opportunities to engage in authentic classroom teaching and technology-integrated instructional practices before they enter the teaching profession. These findings highlight the importance of providing structured opportunities that emphasize pedagogical integration rather than technical familiarity in ICT-related teacher education.

5.2 Readiness for Online and Blended Learning

The findings of this study indicate that pre-service EFL teachers generally reported a moderate level of readiness for blended learning, suggesting a relatively favorable foundation for technology-enhanced teacher education. Their positive attitudes toward learning flexibility and openness to technology suggest that they are receptive to technology-enhanced learning environments. This pattern is also reflected in teacher educators' perceptions, who generally recognized pre-service EFL teachers' positive attitudes toward ICT and blended learning. This aligns with a study by Ihnatova et al. (2022), which reports that students tend to show strong motivation to engage in blended learning. Widespread access to digital devices and internet connectivity provides an important foundation for blended learning participation; however, technological access alone does not necessarily ensure effective engagement in online learning processes.

A closer examination of the data reveals that this readiness is not uniform for all dimensions. Respondents reported comparatively lower readiness for online learning than their level of openness to technology and preference for learning flexibility, suggesting that positive attitudes toward technology and blended learning do not necessarily correspond with equally strong readiness for online learning. This interpretation is consistent with research that suggests that, although blended learning offers flexibility and opportunities for personalized learning (Buluma & Walimbwa, 2021; Rasheed et al., 2020), successful engagement in blended learning environments depends substantially on learners' readiness to engage in online and self-directed learning. Therefore, enhancing blended learning readiness may provide favorable conditions for technology-enhanced teacher education and ICT teaching competency development.

5.3 Development Needs for ICT Teaching Competency

Given that participants reported generally positive attitudes toward technology and comparatively favorable readiness across several blended learning dimensions, these findings provide insights into how ICT-enhanced learning environments could support ICT teaching competency development. The relatively lower score of Technology-Supported Teaching indicates challenges in applying ICT for pedagogical purposes, while teacher educators' perspectives provide complementary contextual insights into this competency gap. In addition to the identified competency gaps and readiness issues, the findings of this study indicate that instructional practices within the studied teacher education contexts may not always provide sufficient support for developing ICT teaching competency through practice-based experiences.

The qualitative findings indicate that instructional practices were often characterized by teacher-centered approaches, with limited opportunities for active student engagement. Pre-service EFL teachers may often experience learning environments in which they are positioned more as recipients of knowledge than as active participants in technology-enhanced learning processes. This reliance on traditional teaching approaches may provide fewer opportunities for pre-service teachers to engage actively in technology-enhanced and practice-based learning.

In addition, because pre-service teachers are still developing their professional identities and pedagogical knowledge, their limited classroom experience may affect their confidence and ability to integrate ICT in teaching practice. Similar findings have been reported by other studies, which suggest that teacher education programs often emphasize theoretical knowledge while providing limited opportunities for practical application. This qualitative evidence complements the quantitative finding that Technology-Supported Teaching was the lowest-scoring competency dimension.

Furthermore, teacher educators pointed to the importance of effective modeling of ICT integration in teacher education. Other studies (Fearnley & Amora, 2020; Leba & Temaja, 2023) emphasize the importance of teacher educators as role models in shaping pre-service teachers' technology integration practices. In addition, teacher educators highlighted the need for sufficient practice opportunities, teaching resources and hardware facilities, and appropriate assessment support. Collectively, these concerns point to the importance of providing structured support for pre-service teachers' ICT teaching competency development.

Limited opportunities for teaching practice emerged as another area of concern in ICT teaching competency development. This finding is consistent with the quantitative finding that Technology-Supported Teaching received

the lowest mean score, which suggests challenges in transferring ICT knowledge into instructional practices. These challenges may partly reflect pre-service teachers' developmental stage, because they often have limited exposure to authentic classroom teaching and technology-integrated instructional experiences before they enter the teaching profession. Other research (Kaminskienė et al., 2022; Kulaksız & Toran, 2022; Tondeur et al., 2017) similarly highlights the importance of practice-based experiences in developing ICT teaching competency.

Taken together, these findings underscore the need for student-centered and practice-oriented instructional approaches in teacher education. In addition to developing technological knowledge, pre-service EFL teachers need opportunities to apply ICT in authentic or simulated teaching contexts, observe effective examples of technology integration, and receive guidance on connecting technology use with pedagogical objectives. Such experiences may help bridge the gap between technological knowledge and classroom practice. These findings reinforce the potential value of teacher education modules that integrate technological, pedagogical, and practice-based learning opportunities, including through appropriately designed blended learning environments, to support ICT teaching competency development.

6. Conclusion

This study investigated the ICT teaching competency and development needs of pre-service EFL teachers through a convergent parallel mixed-methods design. By integrating data from 203 pre-service EFL teachers and six teacher educators, the study identified their competency levels, blended learning readiness, and key areas requiring further development.

Pre-service EFL teachers reported moderate ICT teaching competency; Technology-Supported Teaching emerged as the weakest dimension, indicating challenges in integrating ICT into pedagogy. Blended learning readiness was also moderate, and readiness for online learning was comparatively lower than several other dimensions. The qualitative findings exposed challenges associated with teacher-centered instruction and limited practice-based learning opportunities, as well as the need for greater instructional and resource support. This study contributes to the literature by highlighting the value of convergent mixed methods needs analysis that integrates pre-service teachers' self-assessments with teacher educators' perspectives. The findings provide empirical evidence for teacher education initiatives that emphasize the integration of ICT in pedagogy, authentic or simulated technology-supported teaching experiences, and practice-based learning opportunities.

Several limitations should be acknowledged. The quantitative data were collected from a single teacher education institution using convenience sampling and self-reported measures as part of a cross-sectional design,

which limits generalizability and the assessment of actual ICT teaching competency performance. Participants' limited classroom experience may also have influenced their self-assessments. The relatively small qualitative sample and differences in institutional contexts between the quantitative and qualitative participant groups should be considered when interpreting the integrated findings. Future research may incorporate classroom observations, performance-based assessments, longitudinal designs and diverse education contexts to examine ICT teaching competency development further. Ultimately, strengthening practice-based and pedagogically meaningful ICT integration in teacher education may better prepare future EFL teachers for technology-enhanced teaching contexts.

7. Ethical Considerations

Participation in this study was voluntary. All participants were informed of the study purpose and provided informed consent before they completed the questionnaires or participated in the interviews. Participants were assured that their responses would remain confidential and would be used solely for academic research purposes. To protect participants' privacy, all identifying information was removed from the dataset, and anonymized codes were used during data analysis and reporting. Permission to conduct the study was obtained from the relevant academic authority at the participating institution before the study began.

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Conflict of Interest

The authors declare no conflict of interest.

Data Availability Statement

The questionnaire and interview data used in this study are not publicly available because of concerns regarding participant privacy and confidentiality. The data may be made available by the corresponding author upon reasonable request, subject to participant confidentiality and applicable institutional requirements being adhered to.

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