International Journal of Education & Literacy Studies
ISSN: 2202-9478
www.ijels.aiac.org.au

Challenges of ICT Teachers in Integrating Digital Literacy Post-COVID-19 Curriculum Revisions in Thailand's English Teacher Education Programs

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ARTICLE INFO

Article history
Received: June 13, 2024
Accepted: July 25, 2024
Published: July 31, 2024
Volume: 12 Issue: 3

Conflicts of interest: None
Funding: None

ABSTRACT

After the curriculum reforms from 2021 to 2023, public universities in Thailand have been adapting to integrate ICT and digital literacy into their teaching. This research explores the changes experienced by ICT teachers when integrating digital literacy with student teachers in English teacher education programs after the pandemic. During COVID-19, online learning was mandatory, necessitating significant adjustments. This study also investigates the challenges associated with these changes. The participants were six teachers from six public universities with firsthand experience with the revised curriculum from 2021 to 2023. Semi-structured interviews were used as the research instrument. The interview data were grouped into themes according to the degree of change and challenges encountered by the teachers. The findings showed four levels of changes due to the curriculum reforms: changing course names, descriptions, topics, and assessments. Along with these changes, the teachers faced several challenges: selecting appropriate ICT resources, insufficient digital literacy knowledge, the need for pedagogical adjustments, insufficient training and support, infrastructure limitations, and time constraints. The study suggests that universities should offer ongoing professional development to help teachers keep up with the changing digital literacy landscape. Additionally, institutional infrastructure and support need improvement. Teacher education programs should incorporate comprehensive training on using ICT in teaching, emphasizing practical applications. Future research should study the effectiveness of professional development models in enhancing teachers' ICT skills and their ability to integrate technology into their teaching. It should also identify the impact of collaborative teaching approaches on ICT integration in teacher education programs.

Key words: ICT Teachers, Teacher Education Program, ICT Integration, Revised Teacher Education Curriculum

INTRODUCTION

Thailand's education system aims to help students improve their skills at various levels. The main goal is to provide students with a well-rounded education. The curriculum includes important subjects such as Thai Language, Mathematics, Science, and Social Studies. In the classroom, it offers a wide range of knowledge, focusing on global English proficiency, student-centered learning, and technology integration (Jegede, 2019). Incorporating technology into education helps develop critical skills needed for the twenty-first century (Hendehjan & Noordin, 2013).

Universities in Thailand play a key role in giving students the chance to learn essential skills for the workplace. The curriculum reforms in Thailand recognize the importance of integrating technology and digital literacy into teaching and learning. The teacher education program, in particular, prepares future teachers. This program includes training on how to use technology effectively in the classroom, ensuring that teachers have the necessary skills and competencies (Mukhari & Sanders, 2023). The curriculum for the teacher education program is revised every three to four years to keep it up-to-date with current trends and global events, ensuring a modern and relevant education for students (Rupavijetra & Rupavijetra, 2022).

ICT subjects in English teacher education programs are crucial as they provide future teachers with the skills to integrate digital tools into language teaching. These subjects can be taught by teachers with degrees in Education Technology or those with degrees in English Language Teaching (ELT), highlighting the interdisciplinary nature of ICT education. Teachers with a background in Educational Technology bring expertise in the technical aspects of ICT, while those with an ELT background bring insights into effectively integrating these technologies into language teaching. This

Published by Australian International Academic Centre PTY.LTD.

http://dx.doi.org/10.7575/aiac.ijels.v.12n.3p.208

relationship ensures a comprehensive approach to preparing teachers for modern educational challenges.

Despite these efforts, ICT teachers face several challenges when integrating technology into their teaching. These challenges became more pronounced during the COVID-19 pandemic when online teaching became mandatory (Mukhari & Sanders, 2023). Teachers had to quickly adapt to new teaching methods, which highlighted gaps in their ICT skills and the need for better support and infrastructure (Warner et al., 2021). After the pandemic, the demand for effective ICT integration has increased, putting more pressure on teachers to meet higher expectations from the curriculum and their students (van der Berg & Spaull, 2020). The COVID-19 pandemic significantly impacted the education system, forcing all institutions to adopt online instruction. CALL (Computer-Assisted Language Learning) instructors, especially those in teacher education programs, faced unique challenges in adapting to this sudden shift. Research by Kaoropthai and Boonmoh (2023) highlights that CALL instructors at Rajabhat Universities had to quickly adjust to online teaching, despite many lacking sufficient ICT knowledge. This situation underscored the need for comprehensive training and support for these instructors.

There is limited research on the specific challenges that ICT teachers in Thailand face when integrating ICT and digital literacy into their teaching, especially after the curriculum revisions and the aftermath of the COVID-19 pandemic. This study aims to fill this gap by providing insights into these challenges and offering recommendations to improve ICT and digital literacy integration in teacher education programs. Understanding these issues is crucial for developing effective professional development programs and enhancing the overall quality of education.

In this study, ICT skills refer to the ability to use technological tools and resources such as computers, the Internet, and other digital devices to facilitate teaching and learning (Ghavifekr & Rosdy, 2015). Digital literacy, on the other hand, encompasses a broader range of competencies, including the ability to locate, evaluate, create, and communicate information using digital technologies, and understanding the ethical implications of digital usage (Nguyen & Kieuthi, 2020). By integrating both ICT skills and digital literacy into their teaching, educators can ensure that students are not only proficient in using technology but also capable of critical thinking and responsible digital citizenship.

The purpose of this study is to provide insight into the challenges that ICT teachers face in teacher education programs in Thailand, as well as the challenging factors associated with those changes. Our study was guided by the following two research questions.

1. What changes have the teachers encountered when integrating digital literary and ICT in their teaching courses after the revision of English teacher education programs?
2. What are the challenges that are associated with the changes in their teaching, especially after the COVID-19 pandemic?

LITERATURE REVIEW

The integration of Information and Communication Technology (ICT) in education has garnered significant attention globally. ICT in education refers to using technological tools and resources in teaching and learning processes, such as computers, the Internet, broadcasting technologies (radio and television), and telephony (Hendehjan & Noordin, 2013). The primary objective of integrating ICT is to enhance the quality of education by fostering more interactive and student-centered learning environments (Ghavifekr & Rosdy, 2015).

Theoretical frameworks supporting ICT integration often emphasize the constructivist approach, where learners construct knowledge through experiences and interactions (Mukhari & Sanders, 2023). This approach aligns with the shift towards student-centered learning, positioning students as active participants in their learning journey. Constructivist theories suggest that technology facilitates active learning by providing interactive and engaging platforms for students (Ghavifekr & Rosdy, 2015). Numerous empirical studies have examined the challenges educators face in integrating ICT into their teaching practices, highlighting barriers such as inadequate infrastructure, insufficient training, and lack of support.

Boonmoh et al. (2021) conducted a study involving 50 Thai EFL teachers to identify barriers to ICT integration. Using surveys and interviews, the study revealed several barriers, including a lack of ICT infrastructure, insufficient training and support, and time constraints. The findings highlighted the need for continuous professional development and adequate resources to support teachers in effectively using ICT tools.

Almazova et al. (2020) conducted a study with 200 higher education teachers in Russia to explore ICT integration challenges. Using questionnaires and focus group discussions, the study found that teachers often struggle with selecting appropriate ICT resources and adapting their pedagogical methods to incorporate technology effectively. The findings indicated a significant need for comprehensive training programs to improve teachers' ICT skills and confidence.

Boonmoh and Kulavichian (2023) investigated how Thai EFL pre-service teachers (PSTs) used technology in their classrooms and found that teacher motivation, availability of ICT equipment, and familiarity with technological tools significantly influenced their technology integration. They observed that most PSTs were at the augmentation level of the SAMR model, highlighting the need for comprehensive training programs to enhance their technology integration skills. The study emphasized that continuous support and training are crucial for effective technology integration in classrooms.

Kaoropthai and Boonmoh (2023) examined the impact of ICT integration on teaching practices in Thai universities, involving eight university teachers responsible for integrating ICT into their curriculum. Using a mixed-method approach of surveys and interviews, the study found that while ICT has the potential to enhance teaching and learning, it requires substantial adjustments in pedagogical approaches

and continuous support for teachers. The study emphasized the importance of a supportive environment that encourages collaboration and sharing of best practices among educators.

Impact of Curriculum Reforms

Recent curriculum reforms in Thailand aim to enhance educational quality by integrating more ICT components. These reforms have necessitated updates to instructional practices and the incorporation of new technological tools into teaching (Mukhari & Sanders, 2023). Studies show that these changes can be particularly challenging for teachers with limited ICT knowledge and experience (Warner et al., 2021). Boonmoh and Kulavichian (2023) also noted that PSTs required significant support and motivation to adapt to these changes effectively.

Antón-Sancho et al. (2023) investigated the impact of the COVID-19 pandemic on ICT tool usage in science and technology education, involving 150 teachers in Spain. Using surveys and interviews, the study revealed substantial difficulties in adapting to online instruction, underscoring the pandemic's widespread impact on teaching practices. The findings emphasize the importance of providing adequate support and training to help teachers navigate the digital landscape effectively.

Professional Development and Support

Professional development is crucial for enhancing teachers' ICT skills and confidence. Alt (2018) examined the impact of ICT professional development on the efficacy and practices of 100 science teachers in Israel. Using surveys and classroom observations, the study emphasized the necessity of continuous ICT professional development to improve teachers' efficacy and integration of technology in classrooms.

Nguyen and Kieuthi (2020) explored digital literacy integration in teacher training programs in Vietnam, involving 200 pre-service teachers. Using surveys and focus group discussions, the study stressed the importance of digital literacy in enhancing educators' capabilities in using technology. The study recommended incorporating comprehensive digital literacy training into teacher education programs to better prepare teachers for the digital age.

Cheshmehzangi et al. (2023) examined ICT applications during the COVID-19 pandemic and their impact on digital data and privacy, involving 120 participants, including teachers and students from various educational institutions in China. Using surveys and interviews, the study highlighted the need to address privacy concerns and ensure data protection when integrating ICT tools into educational settings, adding another layer of complexity to the challenges faced by teachers.

Valverde-Berrocoso et al. (2021) conducted a study with 250 pre-service teachers in Spain to investigate digital technology integration before the COVID-19 pandemic. Using a mixed-method approach of surveys and focus group discussions, the study found that successful digital technology integration in education requires technical skills and a supportive institutional culture that values continuous learning and innovation.

The literature on ICT integration in education highlights several key themes. First, integrating ICT is essential for enhancing educational quality and promoting student-centered learning. However, significant challenges remain, including inadequate infrastructure, insufficient training and support, and the need for continuous professional development. Empirical studies consistently emphasize the importance of addressing these challenges to ensure effective ICT integration. Furthermore, recent curriculum reforms in Thailand have placed additional demands on teachers, underscoring the need for ongoing support and tailored professional development programs. Addressing these challenges is crucial for educational institutions to support teachers in leveraging ICT and digital literacy to enhance teaching and learning.

METHODOLOGY

Research Design and Instrument

This study used a qualitative interpretative research design (Creswell & Creswell, 2017). The research instrument was a semi-structured interview, designed to explore the experiences and challenges faced by ICT teachers in English teacher education programs at Thai universities. This qualitative approach allows for a deep understanding of the difficulties from the participants' perspectives. Semi-structured interviews provided detailed insights into the challenges ICT teachers encounter when integrating technology into their teaching. The interview questions focused on the use of ICT in courses during 2021–2023, the challenges and experiences faced, difficulties related to ICT integration, ways to improve students' ICT proficiency, and any additional comments.

Participants

Table 1 provides demographic information about the participants, including their gender, age, years of teaching experience, and educational background. The participants in this study were teachers from six different Thai universities, specifically chosen for their involvement in the recent curriculum revisions between 2021 and 2023 and their integration of ICT into their courses. The six universities, known as Rajabhat Universities, are recognized for having some of the best teacher education programs for pre-service English teachers. The participants included three male and three female teachers, aged between 34 and 49 years old. Their educational backgrounds varied: four participants had bachelor's degrees in English, one had a bachelor's degree in educational technology, and one had a bachelor's degree in science. All participants had master's degrees in either English or educational technology, and one participant had a PhD in English.

All participants have between 10 and 23 years of teaching experience, with at least 3 years of experience specifically teaching ICT courses. ICT teachers in this context refer to educators who teach ICT-related subjects within English teacher

Table 1. Demographic information of the participants

Participant	Gender	Age	Teaching experience	Bachelor	Master	PhD
T1	Male	44	16	English	English	-
T2	Female	43	17	English	English	-
T3	Female	44	18	English	English	-
T4	Female	48	21	EdTech	English	English
T5	Male	34	10	English	English	-
T6	Male	49	23	Science	EdTech	-

education programs. These teachers may have degrees in either Education Technology or English Language Teaching (ELT), which enables them to integrate digital tools effectively into language teaching. This combination of technical expertise and pedagogical knowledge is essential for preparing future teachers to meet modern educational challenges.

Data Collection

This study received IRB approval with the IRB number KMUTT-IRB-2024-200. First, the researchers conducted ethical considerations and collected teacher information from the faculty of education at the six universities. The six teachers were selected because they were involved in the most recent curriculum revision between 2021 and 2023, and they had used ICT in their teaching in the assigned courses. Teachers who agreed to participate in the study's interview were asked to schedule an appointment via Zoom. Second, the researchers informed participants about the study's purpose, ensured their anonymity, and obtained permission to audio-record the interviews for educational purposes. There were six interview sessions, each lasting about 20 to 30 minutes.

Data Analysis

The researchers analyzed the raw participant data using a thematic content analysis approach. Creswell and Creswell (2017) define thematic content analysis as a systematic approach to presenting qualitative data. The data collection and analysis followed these steps: The audio-recorded interviews were transcribed verbatim. The transcriptions were read multiple times to familiarize the researchers with the data. Irrelevant data were excluded from the analysis. Relevant data were coded and categorized based on the challenges and comments related to ICT integration. The coded data were organized into themes that represented the main challenges and experiences of the teachers. A set of data from one teacher was checked and validated by an expert to ensure accuracy and reliability.

In the presentation of findings, summaries were provided and supported by excerpts from the teachers' interviews. This approach ensures a clear and systematic analysis of the data, making it possible to replicate the study.

FINDINGS

The findings of this study relate to the use of ICT and the impact of changes in the revised teacher education curricula on teaching. These findings address two main aspects: the changes that the revised teacher education curricula require from ICT instructors, and how these changes could impact their teaching from 2021 to 2023, especially considering the COVID-19 pandemic.

Changes Faced by ICT Teachers in Integrating ICT into Courses Post-Revisions in English Teacher Education Programs

The main objective of this research was to examine the challenges faced by ICT teachers in English teacher education programs when teaching updated ICT knowledge following the curriculum revision. It is essential to provide information on how the revised curricula's ICT courses have changed. Table 2 outlines the details of the revised curricula and the extent of changes from 2021 to 2023. The modifications to the ICT courses were categorized into four levels: course name change, course description change, course topic adjustment (15 weeks), and assessment changes.

Regarding the curriculum revisions from 2021 to 2023, the six revised teacher education programs (T1, T2, T3, T4, T5, and T6) experienced varying degrees of modification in their instructional practices. These programs can be grouped into three levels of modification, which clearly address the first research question: "What changes have the teachers encountered when integrating ICT in their teaching courses after the revision of English teacher education programs?"

The first group, comprising T1, T2, and T3, or the slight changes group, experienced slight changes in course topics and course descriptions. The fewest modifications were encountered by the first group, which included T1, T2, and T3. Particularly, T1 and T2 predominantly changed their course content to match the 15-week format, whereas T3's modifications were mainly in the course description.

T1 experienced minor changes in course topics and assessment methods. The course "Material Development and Learning Innovations in English Language Teaching" maintained its name and description but included new topics like teaching language skills, such as vocabulary and listening. Additionally, assessments now incorporate online presentations where students are graded on non-verbal communication and familiarity with online tools. As the interview excerpt from T1 demonstrates: "*We updated the course 'Material Development and Learning Innovations in English Language Teaching' in 2021. New topics like ICT knowledge, basic software, and other resources for teaching*

Table 2. Details of the revised curriculum and level of changes of the curriculum based on the interview

	T1's curriculum	T2's curriculum	T3's curriculum	T4's curriculum	T5's curriculum	T6's curriculum
Has curriculum been revised	/	/	/	/	/	/
Year of revision	2021	2022	2022	2021	2022	2023
Has changes been made on ICT courses	/	/	/	/	/	/
Level of changes made						
1. changing name of course				/	/	/
2. changing course description			/	/	/	/
3. changing in course topics (15 weeks)	/	/			/	/
4. changing in assessment	?			?		

Note: *The "?" symbol indicates that changes in assessment methods were either very slight or not explicitly detailed in the course syllabus.*

*were added. The curriculum mandates on-site instruction. We added topics like teaching language skills, such as vocabulary and listening. Assessments now include online presentations, grading on non-verbal communication, and familiarity with online tool*s."

T2 experienced changes mainly in the course topics. The course name and description remained the same, but new topics were added to incorporate ICT more effectively. This adjustment is evident from the following interview excerpt: *"The course 'Information and Communication Technology for English Language Teaching' was updated in our curriculum. The name and description of our course remained unchanged; however, we have incorporated new topics. We incorporated the following: 'Creating Interactive Presentations,' 'Online Tools,' 'Online Collaboration Tools,' 'Web Skills,' 'Web-Based Research Skills,' 'Podcasting Resources,' 'Podcasting and Audio Resources,' and 'Online Assessment and Feedback."*

T3 saw a change in the course description to better reflect the comprehensive use of digital technology in teaching. The course name did not change, but the description was updated to focus on innovation and digital technology for learning management. As the interview excerpt clearly supports: "*The course name didn't change, but we updated the course description from 'Designing Natural Learning Environments with Digital Technology for Major Fields of Study' to 'Innovation and digital technology for learning management, innovation and educational technology; information technology for communication; the principle of selection, analysis, design, media development, and innovation for students' learning.' These changes reflect a shift towards more comprehensive use of digital technology in teaching*."

The second group, or the moderate changes group, which includes T4, experienced changes in two main aspects: the course name and the course description. The course name was changed from 'Material Design for English Language Teaching' to 'Material and Innovation Development for English Language Learning.' This new title reflects a broader and more modern approach to English language learning, incorporating innovations and advancements in digital technology. The course description was also extensively revised. Initially, the course covered general principles such as studying, selecting, designing, developing, creating, using, and evaluating various media and innovations for English language learning. Post-pandemic changes necessitated a more detailed and dynamic approach. The revised curriculum now focuses on the analysis and application of theoretical concepts, the basics of media, and innovations in digital technology for learning English. As the interview excerpt from T4 demonstrates: "*We changed the course name from 'Material Design for English Language Teaching' to 'Material and Innovation Development for English Language Learning.' This new title reflects a broader and more modern approach to English language learning, incorporating innovations and advancements in digital technology. The revised curriculum now focuses on the analysis and application of theoretical concepts, the basics of media, and innovations in digital technology for learning English. This includes media development trends, the role of media, research, media examples, innovation, design, creation, development, media production, and innovative learning methods. The main focus of this course is on practical experience in all aspects of media production. We assess our students on the basis of tasks such as the production of handmade media, the use of online media tools, the production of English videos on TikTok, and integrating the use of media innovation into learning management."*

The third group, or the significant changes group, which consists of T5 and T6, experienced the most significant modifications in terms of course name, course description, and course topics (15 weeks).

T5 revised the course name from 'Material Design for English Language Teaching' to 'Material Development and Learning Innovations in English Language Teaching.' Alongside the name change, a substantial revision also took place to the course description. The new description contains the principles of producing teaching media for English language learning, as well as the adaptation, design, development, use, and evaluation of a variety of media and innovations to organize English language learning. This required modifications to the course topics to accommodate the 15-week format. As the interview excerpt from T5 demonstrates: "*In 2022, we revised the course name from 'Material Design for English Language Teaching' to 'English Material and Innovation Development.' The new course description emphasizes producing teaching media for English language learning and adapting, designing, developing, using, and evaluating various media and innovations. The course topics*

now include the ASSURE Model for integrating technology and media into instruction, traditional media, computer usage, connecting learners with Web 2.0 tools, understanding 21st-century learners, achieving 21st-century learning environments, instructional system design (ISD) using the ADDIE Model, connecting learners at a distance, using multimedia to engage students, enhancing learning with visuals, and applying infographics. We assign tasks such as the design of instructional systems using the ADDIE Model, the use of visuals to improve learning, the creation of infographics, and the organizing of project workshops for the assessment. We are of the opinion that these assignments satisfy the course's established assessment criteria."

T6 revised the course name from 'Learning Management in English 2' to 'English Language Learning Management for the 21st-Century Learners.' The previous course description focused on the methods by which teachers can oversee the learning process in English courses. The revised version emphasizes examining theories, principles, and methodologies for managing English language learning for 21st-century learners, incorporating a variety of techniques for active learning management and organizing English camps. As the interview excerpt from T6 demonstrates: "*We changed the course name from 'Learning Management in English 2' to 'English Language Learning Management for the 21st-Century Learners.' The revised course description focuses on examining theories, principles, and methodologies for managing English language learning for 21st-century learners. It now includes the theory, teaching methods, and techniques for teaching English as a foreign language in the 21st century, an introduction to CLIL (Content and Language Integrated Learning), task-based learning, CLT (Communicative Language Teaching), and the integration of technology into lesson planning*."

Each teacher faced different obstacles depending on their prior knowledge and teaching experience with the revised curriculum, which increased the challenges for them. Table 3 presents the challenges faced by ICT teachers in adapting to the revised curricula of their teacher education programs, focusing on the specific difficulties reported by the teachers. The challenges identified include the selection of appropriate ICT resources, the insufficiency of in-depth ICT knowledge, the need for pedagogical adjustments, insufficient training and support, infrastructure limitations, and time constraints.

Challenges Faced by ICT Teachers

Table 3 presents the challenges that ICT teachers from the six teacher education programs face when having to teach an ICT course after the revised curriculum. There are six main challenges: limitations in infrastructure, time limitations in preparing classes, insufficient training and support for ICT knowledge, difficulty selecting appropriate ICT resources, the need for pedagogical adjustments, and insufficient current or up-to-date ICT knowledge.

As shown in Table 3, the most frequently mentioned issues were related to infrastructure. All teachers reported this challenge. With increased demand for ICT outputs, the infrastructure should be available for ICT classes, but all teachers reported different problems within the scope of facilities and infrastructures. For example, T3 stated, "*Regard the course 'Innovation and Information Technology for Educational Communication and Learning' We need newer versions of computers in the computer lab. The current computers are too slow and take time to process." T5 also mentioned, "You know, in teaching the current course, 'Material Development and Learning Innovations in English Language Teaching', we do need the rooms for students to gather and produce the materials all together. Now that we don't have our own fixed time for the ICT class because we have to book the computer room, on days we don't have the lab, we cannot do much. So, it is problematic for us. We need the room for students to produce the materials for their teaching."* Similarly, T6 noted, *"The internet connection is unreliable, and the lack of proper equipment prevent effective teaching."*

The next problem reported by five teachers is time limitations. Teachers mentioned having to deal with additional administrative work, which left them with less time to prepare for ICT classes. This is especially true for ICT teachers whose courses required many changes, forcing them to sacrifice their own time and affecting their personal lives. T2 explained, *"The course' Information and Communication Technology for English Language Teaching' that I taught, I struggle with finding the time to plan and prepare ICT-based lessons for the 'English Language Teaching and Digital Literacy' course."* T4 added, *"You know, in the course 'Material and Innovation Development for English Language Learning' I have been preparing lessons that incorporate ICT. It takes a lot more time. Sometimes I am under feeling that I must remain up to date on the latest developments in ICT."* T5 shared, *"It was problematic when I taught the course 'Material Development and Learning Innovations in English Language Teaching'. I have to balance my administrative duties, and apart from that, I have to prepare for the ICT lesson. I feel overwhelmed. I often end up working late into the night, which is exhausting."*

Table 3. Challenges Faced by the ICT teachers

Challenges	T1	T2	T3	T4	T5	T6	Total
Limitations in infrastructure	/	/	/	/	/	/	6
Time limitation		/	/	/	/	/	5
Insufficient training and support		/		/	/	/	4
Selection of appropriated ICT resources		/			/	/	3
Need for pedagogical adjustments			/	/		/	3
Insufficiency of in-depth ICT knowledge			/		/	/	3

Insufficient training and support emerged as the third challenge, mentioned by four teachers. They felt they needed more training on new ICT tools and methods. As technology rapidly evolves, the COVID-19 pandemic accelerated the demand for ICT tools and skills. Teachers need to cope and learn quickly, and having training and support would be beneficial. T3 remarked, *"Teaching the course 'Innovation and Information Technology for Educational Communication and Learning' I feel we need more training for this course."* T6 echoed this sentiment, saying, *"Even though I teach the course 'English Language Learning Management for the 21st-Century Learners', I didn't get much training on the new software we are supposed to use. It's really challenging to figure things out on my own."* T4 added, *"Even though I studied education technology for my BA, when teaching the course 'Material and Innovation Development for English Language Learning', I still need to upskill and relearn because everything changes very fast. After COVID-19, some of my students asked me about things I knew about but not in depth, so I have to learn to better support my students. Apart from my knowledge of technology, I am also interested in upgrading my English language skills, as it is necessary to have both of these skills in order to teach in the English Education Program."*

The difficulty in selecting appropriate ICT resources was another challenge reported by three teachers. This process includes the following: navigating a wide variety of options, ensuring the quality and reliability of tools, finding compatible resources with existing infrastructure, managing costs within budget constraints, ensuring usability for both teachers and students, aligning resources with the curriculum, and obtaining adequate training and support.T4 shared, "*Choosing the right ICT resources for the 'Material and Innovation Development for English Language Learning' course is overwhelming.*" T5 agreed, noting, *"It's tough to pick the right tools. There are so many apps and software out there, and not all of them fit well with our curriculum."* T2 mentioned, *"Selecting the best tools that match our course objectives is a real challenge. There are too many options, and it's hard to know which ones are effective."*

Three teachers also indicated a need for significant pedagogical adjustments to integrate ICT effectively into their teaching. Significant pedagogical adjustments are necessary to effectively integrate ICT into the teaching process. In order to effectively integrate technology into lesson plans, teachers must redesign them. In an effort to foster student-centered learning, they must implement novel instructional methodologies that take advantage of digital tools. Furthermore, it is crucial to take part in ongoing professional development to remain informed about the latest ICT resources and best practices. T5 commented, *"Integrating ICT in the course 'English Material and Innovation Development' requires a change in teaching methods."* T6 added, "*The course* '*English Language Learning Management for the 21st-Century Learners' requires using ICT, and it changes the way I teach. It's not just about adding technology; it's about changing my whole approach to teaching."* T4 said, *"The course I taught, 'Material and Innovation Development for English Language Learning, required me to adapt my teaching style to incorporate ICT, which has been a challenge. I need to find new ways to engage students and make the lessons interactive."*

Finally, three participants reported insufficient in-depth ICT knowledge, making it challenging to implement ICT tools effectively. Consequently, teachers encounter difficulties in effectively employing ICT tools due to their inadequate background in ICT. Frequently, teachers find it hard to properly use complex digital tools due to a lack of expertise. Their ability to seamlessly incorporate technology into their teaching is limited by this knowledge gap. Continual training and support are essential for bridging this knowledge gap and enhancing the implementation of ICT. T6 stated, "*I don't have enough in-depth knowledge about ICT for the 'English Language Learning Management for the 21st-Century Learners' course."* T2 said, *"Since I teach the course Information and Communication Technology for English Language Teaching, I feel that my ICT knowledge is pretty basic. There are so many advanced features that I just don't know how to use effectively."* T3 added, *"Since I have been teaching the course 'Innovation and Information Technology for Educational Communication and Learning', I often feel out of my depth with some of the more advanced ICT tools. It's a steep learning curve, and I need more support to get up to speed."*

These findings highlight the multifaceted challenges that ICT teachers face in integrating technology into their teaching. Addressing these challenges is crucial for successful ICT integration in teacher education programs.

DISCUSSION

This study investigated the challenges faced by ICT teachers in English teacher education programs at public universities in Thailand following curriculum reforms during and after the COVID-19 pandemic. The key findings indicate that ICT teachers encountered several significant challenges, including selecting appropriate ICT resources, lacking in-depth ICT knowledge, needing to adjust their pedagogical methods, insufficient training and support, infrastructure limitations, and time constraints. These challenges are consistent with previous studies, such as Boonmoh et al. (2021) and Almazova et al. (2020), which highlighted the difficulties teachers face when integrating technology and digital literacy into their teaching practices.

One of the significant challenges identified was the difficulty in selecting appropriate ICT resources. This issue aligns with findings from Almazova et al. (2020), who noted that educators often struggle to choose suitable technological tools that match their instructional needs and the curriculum's requirements. T2 highlighted the overwhelming number of available resources and the difficulty in evaluating their effectiveness: "Selecting the best tools that match our course objectives is a real challenge. There are too many options, and it's hard to know which ones are effective." This challenge necessitates the development of criteria and support systems to aid teachers in selecting and utilizing the most effective ICT resources.

Another notable challenge was the lack of in-depth ICT knowledge among some teachers. T3 stated, "I often feel out

of my depth with some of the more advanced ICT tools. It's a steep learning curve, and I need more support to get up to speed." This finding is consistent with previous research by Ghavifekr and Rosdy (2015), which emphasized the need for continuous professional development to enhance teachers' ICT skills. Without adequate training, teachers may struggle to integrate ICT effectively into their teaching practices, thereby limiting the potential benefits of these tools.

The need for significant pedagogical adjustments was another challenge highlighted in the study. T5 commented, "Integrating ICT in the course requires a change in teaching methods." This aligns with Mukhari and Sanders (2023), who emphasized that integrating ICT into education requires a shift towards more student-centered learning approaches. Teachers need to redesign their lesson plans to incorporate digital tools effectively, which can be a time-consuming and complex process.

Insufficient training and support were also significant issues. T4 noted, "I feel we need more training for this course." This sentiment is echoed by Nguyen and Kieuthi (2020), who stressed the importance of integrating digital literacy into teacher training programs to enhance educators' capabilities in using technology. Continuous professional development and support systems are essential to help teachers stay updated with the latest ICT tools and methodologies. Boonmoh and Kulavichian (2023) also highlight the importance of comprehensive training programs, as their study found that teacher motivation, availability of ICT equipment, and familiarity with technological tools significantly influenced technology integration in classrooms.

Infrastructure limitations were the most frequently mentioned challenge. All teachers reported issues related to inadequate infrastructure, such as outdated computers and unreliable internet connections. T3 stated, "We need newer versions of computers in the computer lab. The current computers are too slow and take time to process." This finding is consistent with Boonmoh et al. (2021), who highlighted the need for improved infrastructure to support ICT integration in education.

Time constraints were another significant challenge. Teachers reported that additional administrative work left them with less time to prepare for ICT classes. T5 shared, "I have to balance my administrative duties and prepare for the ICT lesson. I feel overwhelmed." This issue underscores the need for institutional support to reduce teachers' administrative burdens and allow them more time to focus on lesson preparation and professional development.

These findings highlight the multifaceted challenges that ICT teachers face in integrating technology into their teaching. Addressing these challenges is crucial for successful ICT integration in teacher education programs. Comprehensive support systems, continuous professional development, and improved infrastructure are essential to help teachers navigate the complexities of integrating ICT and digital literacy into their teaching practices. By addressing these issues, educational institutions can better support teachers in leveraging technology to enhance teaching and learning.

In line with Cheshmehzangi et al. (2023), the findings suggest that addressing privacy concerns and ensuring data protection are also critical when integrating ICT tools into educational settings. These additional layers of complexity further complicate the challenges faced by teachers. Future research should explore the impact of collaborative teaching approaches on ICT integration and identify effective strategies for professional development to support ICT teachers.

Pedagogical Implications

The findings of this study have several important implications for institutions, schools, teacher education programs, and ICT teachers. Institutions should provide additional funding to improve infrastructure and support mechanisms, ensuring that teachers have access to the necessary resources and facilities for effective ICT and digital literacy integration. Schools should encourage their ICT staff to pursue professional development opportunities, such as advanced courses in ICT, to enhance their pedagogical skills and confidence in using technology.

Teacher education programs should incorporate comprehensive training on the use of ICT in teaching, emphasizing practical applications and real-world scenarios. This is supported by the finding that many teachers, like T2 and T3, reported insufficient training and support, which hindered their ability to effectively integrate ICT and digital literacy (see Table 3). Collaboration between educational technology specialists and English educators can provide valuable insights and foster the development of innovative teaching methods. As suggested by Kaoropthai and Boonmoh (2023), a collaborative approach can bridge the gap in knowledge and skills, ensuring a well-rounded education for student teachers. Additionally, creating a professional learning community (PLC) can facilitate the sharing of best practices and continuous learning among educators.

ICT teachers should be proactive in seeking out professional development opportunities and staying updated on the latest technological advancements. Engaging in workshops and training programs can help teachers like T4, who expressed the need for ongoing professional development to keep up with rapid technological changes (see Table 3). By enhancing their ICT and digital literacy skills, teachers can improve their ability to create engaging and effective learning experiences for their students.

To address the challenges posed by the rapid advancement of technology, institutions of teacher education must rethink their organizational design to facilitate a web-based training environment (Hampel & Stickler, 2005). Enhancing the standard of teacher education requires the efficient use of ICTs and continuous updates to course materials to reflect current technological trends (Nguyen & Kieuthi, 2020).

Based on the study by Kaoropthai and Boonmoh (2023), there is a clear need for a collaborative approach in teaching ICT courses, where instructors with strong ELT backgrounds work alongside those with strong ICT backgrounds. This collaborative approach can help bridge the gap in knowledge and skills, ensuring that student teachers receive a well-rounded education that prepares them for future

challenges. Additionally, institutions should consider the specific needs and backgrounds of their instructors when designing professional development programs, providing tailored support that addresses their unique challenges. For example, T3 and T6, who reported insufficient ICT knowledge, would benefit from targeted training programs that address their specific needs (see Table 3).

Limitations and Suggestions for Future Research

One limitation of this study is the small sample size, which included only six ICT teachers from public universities in Thailand. This limited sample may not fully represent the diverse experiences and challenges of ICT teachers in different regions or types of institutions. Future research should include a larger and more diverse sample to provide a more comprehensive understanding of the challenges and needs of ICT teachers in different contexts. Additionally, longitudinal studies could examine the long-term impact of curriculum changes on teachers' practices and student outcomes.

Another limitation is the reliance on self-reported data from interviews, which may be subject to biases such as social desirability or recall bias. Future studies could incorporate multiple data collection methods, such as classroom observations and student feedback, to triangulate the findings and provide a more nuanced understanding of the issues faced by ICT teachers.

The current study also did not explore the specific challenges faced by teachers with varying levels of ICT proficiency in depth. Future research could investigate how teachers' prior ICT knowledge and skills influence their ability to adapt to curriculum changes and integrate technology and digital literacy into their teaching.

Future research should also explore the effectiveness of different professional development models in enhancing teachers' ICT skills and their ability to integrate technology and digital literacy into their teaching. By identifying the most effective strategies, educators and policymakers can develop targeted interventions to support ICT teachers and improve the overall quality of teacher education programs.

Moreover, future research could investigate the impact of collaborative teaching approaches on the effectiveness of ICT and digital literacy integration in teacher education programs. Studies could explore how partnerships between ICT and ELT instructors influence teaching practices and student outcomes, providing valuable insights into the benefits and challenges of such collaborative efforts.

Lastly, given the rapid pace of technological advancement, future studies should continually assess the evolving needs of ICT teachers to ensure that professional development programs and curriculum designs remain relevant and effective.

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