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Empowering Libyan Student-Teachers for 21-Century Literacy Demands: A Triangulated Analysis of CALL Course Design Using P21, Bloom's Revised Taxonomy, Quality Matters Standards, and Student-Teachers' Perspectives

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تمكين الطلاب-المعلمين الليبيين لتلبية متطلبات مهارات القرن الحادي والعشرين: تحليل ثلاثي لتصميم مقرر تعليم اللغة الإنجليزية بمساعدة الحاسوب باستخدام P21، وتصنيف بلوم، ومعايير الجودة، وأراء الطلاب المعلمين

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Abstract:
Computer-Assisted Language Learning (CALL) is one of the courses offered by many TEFL teacher education programs in Libya and around the world. It trains EFL student-teachers on utilizing CALL tools for effective technology integration. Review of currently published research studies on CALL course design evaluation, especially using P21, Bloom's Revised Taxonomy, and Quality Matters Standards, seems to be virtually non-existent. Thus, this study aimed to explore CALL course alignment with 21-Century Literacy Demands, identify the affordances and constraints of the design principles and practices of the CALL course of the Libyan TEFL teacher education program, and propose data-driven recommendations for CALL course improvement. Intrinsic case study design was the chosen research design. The participants were fifty student-teachers who took and passed the CALL course offered by TEFL teacher education program at the Faculty of Education in Tripoli, Libya. Data were collected through CALL course documents and student-teachers' reflective essays. Data were analyzed qualitatively in three phases: framework-based document analysis, thematic analysis of student-teachers' essays, and triangulation protocol. Findings revealed that a strong alignment with P21 especially with two of the P21 strands that had Very High level of alignment: Creativity and Innovation and Media Literacy. Data analysis also identified eight affordances and 6 constraints. Triangulation phase of data analysis revealed ten themes as recommendations for CALL course improvement. These findings invite interested scholars to investigate the effectiveness of the CALL courses in preparing student-teachers for successful CALL tools integration.

Keywords: Computer-Assisted Language Learning (CALL); 21-Century Literacy Demands; Bloom's Revised Taxonomy; P21; Quality Matters Standards; Student-Teachers' Perspectives.

الملخص :
يعد مقرر تعلم اللغة بمساعدة الحاسوب أحد المقررات التي تقدمها العديد من برامج إعداد معلمي اللغة الإنجليزية كلغة أجنبية في ليبيا وحول العالم. ويدرب هذا المقرر الطلاب المعلمين للغة الإنجليزية كلغة أجنبية على استخدام أدوات التقنية الخاصة بتدريس اللغة من أجل دمج فعال للتكنولوجيا. تبين مراجعة الدراسات البحثية المنشورة حاليًا حول تقييم تصميم هذا المقرر، وخاصة باستخدام بي21، تصنيف بلوم المنقح، ومعايير جودة المواد التعليمية، عدم وجود هذه البحوث فعليا. وبالتالي، لهذا هدفت هذه الدراسة إلى استكشاف مدى توافق المقرر مع متطلبات محو أمية القرن الحادي والعشرين، وتحديد الإمكانيات والقيود لمبادئ وممارسات تصميم المقرر في برنامج إعداد معلمي اللغة الإنجليزية كلغة أجنبية الليبي، واقتراح توصيات تستند إلى البيانات لتحسين المقرر. كان تصميم دراسة الحالة الذاتية هو التصميم البحثي المختار. كان المشاركون خمسين طالبة-معلمة اجتازوا المقرر المقدم من برنامج إعداد معلمي اللغة الإنجليزية كلغة أجنبية بكلية التربية في طرابلس، ليبيا. تم جمع البيانات من خلال وثائق المقرر والمقالات التأملية للطلاب المعلمين. وتم تحليل البيانات نوعيًا في ثلاث مراحل: تحليل الوثائق القائم على الإطار، والتحليل الموضوعي لمقالات الطلاب المعلمين، وبروتوكول التثليث. كشفت النتائج عن توافق قوي مع بي21، وخاصة مع مسارين من مساراته اذ كان لديهما مستوى توافق عالٍ جدًا: الإبداع والابتكار و محو الأمية الإعلامية. كما حدد تحليل البيانات 8 من نقاط القوة و 6 من نقاط الضعف. وكشفت مرحلة التثليث لتحليل البيانات عن عشرة مواضيع كتوصيات لتحسين المقرر. تدعو هذه النتائج الباحثين المهتمين إلى التحقق من فعالية مقررات تعلم اللغة بمساعدة الحاسوب في إعداد الطلاب المعلمين للدمج الناجح لأدوات التعلم بمساعدة التقنية.

الكلمات المفتاحية: تعلم اللغة بمساعدة الحاسوب، متطلبات محو أمية القرن الحادي والعشرين، كلمة، تصنيف بلوم المنقح، بي21، معايير جودة المواد التعليمية، وجهات نظر الطلاب المعلمين.

Introduction

TEFL teacher education programs around the world are programs that aim at preparing and training students to become successful English language teachers. These programs are holistically designed to address the necessary linguistic proficiency and pedagogical skills [1]. The main components of such programs are courses that aim at improving the students' language proficiency and courses that equip them with teaching methodologies and strategies that develop their teacher identity to become effective language teachers. These programs train the students to become efficient teachers through microteaching as part of certain courses' requirements and teaching at schools during practicum to enhance their professional knowledge, which is why they are referred to as student-teachers or preservice teachers. In this paper, they are referred to as student-teachers because the term preservice teachers not only includes the student-teachers but also those who have graduated and did not start teaching as in-service teachers.

To achieve their main goal of preparing future competent EFL teachers, TEFL teacher education programs equip their student-teachers with Subject Matter Knowledge, General Pedagogical Knowledge, Pedagogical Content Knowledge, Knowledge of Context, Technological Content Knowledge, Technological Pedagogical Knowledge, and Teacher Self-Knowledge so that they deliver efficacious instruction and face real classroom challenges effectively [2, 3]. In this paper, the focus is on how TEFL teacher education programs enhance student-teachers' technological competencies through Technological Content Knowledge and Technological Pedagogical Knowledge. While the focus of Technological Content Knowledge (TCK) is on how teachers use technology to illustrate and improve their learners' understanding of the subject matter content, Technological Pedagogical Knowledge (TPK) focuses on using technology with the aim of assisting and improving learning experiences and teaching strategies [4]. Accordingly, TCK and TPK are core aspects of Technological Pedagogical Content Knowledge.

Technological Pedagogical Content Knowledge (TPACK) framework is the foundational model the student-teachers that need to understand the complexity of the knowledge they need for effective integration of technology into their teaching [4]. The significance of TPACK lies in its role as a framework that combines the three domains of knowledge: technology, pedagogy, and content to help student-teachers develop a comprehensive understanding of how to integrate technology effectively to enhance their learners' language proficiency [3]. TPACK aims not only at enhancing student-teachers' technological competencies but also how they integrate technology to teach English effectively.

TEFL teacher education programs help student-teachers to meet the current technological demands and utilize technology successfully with "increased control and independence" through formal and informal approaches [5] (p. 236). A formal approach to training student-teachers on utilizing technology in the EFL classroom is by offering courses that quip them with the necessary skills and strategies [5]. For this reason, many TEFL teacher education programs around the world offer Computer-Assisted Language Learning (CALL) courses to prepare EFL student-teachers so that they meet the needs of their future "digital native" language learners [6]. To help student-teachers navigate the complexities of technology integration into EFL classrooms, TPACK informs CALL course design and provides a holistic model for not only developing CALL competencies but also addressing the challenges they face in CALL [7].

The recent technological advancements along with the increasing interest in the implementation of online education made CALL become one of the crucial components of modern foreign language teaching methods. CALL is a widely spread term that comprises computer implementation elements in language classes. The term was chosen as the expression that refers to using technology in language teaching and learning at the 1983 TESOL convention [8]. Even though the term CALL is widely used since then, there were suggestions that called for revisions for the term [8]. Later, from the broader field of CALL, more terms emerged, such as Technology-Enhanced Language Learning (TELL), Web-Enhanced Language Learning (WELL), Internet-Based Language Learning (IBLL), Mobile-Assisted Language Learning (MALL), and Mobile Assisted Language Use (MALU) [9]. Recent advancements in Artificial Intelligence led to the emergence of AI-Assisted Language Learning (AIALL) marking a new era of CALL [10].

The earliest definition of CALL describes it as "the search for and study of applications of the computer in language teaching and learning" [11] (p.1). While Beatty defines it as "any process" during which a computer is used to develop a language [12] (p. 7), Yuan considers CALL as "a side of e-learning" that aims at improving learners' language proficiency using computer technology [13] (p. 416).

CALL is a computer-assisted instruction that facilitates language learning. CALL covers a wide variety of tools utilized as part of computer-assisted instruction, such as interactive multimedia through CD-ROMs, electronic and online dictionaries, grammar checkers, blogs, wikis, Massive Open Online Courses known as MOOCs, and other forms of interactive educational technologies [14, 15, 16, 17]. For this reason, TEFL teacher education programs offer CALL courses to train student-teachers to use technology so that they know how to create learner-centered interactive language learning experiences by using computers, multimedia, and various

online tools [2, 18]. By offering CALL courses, TEFL teacher education programs aim to familiarize and train student-teachers on using these various technological tools to be successful EFL teachers who utilize technology and computer-assisted instruction efficiently.

Current research results have shown that the implementation of CALL had positive effects and improved students' outcomes in speaking, writing, reading comprehension, and vocabulary acquisition [19]. Besides, CALL positively impacted students' willingness to communicate, interaction, attitudes, motivation, and metacognition [19]. Regardless of these significant advantages, research shows EFL teachers' lack of interest in utilizing CALL in their classrooms due to a number of individual and contextual factors [19]. Without the essential knowledge and skills needed for technology integration, EFL teachers will not be interested in utilizing CALL in their classrooms [20, 21], which signifies the need for CALL courses in TEFL teacher education programs.

Research findings on CALL as a course offered by TEFL teacher education programs revealed a positive effect on student-teachers as it enhanced their competencies and pedagogical approaches [22, 23]. This is because it increased the student-teachers' technological competence and confidence, enhanced their pedagogical skills by learning effective integration of various CALL tools, developed their attitudes towards CALL, and gained the necessary skills for creating and adapting CALL materials [22, 23, 24]. Lee & Lee indicated that the CALL course "was effective" because they noticed an increase in teachers' self-efficacy beliefs on integrating technology "mostly due to the lesson planning factor" [6] (p. 126).

Even though their study revealed the positive components of a CALL course offered by the Islamic University in Indonesia, Azmina, Fauziati, and Drajati concluded that further exploration of the course was "essential" [25] (p.228). This shows that despite the positive impact of CALL courses in TEFL teacher education programs and their acknowledged advantages, there is still a need to evaluate the course design, implementation, and its effectiveness in preparing EFL student-teachers to integrate CALL tools effectively. The significance of the need for CALL course design evaluation lies in ensuring that the courses meet current educational standards and effectively prepare the student-teachers' to meet the needs of their digital native learners.

Review of current literature revealed a notable lack of systematic evaluations of CALL courses, especially in the Libyan context. Thus, this study aims to narrow this research gap by achieving the following research objectives:

1. Evaluate the extent to which the CALL course design in the Libyan TEFL teacher education meet 21st-century literacy demands by using P21 frameworks.
2. Identify the affordances and constraints of the CALL course design by using Bloom's Revised Taxonomy, Quality Matters (QM) standards, and by incorporating student-teachers' perceptions.
3. Propose data-driven recommendations for CALL course improvement that are based on the findings of the first and second research questions.

To achieve those research objectives, the following research questions were raised:

1. To what extent does the CALL course design in the Libyan TEFL teacher education program meet 21st-century literacy demands?
2. Using Bloom's Revised Taxonomy, Quality Matters (QM) standards, and incorporating student-teachers' perceptions, what are the affordances and constraints of the design of the CALL course of the Libyan TEFL teacher education program?
3. Based on the findings of the first and second research questions: what kind of recommendations can be proposed for CALL course improvement?

The rationale for favoring the terms affordances and constraints over strengths and limitations can be summarized as (1) capturing user-design interplay through course design and student-teachers' perceptions, (2) focusing on action possibilities rather than merely describing the strengths and limitations, and (3) fostering solution-oriented analysis rather than using judgmental or blaming language. As one of the main objectives of this study was to propose data-driven recommendations, the terms affordances and constraints seemed the most appropriate and were chosen.

This study is of significance because the findings will lead to proposing data-driven recommendations for CALL course improvement. By identifying the gaps in the course design that hinder the student-teachers' preparedness for effective technology and CALL tools integration, the suggested recommendations will help in reversing what was considered as the constraints that limit the course effectiveness into course affordances. The revised CALL design will also include the student-teachers' voices which will help meeting their future needs and

expectations. This study will also open doors for future TEFL teacher education course developments and evaluations by utilizing P21, Bloom's Revised Taxonomy, and QM.

Literature Review

Since the main aim of the study was to analyze the CALL course design that is offered as one of the compulsory courses by the English Language Department at the Faculty of Education Tripoli to evaluate whether the CALL course meets 21st-century literacy demands, identify the course affordances and constraints, and propose data-driven recommendations for course improvement, this section provides a brief review of CALL in TEFL teacher education and the related literature. It is divided into four sections that are: the role of CALL in TEFL teacher education, the symbiotic relationship between CALL and 21st-century literacy, affordances and constraints of CALL in TEFL teacher education, and CALL in the Libyan TEFL Teacher Education.

The Role of CALL in TEFL Teacher education

The emergence of CALL as a transformative force in TEFL teacher education has made it play a dual role: enhancing EFL students' language proficiency and equipping the student-teachers with digital pedagogical skills. Current technological advancements and the integration of ever-changing CALL tools are redefining EFL classrooms and the roles of EFL teachers, which necessitated a paradigm shift in TEFL teacher education programs and how they prepare and train student-teachers for future challenges in constantly evolving educational technology contexts [26]. Besides enhancing student-teachers' linguistic and pedagogical competencies, TEFL teacher education programs offer CALL courses to develop their essential technological skills for successful technology-based instruction.

The Symbiotic Relationship between CALL and 21st-Century Literacy

21st-century literacy involves a complex, interconnected set of skills, competencies, and dispositions [27]. These skills are the "competencies" that "cover both the learning periods of the individual and the field of lifelong learning" with the aim of preparing individuals "for the developments in today's world and the future" [28] (p. 61). For this reason, there is a symbiotic relationship between CALL courses offered by TEFL teacher education programs and 21st-Century Literacy skills. Paradigm shifts lead to integrative 21st-century technologies and emphasized CALL literacy as it is necessary for successful technology integration, which involves EFL teachers understanding of digital literacies and pedagogical knowledge [29]. This is presented by the idea of CALL literacy that is defined as "dynamic" relationship between language literacy, teaching literacy, and digital literacy [30] (p. 32). CALL courses cultivate the essential digital literacy and mirror the "4Cs" that are Communication, Collaboration, Critical Thinking, and Creativity. CALL is interrelated to 21st-century Literacy by incorporating digital literacy, media literacy, and multiliteracies. Since TEFL education is shifting focus to learners' global communication, it is vital to create a learning environment where linguistic competence and digital fluency are inseparable [31] by incorporating CALL tools that enhance these literacies, to foster critical thinking, creativity, and collaboration. Examples of CALL tools that foster these essential skills that are known as 4Cs are blogs, wikis, and digital storytelling platforms. Thus, as it seems that research that explored CALL course alignment with21st-century literacy is nearly nonexistent, it is of significance to investigate whether the CALL course design in the Libyan TEFL teacher education meet 21st-century literacy demands. By utilizing Partnership for 21st Century Skills (P21) framework, this study intends to evaluate the extent to which the CALL course design in the Libyan TEFL teacher education meet 21st-century literacy demands and provide suggestions for CALL course improvement.

Affordances and Constraints of CALL in TEFL teacher education

As mentioned earlier, the main purpose of offering CALL courses as one of the compulsory courses of TEFL teacher education programs is to equip the student-teachers with the knowledge they need for successful CALL tools integration in the EFL classroom. Through TPACK framework, a key theoretical model, CALL courses not only enhance the student-teachers' technical skills related to CALL tools by training them on different tools such as using certain digital resources and various software and online platforms, but also develop their pedagogical knowledge by designing tech-based activities, learning outcomes assessment, and adapting different tools for different learning styles [2, 3, 5, 7, 22, 32]. Research findings confirmed that designing CALL courses with TPACK principles increased student-teachers' confidence, technological competencies, and technology-related pedagogical skills [22].

Research into the effectiveness of CALL courses' design showed emphasis on practical skills and concentration on project-based training and authentic task creation [33]. This focus warns educators and signals them to the significance of balancing between theoretical foundations and hands-on practice: why use technology and how to use it [34]. This is to reduce overemphasis on skills on the expense of critical pedagogical knowledge. CALL courses should meet the student-teachers' need for developing digital literacy skills to be able to critically evaluate CALL tools and utilize them effectively [32].

In a world of evolving educational technology and CALL tools, offering CALL courses as a significant part of TEFL teacher education comes with a vibrant blend of opportunities and challenges. With regard to opportunities, offering CALL courses to EFL student-teachers not only fosters their autonomy and innovation in teaching, but also boosts their digital readiness [34, 35]. It also gives the student-teachers the chance to learn about context-specific models and tools so that they understand how CALL education varies across cultural contexts and learn how to utilize technology in low-tech and underrepresented contexts [35]. In addition, CALL courses give the student-teachers the chance for collaborative and reflective practices. Through communities of practice and mentoring model, they enhance their engagement [35].

Despite the mentioned opportunities, CALL courses in TEFL teacher education face a number of challenges related to pedagogical, systematic, and contextual barriers. For instance, lack of pedagogical integration is a result of focus on training the student-teachers on the standalone skills without being integrated into broader teaching philosophies, which leads to gap in bridging theory and practice [34]. In addition, instead of focusing on holistic approaches with effective pedagogical dimensions, many CALL courses are designed to focus on the tools at the expense of the student-teachers' creativity, assessment literacy, and classroom management [35]. Moreover, offering CALL courses in contexts that lack the essential resources, other devices and tools, and reliable internet access leads to technical and infrastructure limitations that hinder effective student-teacher training. To avoid the consequences that lead student-teachers to develop negative attitudes toward technology integration and resistance to it in their future career as EFL teachers, it is crucial to design CALL with these limitations in mind [36]. In addition to course design, institutions support is required to provide the necessary tools and infrastructure and offer training that eliminates skepticism while enhancing their familiarity with the trending CALL tools [37].

For this reason, CALL courses should also train the student-teachers on troubleshooting to help them learn how to identify, resolve, and adapt to any technical issues they might face while integrating CALL tools. Training student-teachers on troubleshooting involves (1) diagnosing and fixing issues related to the devices, apps, or platforms that are used in class, (2) checking systems and testing networks using diagnostic tools, and (3) adapting to technological failures by switching to offline activities or finding alternative CALL tools or platforms [38].

Besides, recent pandemics and crises necessitated and emphasized the need for preparing EFL student-teachers for sudden shifts to remote and hybrid classrooms and be able to utilize tech-based activities [39]. CALL courses also should focus on enhancing the student-teachers' digital fluency and include the trending technologies to equip them with the necessary skills to be able to integrate them. For example, student-teachers should be trained on emerging trends such as AI-Assisted Language Learning (AIALL) and facilitating personalized learning [10, 37].

In brief, the highlighted challenges and the trending advancements signify the necessity for a thoughtful and structured approach to CALL course design in TEFL teacher education. The limitations that ranged from lack of pedagogical integration to contextual limitations emphasize the need for a guiding critical systematic framework for CALL course design. By utilizing Quality Matters and Bloom's Revised Taxonomy frameworks, this study intends to provide suggestions for CALL course improvement to redesign it with a robust curriculum that nurtures the student-teachers' digital literacy, critical thinking, and pedagogical competencies.

CALL in the Libyan TEFL Teacher Education

A quick search in various search engines about CALL integration in the Libyan context would reveal that research on CALL integration in general is limited; however, interest in technology in general and CALL integration is growing, especially post-COVID-19 years [40, 41]. Review of currently published research showed that researchers focused on various technological tools and conducted their studies in Libyan public and private schools and universities. For instance, at the secondary school level, published research covered various areas such as the role and the advantages of computers in ELT [42], the perceptions of Libyan EFL teachers of international schools on online teaching during the pandemic [43], and the role of social media in EFL at secondary schools [44]. At the university level, published research is more focused on trending CALL tools such as TEFL teacher educators' perceptions on the impact of AI on EFL [45], the application of internet-based language learning in teaching English classes [41], and Libyan student-teachers' perceptions of Grammarly as an AI-powered automated writing checker [46] (Elsherif, 2025).

The primary focus of the existing research in the Libyan context is on CALL effectiveness in enhancing students' language skills and on students' and teachers' perceptions of utilizing technology into the EFL classroom [40, 41, 42, 43, 44, 45, 46, 47, 48]. Most of these studies reported that Libyan EFL students, teachers, and teacher educators/professors had positive perceptions toward technology and CALL tools' integration. They also acknowledged the benefits of technology-assisted instruction. For EFL students, Libyan researchers reported that technology-assisted instruction reinforced personalized learning, advanced students' communication and collaboration skills, boosted motivation and engagement, and promoted learner autonomy [40, 41, 42, 43, 44, 45, 46, 47, 48]. For EFL teachers, they reported that technology and CALL tools integration benefited teachers by

making authentic materials accessible and optimizing the teaching process to become more effective and engaging for students [40, 41, 42, 43, 44, 45, 46, 47, 48]. Despite those reported benefits, research findings also revealed a number of constraints of successful integration of technology and CALL tools in the Libyan context. Issues such as slow/weak internet services, scarcity of technological/CALL tools, absence of technical support, lack of institutional support, and lack of technological professional development opportunities for teachers were reported as the obstacles that hindered effective integration of technology and CALL tools [43, 46, 47, 48, 49].

Building on these findings, Libyan TEFL teacher education programs recognize the significance and the potential benefits of CALL tools in EFL classrooms with the aim of addressing the reported challenges and preparing effective EFL teachers. Consequently, they offer CALL courses aimed at effectively training Libyan EFL student-teachers in using and integrating technology, as well as addressing the challenges they may encounter. Examples of CALL courses offered by TEFL teacher education programs can be found at the University of Tripoli. The University of Tripoli's three faculties of education; Faculty of Education Tripoli, Faculty of Education Qasar Bin Ghashir, and Faculty of Education Janzour, offer TEFL programs that include CALL courses.

Regardless of the growing interest in CALL integration into EFL classroom and the integration of CALL courses into TEFL teacher education programs, published research exploring CALL courses within the English Department at the Faculty of Education in the Libyan context is virtually non-existent. Even though there are many Libyan TEFL teacher education programs that offer CALL courses that aim at developing student-teachers' technological competencies and train them on CALL tools' integration, there is a noticeable gap in the existing literature that calls for research on their effectiveness in preparing the student-teachers for technology integration reality in the Libyan context, how those courses are perceived, and their long-term impact. Moreover, empirical studies that explored TEFL course design through Partnership for 21st Century Skills (P21), Bloom's Revised Taxonomy (BRT) and Quality Matters (QM) framework seem to be nonexistent. Thus, this study aims to raise the scholarly attention for the urgent need to explore CALL courses by identifying the affordances and constraints of the design principles and practices of the CALL course of the Libyan TEFL teacher education program and proposing data-driven recommendations for CALL course improvement.

Methodology

This study is a precursor to a large-scale study on the effectiveness of a CALL course that is offered as one of the compulsory courses by the English Language Department at the Faculty of Education Tripoli in training Libyan EFL student-teachers on utilizing CALL tools. It aimed to explore how the CALL course design meets 21st-century literacy demands and identify the CALL course's affordances and constraints through Quality Matters standards, Bloom's Revised Taxonomy, P21, and student-teachers' perceptions. It also aims to propose recommendations for course improvement based on the findings of this analysis. Since the main aim of the study is to conduct an in-depth-analysis of the CALL course's design using three frameworks to interpret and not to measure, the interpretive qualitative research paradigm is the adopted paradigm. This is evident in the application of Quality Matters, Bloom's Revised Taxonomy, and Partnership for 21st Century Skills analytical frameworks (P21).

The research design of the study is an intrinsic case study. Yin defines a case study as "an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the boundaries between the phenomenon and context may not be clearly evident" [50] (p. 16). This specifically aligns with the aim of the study. The case study design was chosen because it leads to a holistic understanding of the CALL course within its Libyan TEFL teacher education context and aligns with the research questions. The intrinsic design facilitated document analysis, student voice analysis, and triangulation by integrating systematic analysis of course artifacts (syllabus, objectives, assessments, material), thematic examination of the student-teachers' reflective essays to identify their perceived gaps and recommendations for improvement, and the convergence of the findings from the three frameworks and student-teachers' perspectives to answer the research questions.

Theoretical Framework for CALL Course Design Evaluation

The fundamental principle for quality education is effective course design. For that reason, it is of significance to analyze the CALL course design to understand how effective it is in preparing the student-teachers to integrate technology and CALL tools successfully with the aim of proposing data-driven recommendations for course design improvement. To evaluate the CALL course design, this study employed three frameworks; Quality Matters (QM), Bloom's Revised Taxonomy (BRT) and Partnership for 21st Century Skills (P21), through the lens of constructive alignment [51]. This approach emphasized coherence between course objectives, activities, and assessments. The study suggests that coherent alignment between intended learning outcomes, teaching and learning activities, and assessment tasks, facilitates effective learning and students' knowledge construction and demonstration of skills as outlined in the course objectives. On the contrary, misalignment expands the theory-practice gap and hinders student-teachers' effective application of pedagogical knowledge in the classroom [52].

Partnership for 21st Century Skills (P21). Partnership for 21st Century Skills is a non-profit organization that is located in the USA was founded in 2002. It is also known as Partnership for 21st Century Learning. According to Battelle for Kids website, P21's Framework for 21st Century Learning was "developed with input from teachers, education experts, and business leaders to define and illustrate the skills and knowledge students need to succeed in work and life, as well as the support systems necessary for 21st century learning outcomes" [53]. This framework outlines the crucial skills needed by the students to succeed in an ever-changing world and includes the 4Cs known as critical thinking, communication, collaboration, and creativity [54]. The core components of the framework are structured around three key categories, which are 21st century student outcomes, 21st-century interdisciplinary themes, and support system. The 21st century student outcomes are visualized as an arching rainbow that include three categories, which are Learning and Innovation Skills (4Cs), Information, Media, & Technology Skills, and Life and Career Skills. The main aim of the 21st-century interdisciplinary themes is to foster holistic learning and woven into core academic subjects to raise students' Global Awareness; Financial, Economic, Business and Entrepreneurial Literacy; Civic Literacy; Health Literacy; and Environmental Literacy. Support Systems, which constitute the base of the rainbow, represent the educational infrastructure and includes Standards and Assessments, Curriculum and Instruction, Professional Development, and Learning Environments. P21 matters because it moves beyond memorization and fosters holistic skill development; specifically includes ICT literacy, such as digital and AI tools, as the core of technology integration competency; emphasizes real-world relevance by preparing students for workplace and global challenges, and focuses on equity and bridging digital divides by emphasizing accessibility and inclusion in technology [53, 54]. P21 was utilized as a benchmark framework that evaluates whether the CALL course offered by one of the Libyan TEFL teacher education programs prepared Libyan EFL student-teachers for 21st-century demands. Through P21 framework, the gaps in the CALL course were identified and recommendations that align with 21st-century teaching demands were proposed.

Bloom's Revised Taxonomy (BRT). Bloom's Taxonomy was initially developed by Benjamin Bloom in 1956 and underwent revisions in 2001 by Anderson and Krathwohl [55]. Emphasizing a more active approach to thinking, Bloom's Revised Taxonomy is a framework that categorizes educational learning objectives and focuses on cognitive skills. The hierarchy of the categories goes as: Remember, (formerly Knowledge), Understand (formerly Comprehension), Apply (remained the same), Analyze (formerly Analysis), Evaluate (formerly Synthesis), and Create (formerly Evaluation). The focus of the revised taxonomy is on action verbs. For instance, to describe learning objectives at the Remember level, verbs such as list, identify, recognize, define, recall, and describe are used. This shows a shift from nouns to action verbs and emphasizes students' abilities at each cognition level. The significance of this taxonomy lies in its evaluation of the cognitive consistency among the intended learning objectives, learning activities, and assessments. By using Blooms Revised Taxonomy, course developers and instructors will be able to define clear learning outcomes and align them with cognitive levels, design tests and assignments that match the course intended outcomes, scaffold instruction by building lessons that move from foundational to complex thinking, and stimulate higher-order thinking by encouraging students to analyze, evaluate, and create. Since the study aims at analyzing the CALL course design, applying Bloom's Revised Taxonomy guarantees the cognitive consistency among the CALL course intended learning objectives, learning activities, and assessments.

Quality Matters (MQ). Quality Matters is a global "non-profit, quality assurance organization" that aims to enhance the quality of online education, empower educators, and improve students' learning through "course improvement, professional development and robust review processes" [56]. It provides a research-based rubric that evaluates online and blended course design's quality. Its framework is based on eight general standards and 41 specific standards that help assess the online and blended courses [57]. The eight general standards of the QM rubric are:

General Standard 1 – Course Overview and Introduction: The overall design of the course is made clear to the learner at the beginning of the course.

General Standard 2 – Learning Objectives (Competencies): Learning objectives or competencies describe what learners will be able to do upon completion of the course.

General Standard 3 – Assessment and Measurement: Assessments are integral to the learning process and are designed to evaluate learner progress in achieving the stated learning objectives or mastering the competencies.

General Standard 4 – Instructional Materials: Instructional materials enable learners to achieve stated learning objectives or competencies.

General Standard 5 – Course Activities and Learner Interaction: Course activities facilitate and support learner interaction and engagement.

> General Standard 6 – Course Technology: Course technologies support learners' achievement of course objectives or competencies.
>
> General Standard 7 – Learner Support: The course facilitates learner access to institutional support services essential to learner success.
>
> General Standard 8 – Accessibility and Usability: The course design reflects a commitment to accessibility and usability for all learners. [57]

These eight general standards assess a course's design systematically. For instance, Standard 2 asses the clarity of learning objectives, Standard 3 asses the alignment between course objectives and assessments, and Standards 4 and 5 assess the quality of instructional materials and activities. MacGregor-Mendoza explained:

> Although there are eight standards that comprise the rubric, they address three broad areas: Course Beginnings (Standard 1), Course Alignment (Standards 2–5), and Course Technology (Standards 6–8). Since fully half of the standards are dedicated to alignment, it is evident that at its core the QMR seeks to ensure that the activities, materials, and learners' participation directly reflect specific goals of student learning. [58] (p. 132)

CALL course is by its nature is a mix of traditional and technology-assisted instruction, therefore, utilizing QM to evaluate its design elements and practices leads to effective integration of both pedagogical and technological design elements aligned with quality standards. Since the CALL course is involved in utilizing technology, applying QM guarantees that the main elements of the course meet the acknowledged quality benchmarks [57, 58].

Student-Teachers' Perceptions. Student-teacher perceptions in TEFL (Teaching English as a Foreign Language) teacher education refer to the views, experiences, and attitudes student teachers hold regarding various aspects of their training and the teaching process. These perceptions encompass their understanding of teaching methodologies (like learner-centered approaches or flipped classrooms), their confidence levels in applying these methods, and the challenges they encounter. Research often investigates these perceptions to inform teacher educators about areas for improvement in their programs, ensuring that future TEFL teachers feel well-prepared and confident in their roles.

As currently published research neither triangulated QM, BRT, and P21 to evaluate CALL courses in the Libyan context nor inferred student-teachers' perceptions and recommendations of CALL course improvement, this study fills a critical gap in the literature and advances CALL evaluation research. By triangulating three frameworks, centering student-teachers' voice, and adapting global frameworks to context-specific application, the methodology leads to a comprehensive answer to the research questions.

Research Site and Participants

The study site is the TEFL teacher education program at the Faculty of Education Tripoli at the University of Tripoli. The program's main objective is to prepare and train Libyan student-teachers to become effective English language teachers. It offers the student-teachers 36 compulsory courses and two elective courses with the aim of improving their language proficiency and teaching skills. One of the compulsory courses is the EN340 Computer-Assisted Language Learning (CALL) course. The general aim of the CALL course is to "provide the background" that will help the student-teachers "make informed decisions about the use of technology" as future EFL teachers [59].

The participants were fifty student-teachers who took and passed the CALL course in five different semesters: Fall 2019, Fall 2020, Fall 2021, Spring 2022, and Fall 2023. They were selected randomly from the total pool of 106 student-teachers who took the course across all five semesters. As the faculty is females-only institution, all the participants were females. The participants' voice was included through the reflective essays they wrote by the end of the course. They signed informed consents in which anonymity and the right to withdraw any time were assured. Codes, such as (ST20), were used whenever scripts of student-teachers' reflective essays were used to adhere to research ethics regarding anonymity. All scripts were given the year of data analysis to ensure anonymity, e.g. (ST20, 2024).

Data Collection

Data were collected through CALL course documents and student-teachers' reflective essays. Inclusion criteria ensured that all the course documents were related to the CALL course offered by the English Language Department of the Faculty of Education Tripoli, University of Tripoli and student-teachers' reflective essays. Data collection procedures began by gathering the course syllabi of the five semesters, PPT presentations, activities/assignments descriptions and instructions, students' work, and assessment rubrics. The rationale behind choosing those documents is that they explicitly demonstrate the CALL course's design principles and practices. The subsequent data collection phase was the written reflections because they were submitted as part of the course

requirements. Each semester, student-teachers were asked to write reflective essays about their experiences in the course after submitting the final exam assignments/projects by the end of each semester. Grigorovicius affirmed that reflective essays are "unique" data collection tools because they help researchers to "collect rich qualitative data" [58] (p. 8). By writing reflective essays, the participants will have "more freedom to reflect and think," which will lead them to "produce a response with richness and depth" [58] (pp. 2-3). For the previously mentioned reasons, all the reflective essays that were submitted by the participants by the end of each course were gathered to be part of the qualitative data.

Data Analysis

Data were analyzed in three phases: framework-based document analysis, thematic analysis of student-teachers' essays, and triangulation protocol.

Phase 1: Framework-Based Document Analysis. Three analytical frameworks guided the document framework-based document analysis phase: QM Standards, BRT, and P21. To answer the first research question, P21 literacy alignment was used to evaluate the extent to which the CALL course design met 21st-century literacy demands. P21 Mapping was used to map course components to eight P21 literacy dimensions by checking alignment and rating them as *High*, *Medium*, or *Low* using evidence from the course design. Compliance percentage was calculated using the following formula: (Highly met criteria / total criteria) × 100. To answer the second research question, QM and BRT were utilized to identify the affordances and constraints of the CALL course design. BRT cognitive mapping evaluated course objectives and assessments. Bloom's coding was conducted by using taxonomy verbs like Create = Creating to code objectives and assessments and then by scoring level of alignment as *High*, *Medium*, or *Low* using evidence from the course design. Following that, compliance percentage was calculated using the following formula: (Highly met criteria / total criteria) × 100. QM analysis was conducted by scoring level of alignment with each standard as *High*, *Medium*, or *Low* using evidence from the course design. After each standard was rated, compliance percentage was calculated using the following formula: (Highly met criteria / total criteria) × 100.

Phase 2: Thematic Analysis of Student-Teachers' Essays. In this phase, the focus was on understanding the student-teachers' experiences and their suggestions for improving the CALL course. Through deductive and inductive thematic analysis [59], the process of the reflective essays' analysis began with repetitive reading of the reflections with the aim of familiarization and then creating initial codes, and ended with grouping the codes into themes that are related to the student-teachers' course experiences and their recommendation. The last stage in this phase was defining and naming the themes and clustering them into categories.

Phase 3: Triangulation Protocol. The final phase was the triangulation phase in which convergences and divergences between the QM and BRT frameworks were identified. In this phase, cross-referencing of the findings from documents and reflections' analysis phase was conducted. This final synthesis helped in identifying the overall affordances and constraints of the CALL course. Finally, the findings from these phases revealed the weaknesses and the gaps in the course effectiveness helped in proposing data-driven recommendations for the CALL course improvement. The following section presents the findings.

Findings

To achieve this study's aim and research objectives, three questions were raised to evaluate a CALL course design offered by one of the Libyan TEFL teacher education programs. Data were gathered through course syllabus and other artifacts and student-teachers' reflective essays. Course data were analyzed through three frameworks whereas data from reflective essays were analyzed thematically. Before embarking in the presentation of the findings, here is a brief summary of the CALL course.

CALL design analysis revealed that the course designed on the principles of project-based training and authentic task creation. There is a focus on practical application on the expense of theoretical foundations. The course content covers various topics that are divided into 12 weeks. The course content included the following topics: *Introduction* that covers the basic terms, *Teaching and Learning Languages with Technology*, *Language Skills and Technology*, *Vocabulary and Grammar and Technology*, *Using Technology to Adapt Authentic Materials*, *Web, Blogs, Wikis, and Social Media in the Language Classroom*, *Experiencing a Mobile Language Learning Application*, *Digital Games and Language Learning AI in TEFL education*, and *CALL in Low-Tech Contexts*. Each week student-teachers learn about various *Types of CALL Activities* and *Types of CALL Applications* that they can utilize to integrate technology into the EFL classroom.

As can be seen, the course content provides a robust foundation of CALL that is supported with practical experience that directly addresses the course ILOs. The topics progress from foundation concepts and evolve to explore various CALL tools and critically evaluating certain tools to practical application and creating authentic CALL tools. The specific tools the student-teachers were trained to use can be categorized into four categories that include Foundational Computer Skills, CALL-Specific Software and Tools, Pedagogical Application of Technology, and Continuous Professional Development. Foundational computer skills are the basic technological

competencies the student-teachers need for personal and academic contexts because they form the foundation for advanced technological abilities. Data analysis indicated the practical part of the CALL course trained them on using *Microsoft Word*, creating *PowerPoint* /*E-Poster*/*Prezi* presentations, using academic search engines, using search engines to find and access relevant teaching materials, using images and videos to create videos, and using mobile phones to be creative. CALL-specific software and tools basically cover any type of technology that is designed to facilitate language learning and teaching. Data analysis showed that the practical part of the CALL course trained the student-teachers on using *Google Classroom*, downloading and using different apps such as *Grammarly*, *Kahoot*, and *الاختبارات*, creating online tests using *Google Forms*, *Kahoot*, and *الاختبارات* apps, using *YouTube* to find information and share their videos, using AI-Powered tools for academic writing and research, creating AI-Generated presentations, and using AI and plagiarism checkers. Pedagogical application of technology specifies the strategies used to integrate technology with the aim of enhancing language learning and teaching. Data analysis indicated the practical part of the CALL course trained them on creating infographics, newsletters, flashcards, storytelling podcasts, game review video on the effectiveness of the games they played in ELT, PowerPoint interactive games, and recorded lessons. They also were trained on using AI-powered tools to generate lesson plans, tests, reading comprehension texts, and visual aids, creating blogs and vlogs, using social media to communicate and share academic content and their CALL projects, and creating their own websites. According to some of the student-teachers, the practical part of the CALL course provided them with opportunities for continuous professional development (CPD). CPD here is seen as the ongoing process that helps enhance their performance as future teachers. Data analysis indicated that the practical part of the CALL course trained them by learning how to create recorded lessons as part of asynchronous teaching, learning how to use *Zoom* and *Google Meet* as part of synchronous teaching, learning about the benefits of games in language learning by playing and evaluating the games, learning how to use social media for academic and teaching purposes during crises and pandemics. These activities showcase the sheer volume of assessments. Assessment is mainly focused on authentic task creation. For instance, students create infographics, flashcards, games, recorded lessons, tests, game review videos and other assignments as part of the midterm and finals assessment. Student-teachers did not take any quizzes or tests, as there were no formative assessment requirements. Rubrics were utilized to assess student-teachers' work.

Student-teachers' reflective essays showed positivity in their overall experience with the CALL course. As put in one of the student-teachers' words, their overall impression was positive because the course was "different from other courses in that it gives [them] the chance to be engaged and innovative while learning how to use different technological tools for teaching English" (ST43, 2024). One of the student-teachers summarized most of the student-teachers' feelings by showing feelings of happiness and achievement by the end of the course after feeling overwhelmed in the beginning of the course as she wrote:

> My overall attitude towards CALL course is very positive. In the beginning of the course, I was so nervous and was not confident that I will be able to finish all the assignments. Now that I am about to submit this essay after I finished all the assignments, I feel happy. I believe CALL is an important course to learn how to use all the CALL tools to teach English. I really enjoyed preparing all the assignments and I plan to integrate technology in my lessons in the future. (ST44, 2024)

Another student-teacher wrote:

> I am so satisfied with what I learned and achieved in the CALL course. When I saw the amount of the assignments in the beginning of the course, I lost my confidence that I thought of quitting and dropping the course. But, when I saw what the previous students accomplished in the first lecture and the reviews they created as videos, I said to myself "I can do it!" and now I feel satisfied and proud of myself because I did not quit and I submitted all the assignments. (ST32, 2024)

In their reflective essays, many student-teachers expressed their pride with what they achieved in the course and admitted that they did not expect that as one of the student-teachers stated: "I am very satisfied because I see how I exceeded all my expectations and my work in this course can be used in the future, not just an exam that I will forget about as soon as the semester ends" (ST25, 2024). Their reflections included feelings of fulfillment and achievement as they reported how they have exceeded their expectations in meeting the course requirements. These feelings of satisfaction and accomplishments highlight the significance of the CALL course for training the future EFL teachers for future challenges.

To answer the raised research questions, the following sections are divided into three main sections to present data on CALL course alignment with 21st-century literacy demands, CALL course affordances and constraints, and the proposed data-driven recommendations.

CALL Course Alignment with 21st-century Literacy Demands

To answer the first research question, Partnership for 21st Century Learning (P21) framework was used to evaluate the extent to which the CALL course design of the Libyan TEFL teacher education meets 21st-century literacy demands. Data analysis indicated a strong alignment with P21 especially with two of the P21 strands that had *Very High* level of alignment: Creativity and Innovation and Media Literacy. This strong alignment shows course emphasis on technology and innovation skills. Additionally, two of the P21 strands scored medium because Collaboration and Life and Career Skills strands had gaps as they included limited collaborative tasks and underdeveloped problem-solving. Even though ICT Literacy scored *High*, it needed improvement because of the lack of explicit focus on digital citizenship. Accordingly, compliance scored 75%.

CALL Course Affordances and Constraints

To answer the second research question that aimed to identify the CALL course affordances and constraints, Quality Matters (QM) standards and Bloom's Revised Taxonomy (BRT) were used to analyze the CALL course design. To incorporate student-teachers' perceived course affordances and constraints, their reflective essays were analyzed. To achieve a comprehensive understanding of the CALL course, a triangulation protocol was employed to identify the course affordances and constraints through QM, BRT, and student-teachers' reflective essays. This triangulation approach revealed the following CALL course affordance and constraints.

Affordances of the CALL Course Design

As mentioned earlier, the course is designed on the principles of project-based training and authentic task creation through hands-on practice. Data analysis revealed a number of course affordances that include authentic tasks creation, tech fluency, creativity and autonomy, multimodal learning, contemporary relevance, transparent evaluation, reflective depth, and professional portfolio building. The following sections briefly describe each of these affordances.

Authentic Tasks Creation. Data analysis showed that the most significant affordance of the CALL course is in giving the student-teachers the opportunities authentic task creation. These opportunities gave the students the chance for meaningful task production that reflects real-world language use and their future professional practices as EFL teachers. Example of authentic task creation include creating newsletters, infographics and websites, designing presentations using different tools, designing PPT interactive games, recording lessons, and producing storytelling podcasts.

Tech Fluency. Another fundamental affordance of the CALL course is the enhancement of the student-teachers' tech fluency by understanding why CALL tools matter and how to apply/utilize them. This is because the CALL course design helps student-teachers to move beyond the basic tool proficiency to raise the their confidence and pedagogical foundations of technology integration. Examples of tech fluency that is evident by task engagement include Microsoft Word for document creation and printing, general and academic search engines, Google Classroom, online tests, and other activities.

Creativity and Autonomy. Another powerful affordance that is deeply interweaved and ensures that the student-teachers are neither just passive consumers of technology nor rigid task completers is creativity and autonomy. This is a result of the diversity of the tasks that provide a range of learning experiences that raise the student-teachers' self-expression, independent decision-making, and pedagogical innovation, which is evident in multimedia storytelling tasks; visual and design innovations in newsletters infographics, and presentations; interactive and gamified content in creating interactive PowerPoint games, and online tests; diversity of tools among which AI tools; and ownership of process and product through personal expression and public sharing by using blogs, websites, YouTube, and social media.

Multimodal learning. Another affordance is in the diverse array of tasks the student-teachers are required to deal with that provides them with a profound chance for multimodal learning. The diversity of the tasks require the student-teachers to create multimodal content through textual, visual, auditory, and interactive modes. Examples of tasks that foster multimodal learning include creating game review videos, storytelling podcasts, recorded lessons, newsletters, infographics, and presentations. In all of these tasks, student-teachers are required to choose the appropriate images, sounds, and texts.

Contemporary Relevance. Contemporary relevance is an additional fundamental and highly impactful affordance that places the CALL course at the leading edge of this era's educational practices, technological advancements, and pedagogical needs. This is manifested in the integration of cutting edge AI technologies, focus on digital content creation, emphasis on flexible and blended learning modalities, leveraging social media and digital communication, gamification and interactive learning, and utilization of specialized digital tools. This is evident in training student-teachers on using various AI tools for multiple functions; creating videos, podcasts, newsletters, blogs and other tools; utilizing YouTube, Teams, and Google Classroom and other tools; using social

media for educational purposes; creating interactive games through *PowerPoint* and *Kahoot*; and using *Grammarly*, *Kahoot*, الاختبارات, and plagiarism and AI checkers.

Transparent Evaluation. The analysis of the structure and the requirements of the tasks revealed an important affordance, which is transparent evaluation. This is manifested through designing assessments as the student-teachers move from being test-takers to test-makers; critically evaluating their AI-generated lesson plans, tests, and other texts; disseminating their work to a wider audience; using social media for academic purposes; assessing games' effectiveness; using AI and plagiarism checkers; suing academic search engines; creating reflective game review videos; promoting transparency in communication through multimodal representations. This is apparent in the creation of game review videos, infographics, newsletters, presentations, and other tasks.

Reflective Depth. One more critical and sophisticated affordance is reflective depth. Reflective depth moves the student-teachers from just engaging with surface-level technology towards engaging with reflective metacognition and self-examination. The cornerstone of this affordance is reflective essays and reflective blogs writing. This reflective writing gives the student-teachers the opportunity to synthesize their experiences by writing about how they managed the tasks and critically evaluate their choices, process of design and creation, the outcomes of that process, and how they confronted the complexities of the different tasks and the digital tools.

Professional Portfolio Building. The final and highly strategic and empowering affordance the data analysis revealed is professional portfolio building. Student-teachers' generation of high-value teaching materials, multimedia and digital content, tech literacy, professional online presence, and reflective essays will empower them and help them build professional portfolio that demonstrates their technological proficiency and pedagogical innovation. This professional portfolio will showcase their work as evidence-based collection of work and will position them in the job market as competitive candidates.

Constraints of the CALL Course Design

Although data analysis revealed significant affordances of the CALL course, it also uncovered a number of constraints the might lead to unintended consequences that affect the effectiveness of the course. These constraints were categorized as lack of balance between theoretical foundations and practice, time limitations, risk of cognitive overload, limited collaboration, lack of CALL microteaching and teaching practice opportunities, and technical challenges. The following sections briefly describe each of these constraints.

Lack of Balance between Theoretical Foundations and Practice. Data analysis revealed that there was a focus on practice on the expense of theoretical grounding as the course mostly focused on training the student-teachers on operating and utilizing specific software, apps, or platforms which indicates prioritizing 'how-to' over pedagogical and theoretical rationale. This emphasis on practice may lead student-teachers to become proficient users of CALL tools but unable to align those tools with course learning objectives, learner needs, or second language principles.

Time Limitations. Data from student-teachers' reflections and assignment sheets revealed a pervasive constraint that might have affected their engagement and learning depth. Two interrelated time constraints emerged from data analysis that are in class hours and out-of-class hours needed to complete the assignments. The students complained that the course is offered as 2 hours a week while the course content requires more hours to have enough hours for theoretical part of the course and have enough for practice. They also noted that the amount of out-of-class hours required to complete the assignments is "huge" (ST33, 2024). One of the student-teachers explained:

> creating infographic, 2-Page newsletter, interactive PowerPoint Game, Kahootgames and writing blogs and other assignments requires a lot of time in the class and out of the class. That is why [they] need more class hours to be able to finish the assignments with the professor's support. (ST33, 2024)

Risk of Cognitive Overload. Another significant constraint that undermines the course effectiveness is the high risk of cognitive overload. Risk of overload is a result of MQ and BRT analysis and as perceived by the student-teachers. In their reflective essays, the student-teachers explained that the complexity of the tasks, the mental process, and the efforts to meet the course requirements may lead to overload risks. They believed that "overload" hinders productivity and becomes a burden that obstructs their effective technological integration.

Limited Collaboration. Even though student-teachers had great opportunities for group and peer discussion in class and online through Telegram groups, data analysis identified limited collaboration as one of the CALL course constraints. This was evident as throughout the whole tasks and assignments only one assignment was assigned as group work, which was creating 2-page newsletters.

Lack of CALL Microteaching and Teaching Practice Opportunities. Reflective essays' analysis unveiled the absence of structured microteaching and authentic teaching practice opportunities as a critical constraint that the student-teachers consider as a limitation that affect the effectiveness of course. The absence of chances for real-world application and implementation of CALL tools creates a gap that leads to disconnection

between about CALL tools and learning to implement CALL tools effectively. Relying on demo-only approach and limited hands-on practice without providing student-teachers with real language classroom technology implementation experiences leads to failure to develop core pedagogical competence, inability to apply theory into practice, and underdeveloped critical teaching skills, which creates a profound implementation gap.

Technical Infrastructure Limitations. In their reflective essays, student-teachers identified a number of technical infrastructure limitations in three interconnected areas that are specified as limited access to computers and other CALL tools, unreliable internet connectivity, and frequent power outages and blackouts. All of the student-teachers complained about not being able to use the computers in the lab because they are outdated or have technical issues. In her reflective essay, one of the student-teachers wrote: "what is supposed to be the English Lab includes really old computers and a very small TV that hinder [their] opportunities for independent practice and make completing the assignments challenging, especially that not all of [them] had laptops" (ST33, 2024). Student-teachers also reported experiencing instability of internet connectivity which resulted in communication breakdowns and late submissions. They also that internet service was expensive as it was not offered by the university, so they had to pay for internet services. Another limitation affected student-teachers' power outage and blackouts. As Libya went through political conflicts and other infrastructure issues that affected electricity services, student-teachers reported that power outage and blackouts affected their progress in finishing the assignments on time and meeting the deadlines.

Proposed Data-Driven Recommendations for CALL Course Improvement

The third research question aimed at proposing data-driven recommendations for the CALL course improvement. Triangulation phase of data analysis revealed ten themes as recommendations for CALL course improvement.

Aligning CALL course with 21st-Century Literacy Demands. Even though the CALL course analysis showed that there was a strong alignment to 21st-Century Literacy Demands and revealed a solid foundation, it could be explicitly aligned by incorporating more collaborative tasks and focusing on digital citizenship and problem-solving tasks.

Refining objective to ILOs. It is also recommended to refine the CALL course broad objectives into specific, measurable, and observable Intended Learning Outcomes (ILOs) to reflect the 21st-Century Literacy Demands and Bloom's Revised Taxonomy. It is recommended to audit the existing objectives and identify the problems to address technical barriers and time constraints and then align ILOs with constraints as revised ILOs. As a final stage, it is recommended to scaffold using ILOs as roadmaps to technical anxiety, optimize time managements, and enable equitable assessment. To build student-teachers' targeted competencies for effective technology-integration, it is essential to shift to a well-articulated ILOs.

Increasing the CALL Course Hours. The findings of student-teachers' reflective essays analysis revealed that nearly all the student-teachers explained that offering the CALL course once a week for two hours class with what they described as "overwhelming course content" was "not enough" and suggested increasing the CALL course hours in their reflective essays (ST5, 2024; ST33, 2024; ST12, 2024). They suggested offering the CALL course twice a week by having two hours for presenting what they called "the theoretical part of the course" and two hours for what they called the "practical part" of the course (ST5, 2024; ST33, 2024; ST12, 2024). They believed that offering the course twice a week with "enough time" for hands-on practice would enhance their skills and encourage them to integrate technology in their future career as EFL teachers "effectively" (ST40, 2024).

Enhancing Course Content and Instruction. P21 and QM analysis revealed that there was a need for course content enhancement. For instance, even though student-teachers were being trained on creating online tests using Google Forms and some apps, there is still a need to include a module on assessment in online environments because they need to understand how to choose and use assessment-related digital tools, how to ensure academic integrity and prevent cheating, how to use assessment to evaluate 21st-century skills, and how to give efficient multimodal feedback. There is also a need for including the principles of digital citizenship so that student-teachers move beyond just using digital tools to a more responsible and effective use of digital tools. Finally, there is a need to incorporate collaborative and problem-solving tasks. Collaborative tasks give student-teachers firsthand experience of the benefits and challenges of group work in online classes whereas problem-solving tasks give them firsthand experience with issues related to technology integration and troubleshooting.

Balancing between theoretical foundations and hands-on practice. Data analysis also uncovered a critical need for balancing between theoretical foundations and hands-on practice. As the course is taught on the principles of project-based training and authentic task creation, there is a need to focus on student-teachers' understanding of theoretical concepts such as TPACK so that they bridge the gap and connect between theory and practice. This will not only help them enhance their conceptual understanding but also raise their practical confidence, which leads to effective integration of CALL tools.

Expanding Practice Opportunities. In their reflective essays, most of the student-teachers suggested expanding their practice opportunities. The suggestions included offering micro-teaching with CALL integration opportunities, designing and creating more CALL materials, and planning and delivering lessons with CALL activities. Three of the student-teachers suggested including hands-on troubleshooting sessions. Only One of the student-teachers suggested giving them "online teaching" opportunities (ST40, 2024). These suggestions highlight the student-teachers' understating of the significant role of practice and their progress beyond the basic grasp of the theoretical part of CALL tools. They believed that micro-teaching will give them the chance to be trained on CALL tools integration whereas hands-on troubleshooting sessions will include practical exercises that would help them develop their crucial problem-solving skills to be able to identify, analyze, and resolve the challenges they might encounter.

Access to Technology. All student-teachers suggested providing free and reliable access to technology for course improvement. Most of the student-teachers suggested offering internet access and proposed that either the university provides free and reliable Internet connection on campus or provides affordable Internet connectivity so that they can use on and off campus. They insisted that the university should ensure equitable access. They complained that computers in the lab were really old and suggested providing reliable computers, updated hardware, free access to specific CALL software, and other devices to help the students meet all the course requirements "stress-free" (ST30, 2024; ST46, 2024; ST50, 2024). They also recommended providing technical Support. They indicated that there should be a specialized technician that would help them resolve any technical issues they might face while working on the course requirements in and outside class.

Implementation of Mobile Technology. About half of the student-teachers suggested implementing mobile technology. They stated that most of them do not own laptops/computers and that they mostly use their mobile phones to complete the course assignments. Since not all of the student-teachers have computers or laptops, they thought that it would be "best for all if the assignments were designed taking into the account the mobile phone availability" (ST22, 2024).

Training Student-teachers on "new and trending" Technology. Student-teachers suggested to "always add new and trending technology" to the syllabus to prepare future student-teachers for future technological advances and the challenges that come with them (ST31, 2024). They recommended adding trending and emerging technologies that included training student-teachers on more AI-powered language learning and teaching tools, familiarizing them with online learning platforms, training them on blending learning & flipped classroom, educating them on the latest AI-powered research and academic writing tools, and informing them on the latest gamification platforms.

Discussion

The main purpose of this study was to investigate whether the CALL course design of one of the Libyan TEFL teacher education programs meets 21st-century literacy demands and identify its affordances and constraints to propose data-driven recommendations for improvement. The findings revealed that the course is highly aligned with 21st-century literacy demands and had some affordances and constraints. Following is a discussion of the findings in relevance to the raised research questions and current literature findings.

CALL Course Alignment with 21st-century Literacy Demands

The first research question aimed to investigate whether the current CALL design aligns with 21st-century literacy demands. Findings revealed that there was a strong CALL course alignment with 21st-century literacy demands with few gaps that need to be considered like adding more collaboration tasks and focusing on digital citizenship, which confirms previously published research results [61]. Strong alignment targets 21st-century literacies and moves beyond training student-teachers on basic skills [62]. Thus, CALL courses should explicitly develop student-teachers' 21st-century literacies and train them to effectively nurture their learners' 21st-century literacies. Moreover, CALL courses should be designed to include activities that train student-teachers on critically evaluating resources, designing and implementing tasks, utilizing technology for authentic communication and collaboration, and other significant skills that are needed for effective integration of technology in the language classroom.

CALL Course Affordances and Constraints

The second research question aimed to identify the CALL course affordances and constraints. Findings of this study align with the findings of previous studies in that the course is based on project-based training and authentic task creation, focuses on hands-on practice over theoretical foundations, overemphasized skills on the expense of critical pedagogical knowledge [32, 33]. Findings also uncovered pedagogical, technological, institutional, and career/professional development affordances. Pedagogically, the student-teachers benefited from

being engaged in authentic tasks such as the creation of digital storytelling, interactive quizzes, gamified activities, and other tasks that promoted their creativity, autonomy, and reflective depth, which are the fundamental aspects of learner-centered pedagogies [15]. The diversity of these tasks not only develop the student-teachers' practical skills, but also foster deeper engagement and transferable competencies. This powerfully aligns with the principle of authenticity and ensures offering a CALL course that enhances career-relevant competencies. In addition, technological affordances are represented in student-teachers utilizing a wide range of CALL tools, such as using AI-powered language assistants, that forms their technical competencies and raises their critical digital literacy [31, 62]. Moreover, emphasizing the significance of reflective practice raises the student-teachers' accountability and raises their awareness to the significance of continuous development, which supports the institutional goals [35]. Career/Professional development affordances is represented through professional portfolio culmination that showcases student-teachers' various competencies and reflection skills, which provides concrete evidence of their expertise in CALL tools and technology integration as well as problem-solving and decision making skills [35, 64].

Even though the findings revealed a number of significant affordances of the CALL course, findings also uncovered pedagogical, technological, and institutional constraints that might have affected the course effectiveness in preparing the student-teachers for real classroom technology integration. Despite the pedagogical affordances, findings revealed some limitations that included imbalance between theoretical foundations and practical application and lack of CALL microteaching and teaching practice opportunities, which aligns with existing literature findings [34, 35]. Another critical constraint is related to technological barriers that affected student-teachers progress, such as not having equitable access to reliable computers and other CALL tools and reliable internet access or free internet provided by their institution. Finally, class duration and the unavailability of technical support were the institutional constraints. Lack of the essential resources and reliable internet and institutional support seem to be barriers that are faced in different parts of the world, not just by Libyan EFL student-teachers [36, 37].

Proposed Data-Driven Recommendations for CALL Course Improvement

Nine themes emerged from the data triangulation phase and were proposed as recommendations for CALL course improvement. These themes offer a research-backed comprehensive framework for transforming TEFL teacher education to move beyond minor adjustments and promote TPACK to prepare student-teachers for the digital age [3, 4]. They present a base for a solid and captivating CALL course comprehensive redesign that takes into account alignment with 21-st-century literacy demands [65]. For effective implementation of the proposed recommendations, it is essential to understand that CALL is not just a course for simple CALL tools-training. Teacher-educators and their institution leaders should understand the complexity of the course and its significance in a world of ever-changing technologies and therefore evolving TEFL teacher education programs' components. To holistically equip student-teachers with the knowledge, skills, critical awareness, and adaptability that they need to become effective EFL teachers, CALL course should address alignment with 21st-century literacy demands, refining objective to ILOs, course hours, course design and content, assessment, theory-practice balance, practicum opportunities, access to technology, and emerging trends. The harmonious implementation of the suggested recommendations leads to training student-teachers to become critical reflective practitioners who are able to ethically and effectively implement technology and CALL tools, which will embody Chapelle's vision of having EFL teachers who not only know what type of technology to utilize but also know why it is chosen and how it enhances learners' language proficiency [66].

Conclusion

This study aimed to investigate whether CALL course aligned with 21-Century Literacy Demands, identify the affordances and constraints of the CALL course offered by one of the Libyan TEFL teacher education programs, and propose data-driven recommendations for CALL course improvement. Findings revealed that there was a strong CALL course alignment with 21st-century literacy demands, which indicates that the CALL course nurtures student-teachers critical modern competencies. The key affordances of the CALL course created a dynamic and relevant environment because of authentic tasks creation, enhancement of student-teachers' tech fluency, nurturing their creativity and autonomy, endorsment of reflective depth, and professional portfolio building facilitation among other affordances. Regardless of these affordances, the findings uncovered pedagogical, technological, and institutional constraints that include lack of balance between theoretical foundations and hands-on practice, lack of CALL microteaching and teaching practice opportunities, risk of cognitive overload, limited collaboration, and technical challenges among other constraints. Accordingly, a number of data-driven recommendations for CALL course improvement were proposed.

These findings contain theoretica, practical, and policy-wise implications. The strong alignment of the CALL course design with 21st-century literacy demands validates the pedagogical value and emphasize the significance of the 21st-century literacy skills integration to effectively prepare student-teachers for real-world teaching challenges. The proposed recommendations provide evidence-based strategies for improving the CALL

course and addressing the challenges for better practice opportunities. The recommendations also provide policy makers, curriculum developers, and university leaders and educators with a list of affordances and constraints they need to take into account to promote effective EFL teacher training by addressing the constraints and improving the CALL course design. They need to understand the significance of preparing the student-teachers for the complexities of language teaching and successful technology and CALL tools integration.

Despite the valuable insights this study revealed, there are a number of limitations that has to be addressed. This study focused on one CALL course in one institution, so the findings are not generalizable. Another limitation that has to be mentioned is the study explored the CALL course even though there are programs that have other names for courses that prepare the student-teachers to integrate technology effectivly. Moreover, this study focused primarily on course design documents and reflective essays. Finally, even though multiple data analysis tools were used in this study, data might have been affted by the student-teachers' subjectivity in their reflective essays and the researcher's perspectives as a course instructor.

As mentioned in the begining, this study opens doors for interested scholars and researchers for further research. It is recommended to conduct comparative studies the examines different CALL courses and the other courses that teach how to integrate technology in the language classrooms with different names. It is also suggested to explore the teaching methodologies used to train the student-teachers on technology integration. Finally, longitudinal studies are of significance to evaluate the CALL course effectiveness in preparing the student-teachers for the ever-changing technology era.

Compliance with ethical standards

Disclosure of conflict of interest

The author(s) declare that they have no conflict of interest.

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