Contriving IT-Based Integrated Skills Approach (ITBISA) for Students' English Proficiency and Digital Literacy Skills

Didit Kurniadi [1*], Issy Yuliasri [1], Sri Wahyuni [1], and Zulfa Sakhiyya [1]

[1]   Language Education, Faculty of Languages and Arts, Universitas Negeri Semarang, Semarang 50229, Indonesia.

*   Corresponding author: diditkurniadi@students.unnes.ac.id.

ABSTRACT: Contriving technology is a trend in current TEFL in higher education. IT-Based Integrated Skills Approach (ITBISA) combines IT-based approaches with the EFL education method, ISA (Integrated Skills Approach). This study explores how ITBISA is implemented in teaching-learning and examines participants' perspectives on its effectiveness. This study used a mixed-method research design. Data were collected through classroom observations and open-ended questionnaires and then analyzed thematically to identify key patterns. Initially, participants sourced information directly from the internet without verification. Integrating AI and other digital tools reflects a desire to adopt new technological advancements. This underscores the importance of innovative technology in creating and distributing college educational materials. Consequently, we argue that the IT-based integrated skills approach can effectively enhance students' digital literacy and English proficiency. The findings offer a theoretical concept of how ITBISA is implemented. Figure 4 demonstrates how integrating digital tools, AI, and the Integrated Skills Approach fosters a dynamic, interactive learning environment. The findings also indicate a positive student response to ITBISA, with active participation, effective use of mobile devices, and task completion. This approach enhances instruction, making learning more efficient. ITBISA in EFL is a promising method for implementing the teaching-learning process to improve English proficiency and digital literacy.

Keywords: digital literacy, English proficiency, ITBISA, technology-enhanced learning, integrated skills development.

I. INTRODUCTION

Technology enables access to enormous amounts of data and knowledge. Students with digital literacy skills can navigate the integration of technology like the internet, search for reliable and relevant information, and evaluate sources critically. Information technology integration requires the appropriate integration of information technology into educational systems. It is suggested that educators who subscribe to the notion that the integration of information technology applications can augment their instructional and learning endeavours are more predisposed to perceive these technologies as facile to use [1]. Consequently, they may foster a favourable attitude toward adopting such technologies [2, 3]. Technology integration facilitates the growth of skills, including communication, critical thinking, collaboration, problem resolution, and computational reasoning [4]. Moreover, using and integrating technology in language teaching could be seen as a new way to teach languages in the last decade [5]. Even though it has long been part of language teaching, recent advancements have transformed its role. Technology now extends beyond basic tools to interactive, AI-driven learning, fostering autonomy and critical thinking. This shift from traditional ed Edttech/CALL and blended learning to adaptive platforms highlights technology's evolving impact on pedagogy. The shift of technology in teaching includes habits to use AI [6]. Technology enables students to increase their comprehension, investigate a variety of perspectives, and conduct research more effectively.

The integrated skills approach is an instructional method utilized in English language instruction, especially in teaching English as a Foreign Language (TEFL) context. TEFL (teaching English as a foreign language) focuses on the purposes or studies of English by teachers and learners with a distinct native language [6]. Zhang [7] stated that the use of technology in this digitalized era has increased as a reconceptualization of English language teaching (ELT) classroom (e.g., speaking, listening, writing, and reading). The integrated skills (language) approach emphasizes incorporating multiple language skills, including listening, reading, speaking, and writing, to cultivate overall English proficiency. Instead of considering these skills as distinct entities, the integrated skills approach recognizes that language proficiency is most effectively developed through meaningful and interconnected language use. Hajar [8] clarified that the Integrated Skills Approach (ISA) could engage students passionately in learning activities. It encourages students to engage in authentic and purposeful communication, where they can implement and practice their language skills in factual situations.

In addition, Mantiri et al. [9] examined some misconceptions surrounding digital literacy and attempted to demonstrate that all language educators require fundamental training in this area. Some people have misconceptions that digital literacy is defined solely by the capability to operate a computer and that its use will automatically lead to the development of digitally literate students. Students develop their digital literacy skills, like technical proficiency, problem-solving skills, digital communication skills, and the ability to acclimate to new tools and platforms through technology in teaching. These abilities are crucial for success in higher education and many professions. Digital literacy is much more than just being able to do certain things on a computer. It includes everything about using computers and media in a cultural setting [10]. Digital literacy is comprehending technology's ethical, legal, and accountable use. It encompasses knowledge of online safety, privacy, security, and proper online conduct. Integrating technology and digital literacy into education teaches students to navigate the digital world responsibly, become conscious of potential hazards, and act as responsible digital citizens. Moreover, students are inconsistent in using technology tools because they are unfamiliar with the different technology tools for learning a language and lack the necessary training. Kazemi and Narafshan [11] added that the students have never requested additional facilities because they have never considered incorporating technology into their classrooms. Giving self-directed learning as the source of problem-based learning can help students improve their digital literacy. The important point in self-directed learning is learning in institutions and everyday life through experiences gained [12]. For example, the teacher directs students to find certain information in digital literacy. Students can get this information from different sources such as e-books, IT tools, YouTube, AI tools, or other websites. Therefore, the final requirement for digital literacy is the ability to operate digital technology.

The students must be digitally literate, which technically means the teacher(s) and the students should master and keep up to date with the development of information and technology in all matters. These conditions inspired me to conduct research using IT-based tools combined with the existing theory, the Integrated Skills Approach (ISA). My research proposes ITBISA (IT-Based Integrated Skills Approach) to address the student's language proficiency and digital literacy issues. Integrating technology into education profoundly enhances students' digital literacy and language skills. Educators can significantly boost students' communication, critical thinking, and problem-solving abilities by incorporating digital tools and resources. The Integrated Skills Approach, which combines listening, reading, speaking, and writing, benefits from the capabilities of modern technology to provide a more engaging and comprehensive learning experience. Although there are misconceptions about digital literacy being limited to basic computer skills, it involves understanding and navigating various ethical and practical aspects of technology use (including critical thinking, ethical considerations, and the ability to navigate digital environments effectively). Not only Mantiri, but the concept of digital literacy, as previously stated, can also be traced to Greene [13], where it involves not only knowledge but also the understanding and acquisition of digital use. Addressing these misconceptions and providing students with opportunities for self-directed learning and diverse digital tools can improve their technical proficiency and prepare them for responsible digital citizenship. Ultimately, integrating technology and promoting digital literacy enhances students' learning outcomes and equips them with essential skills for success in the digital age.

However, no study has been published on ITBISA at the university level in the Indonesian context, which offers insight into how this approach helps teachers and students in the teaching-learning process of English proficiency and digital literacy. Further, there are no studies about ITBISA. As ITBISA has been shown separately to benefit students and teachers in the EFL context with IT-based language instruction, integrating the approach theoretically can boost these learners' English and digital literacy skills. This study aims to explore the implementation of ITBISA in developing students' English proficiency and digital literacy. Specifically, it examines how ITBISA is integrated into the teaching-learning process and how participants perceive its application. By analyzing classroom observations and participants' reflections, this study provides insights into the instructional practices, engagement, and experiences shaping ITBISA's role in enhancing language learning and digital literacy.

II. LITERATURE REVIEW

1. DIGITAL LITERACY FOR EFL STUDENTS

The history of digital literacy can be traced back to the early stages of the digital age, initially focusing on basic computer skills and evolving to encompass a diverse range of competencies. This shift of Edrtech highlights the need to integrate historical constructs into modern digital education, emphasizing critical thinking and adaptability [14]. Digital literacy, as a theoretical construct, represents more than mere technological proficiency [15]. It encompasses the holistic ability to engage with digital technologies proficiently, extending beyond mere technical skills. The conceptualization involves the dynamic interplay of creation, communication, collaboration, and information search and evaluation in an increasingly digitalized society [16, 17]. It is about using digital tools and intentionally developing knowledge and skills tailored for specific purposes within the digital landscape. The dynamic interplay of creation, communication, collaboration, information search, evaluation, and a commitment to online safety collectively shapes the theoretical landscape of digital literacy. This conceptual framework is a foundation for understanding and advancing digital literacy in our increasingly digitized society.

Some studies show that digital literacy has recently benefited the EFL context. Some researchers have studied digital literacy in English education or for EFL students. Razak et al. [18] explored technology-based language learning and investigated the role of digital technology and digital literacy. Mudra [19] explored digital literacy among young English as a Foreign Language (EFL) learners with perspectives on the perceived benefits and barriers from teachers and students. They take a broad view, exploring technology-based language learning and digital literacy in a general context. Their emphasis extends to the role of digital technology, encompassing the wider landscape of language education [20]. This approach adds depth to understanding digital literacy, capturing the nuanced perceptions and challenges both stakeholders face.

On the other hand, Alsmari [21] examined the correlation between language proficiency levels and L2 digital literacy self-efficacy involving EFL university students. This targeted approach allows a nuanced understanding of the interplay between language proficiency and digital literacy. Argawati and Suryani [22] studied instruction grounded in digital literacy and the opportunities and challenges in English language teaching. Their study highlights the practical implications of integrating digital literacy into English language instruction. In contrast, Mantiri et al. [9] defined and discussed digital literacy in ESL classrooms. By examining models of learning activities, these studies provide valuable insights into the practical applications of digital literacy within the structured framework of language education.

Murtafi'ah and Setyo Putro [23] investigated models of learning activities on digital literacy in the English curriculum. Nafi et al. [24] investigated the digital literacy of Indonesian Generation Z teachers in the context of English instruction. By examining the digital proficiency of this specific demographic, the study provides insights into the evolving landscape of teaching methodologies and the adaptability of newer generations to digital tools. Furthermore, Santos and Serpa [25] emphasized the significance of fostering digital literacy in higher education. Similarly, Soifah et al. [26] revealed the digital literacy practices of English as a Foreign Language (EFL) teachers. These studies focused on digital literacy in the EFL teaching and learning process. These studies contribute to investigating and understanding digital literacy for EFL students.

2. THE CONCEPT OF IT-BASED INTEGRATED SKILLS APPROACH (ITBISA)

Although the integration of technology in English language teaching has become widespread, there persists a requirement for rigorous research to thoroughly examine the nuanced impact, challenges, and factors associated with this prevalent practice. Compared to digital literacy studies, studies related to ISA that integrate IT-based learning are still relatively limited. In this matter, the integration of technology (IT-based) is combined with one of the English language teaching approaches, the Integrated Skills Approach (ISA), which becomes ITBISA as the eye-catching term used. The integrated skills approach is a teaching approach incorporating the four language skills listening, speaking, reading, and writing—to develop students' communicative competence [27]. This approach was born as a refutation of the traditional/segregated skills approach in language education of the 70s and 80s, as Widdowson stated in 1978. Oxford has also popularized ISA [28], who noted that this approach can be done using content and task-based instruction. The idea of combining both approaches will be different. It proposes an approach highly relevant to the current digital technology era. That is why ITBISA is important to conduct.

3. THE RESEARCH GAPS AND THE JUSTIFICATIONS

The use of ITBISA to modify the previous approach is associated with enhancing students' English proficiency and digital literacy, thus making this gap even more visible. Technological developments also require us to update our digital literacy skills. Therefore, this research adopts previous research in its implementation and administrative techniques. Of course, some things need to be replaced according to the needs of the research topic or current conditions since technology development is rapid. Mostly, digital tools do not last forever. Digital literacy can quickly change because of new technologies and the way people communicate online [29]. However, further research is required to better understand how the IT-Based Integrated Skills Approach (ITBISA) influences students' English proficiency and digital literacy. While research on the Integrated Skills Approach (ISA) has aided teachers in comprehending the acquired communicative competence, the anticipation is that ITBISA will enhance the approach for upcoming research. This systematic review underscores a substantive gap in the literature on the IT-Based Integrated Skills Approach (ITBISA) within the Indonesian context, particularly concerning its influence on enhancing students' English proficiency and digital literacy in TEFL classes. The study concentrates on TEFL classes, aiming to scrutinize how EFL students use ITBISA to augment their English proficiency and digital literacy. By examining the concept of ITBISA in terms of students' English proficiency and digital literacy, this research aims to explore how ITBISA can help students' English proficiency and digital literacy.

However, unlike previous theories that primarily focus on ISA's impact on language proficiency, this research extends the discussion by integrating digital literacy skills as a crucial component within a technology-driven learning environment. Furthermore, prior research has highlighted challenges related to teacher preparedness in ISA-based instruction, but few have explored its technological applications in fostering both linguistic and digital competencies. This study, therefore, builds upon existing findings while introducing a broader and more contemporary perspective that integrates IT-based learning tools with ISA (ITBISA) as a novel contribution, aiming to enhance not only students' English proficiency but also their digital literacy, a key skill in modern TEFL classrooms.

Moreover, ITBISA is distinct from the other approaches. It will be a full package and implemented throughout the whole semester of teaching (all meetings). This study aims to fill this gap by conducting a thorough investigation into the impact of ITBISA on students' English proficiency and digital literacy competencies, enriching the other factors that may come up from participants' views. The findings from this research will offer valuable insights to the academic community and educational practitioners in the relevant context.

Thus, this study describes the implementation of ITBISA on the student's English proficiency and digital literacy and specifically poses the following research questions:

- How can ITBISA be implemented in the teaching-learning process of English proficiency and digital literacy?
- What is the perspective of the participants toward ITBISA?

III. METHOD

1. OBJECTIVE, DESIGN, AND PARTICIPANTS OF THE RESEARCH

This study investigates how ITBISA is implemented in the English proficiency and digital literacy teaching-learning process. The objective was also enriched with the participants' views to depict the application of this approach. The grand design used was mixed-method data collection and analysis; the last is the interpretation of the whole data [30]. This research uses the qualitative phase to collect data supporting the observation data during implementation. The data from the qualitative phase explores the teachers' and participants` activities during the implementation of ITBISA and the participants' views on the use of ITBISA to explain the whole data of ITBISA implementation on students' English proficiency and digital literacy. The quantitative phase measures the result of the implementation of ITBISA. This study was conducted at the English department of one of the private universities in Indonesia. The research participants were students at the university. The subject of this study consisted of 15 students enrolled in the TEFL class and their teacher. A convenience sampling method was used, as these students were readily accessible and actively engaged in learning English with technology. The inclusion criteria required participants to be enrolled in the TEFL course and have prior experience using digital tools in learning. The students, primarily undergraduates in their early 20s, represent a typical demographic of pre-service English teachers, making them an appropriate sample for understanding the impact of ITBISA on English proficiency and digital literacy in an academic setting. The researchers used an observation sheet and an open-ended questionnaire to collect the data. The reason for using this method is that it allows for an in-depth exploration of participants' experiences and instructional practices, enabling the identification of meaningful patterns without relying on predefined categories.

2. DATA COLLECTION: OBSERVATION SHEET AND THE PROCEDURE

The activities were monitored during multiple sessions to facilitate teacher and student engagement when applying for ITBISA with thelesson content, instructional methods, digital tools employed, classroom activities, and student participation. The aspects of observation would encompass the subject matter being covered, the digital tools employed, the delineation of classroom activities, and the responses of students as the instructor integrates ITBISA into digital education. The instrument employed a structured observation checklist which is adapted from Anggeraini [31], who researched a similar topic, the implementation of digital tools in the EFL classroom. This resulted in the compilation of ten statements about classroom interactions and activities during the implementation of ITBISA. The observation checklist was provided with 10 items and was filled with yes or no. The observations were conducted by the researchers, who attended each session in person, taking real-time notes and filling out structured observation sheets. Additionally, qualitative field notes were taken to capture significant occurrences not covered in the checklist.

3. DATA COLLECTION: OPEN-ENDED QUESTIONNAIRE AND THE PROCEDURE

An open-ended questionnaire was administered to all participants at the end of the ITBISA implementation period, encouraging them to express their insights nuancedly. To fully grasp the influence of ITBISA on participants' digital technology skills and language proficiency, the researchers employ a combination of open-ended questionnaires to complement the data obtained from the observation checklist. This instrument allows participants to elaborate on their responses. The open-ended questionnaire draws inspiration from sources like Hampel [32] and Hubbard [33] and consists of three questions and is distributed to all participants. These questions seek explanations regarding the activities undertaken by participants to enhance their integrated digital technology competencies during the ITBISA implementation, their efforts to promote language skills and language aspects, and their insights into the digital media, tools, and applications that the teacher intends to use during the ITBISA implementation. Here are the questions: 1) Could you explain your activities to learn English proficiency in implementing ITBISA in the class? 2) Could you explain your activities to learn digital literacy using ITBISA? 3) Could you mention the technologies the

teacher uses in implementing ITBISA? The participants' responses to the open-ended questionnaire were categorized into three key aspects: their activities in developing integrated digital technology skills, their efforts to enhance English proficiency during ITBISA implementation, and the specific digital media, tools, or programs utilized by the teacher throughout the course. Each of these categories is illustrated in a corresponding figure (each figure consists of four dominant answers) to provide a clearer visual representation of the findings.

4. DATA COLLECTION: TOEFL AND DIGITAL LITERACY TEST

A quantitative data collection approach was employed to evaluate the effectiveness of the ITBISA implementation compared to the traditional method. Two primary instruments were utilized: a TOEFL ITP-like test with a maximum score of 677 to assess English proficiency and a digital literacy test with a maximum score of 50 to measure students' competency in utilizing digital tools. These assessments were conducted with a local campus-affiliated language course institution to ensure standardized testing procedures. The goal was to compare student progress between those enrolled in ITBISA-based classes and those following conventional teaching methods. The TOEFL ITP-like test served as a benchmark for evaluating linguistic improvements, while the digital literacy test examined students' ability to navigate and apply digital resources effectively. By contrasting the outcomes of these two groups, the study aimed to determine whether ITBISA facilitated more significant advancements in English proficiency and digital competency compared to traditional classroom instruction. Ethical considerations involved obtaining informed consent, ensuring anonymity, and following institutional research guidelines.

5. DATA ANALYSIS

The data collected in this study were analyzed qualitatively using thematic analysis to identify patterns related to ITBISA implementation. First, observation sheets and open-ended questionnaire responses were organized and categorized based on key aspects, such as instructional strategies, digital tools, student engagement, and participant perceptions. The data were then systematically coded using an inductive approach, where recurring patterns were identified and grouped into broader themes. A triangulation process was conducted to enhance reliability and validity by cross-examining data from multiple sources, ensuring consistency in emerging themes. The identified themes were interpreted and synthesized to address the research questions, providing a comprehensive understanding of how ITBISA supports English proficiency and digital literacy development and participants' perceptions of its implementation. The test result was analyzed to show the impact of ITBISA's implementation compared to the traditional way.

IV. FINDINGS AND DISCUSSIONS

1. THE IMPLEMENTATION OF THE IT-BASED INTEGRATED SKILLS APPROACH (ITBISA)

The representative of the observation result of the implementation of ITBISA is displayed in Table 1 below:

Table 1. The observation checklist results of the ITBISA's implementation.

No	The teacher and students' activities	Yes/No	Meeting(s)
1	The teacher uses internet connectivity to their personal computers or electronic devices.	Yes	1-15
2	The students use internet connectivity to their personal computers or electronic devices.	Yes	1-15
3	The teacher engages in discussions related to the subject matter and primary themes.	Yes	2-15
4	The teacher initiates a brainstorming session with the students regarding the topic to commence the class.	Yes	2-15

5	The teacher guides the students on utilizing web-based applications, digital tools, AI integration, and current technology.	Yes	2-15
6	The students engage in independent practice involving observation, task completion, summarization, and self-assessment.	Yes	2-15
7	The teacher actively monitors the activities taking place in the classroom during online practice sessions.	Yes	2-15
8	The students follow the instructions given by the teacher regarding the utilization of *ITBISA*.	Yes	2-15
9	The teacher selects one or more students to present their learning outcomes and leads the subsequent discussion, which includes questions, comments, and suggestions for the presenters.	Yes	2-15
10	The teacher reviews and summarizes the instructional materials to conclude the session.	Yes	2-15

The implementation of the ITBISA (IT-Based Integrated Skills Approach) was thoroughly observed across 15 meetings, and the results demonstrated consistent engagement with technology and active learning. The observation checklist revealed that both teachers and students utilized internet connectivity on their personal computers or electronic devices throughout all sessions. The teacher facilitated discussions related to the subject matter and primary themes from the second meeting onwards, encouraging interactive learning. To stimulate class engagement, the teacher initiated brainstorming sessions and guided students in using web-based applications, digital tools, AI integration, and other contemporary technologies. Students were consistently involved in independent practice, which included observation, task completion, summarization, and self-assessment. The teacher maintained an active role in monitoring classroom activities, especially during online practice sessions, ensuring students adhered to the guidelines for utilizing ITBISA. Additionally, students presented their learning outcomes in selected sessions, followed by teacher-led discussions that included questions, comments, and suggestions, fostering a collaborative learning environment. The teacher-reviewed and summarized the instructional materials to conclude each session, reinforcing the key points covered. The findings indicate that the ITBISA approach was successfully integrated into the classroom, promoting both digital literacy and English language proficiency.

The observation results suggested that ITBISA acquainted the students with computer and electronic equipment and apps related to English language acquisition. During the initial meeting, referred to as observation, students are provided with details regarding the implementation of the course, as outlined in the course description. The students and the teacher discussed the instructional materials and methodologies employed in the course. The initial meeting served as an introduction to the implementation of ITBISA. The students accessed the website and digital tools directly and made preparations for digital literacy study, such as utilizing their earphones and connecting to the internet. The teacher elucidated the technologies within the confines of the classroom and posed inquiries about the subjects. The students responded and presented their points by substantiating them with examples sourced from their online reading materials. In summary, there was effective engagement between the teacher and the students. The students adhered to the instructions provided by the teacher.

During the observation, the topic of discussion was "utilizing web-based applications, digital tools, AI integration, and current technology". During this exercise, both the teacher and students' power on their personal computers or gadgets and verify internet connectivity. The teacher instructed the students to assess and choose the tools from the laptop or smartphone. Then, the teacher selected students to present their downloaded or chosen applications, while the rest provided questions, comments, and ideas to the presenter. The discussion focused on accessing and evaluating appropriate instructional materials on the internet. In this activity, the students were instructed on effectively searching for and choosing valuable websites or current technologies. It focuses on searching for and selecting relevant websites for teaching English in the

digital age, considering the learners' proficiency level. During this project, the students were instructed on assessing a high-quality website appropriate for developing English language skills and can be utilized for various instructional purposes.

2. THE FINDINGS OF THE OPEN-ENDED QUESTIONNAIRE

The findings of the open-ended questionnaire corroborate the data obtained from the teacher's observations and the interactions among students regarding the implementation of ITBISA. This section is subdivided into three inquiries. The initial inquiry pertains to the actions undertaken by participants to foster the development of integrated digital technology skills during the ITBISA implementation process. The second question pertains to the actions undertaken by the participants to enhance English proficiency throughout the implementation of the ITBISA class. The final inquiry pertains to the specific digital media, tool, or program employed by the teacher throughout the implementation of the ITBISA course. The outcome of the investigations is displayed in Figure 1.
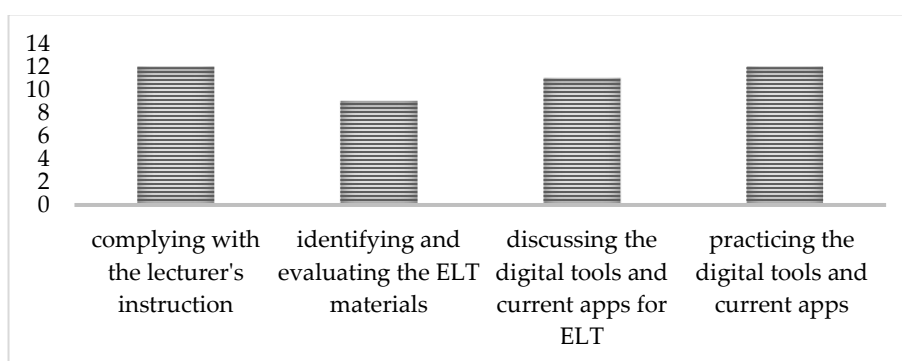

FIGURE 1. Dominant responses from the participants to the first question.

Figure 1presents the main feedback received from students regarding the activities they have engaged in to improve their integrated digital technology skills throughout the ITBISA. There are four prevailing responses. Initially, the students engage in practical exercises using web applications, digital tools, artificial intelligence (AI) integration, and current technologies such as Duolingo, Grammarly, Cake, Chat-GPT, Questionwell, Quillbot, Wordwall, twee.com, BBC Learning English, Canva, CapCut, any blog apps (weebly, blogger, WordPress), and many more. Moreover, the participants conscientiously comply with every instruction given by the teacher. They intently listen to the explanation, actively participate in the conversation, and autonomously accomplish the assignments using their computers/laptops, smartphones, electronic devices, and internet connectivity. Moreover, the participants discuss the digital tools and current apps for English Language Teaching (ELT). This refers to obtaining, choosing, a , and gaining benefits from it within education and acquiring knowledge. The ultimate and dominant outcome is the participants identifying and evaluating the ELT materials. Participants were directed to carefully scrutinize the materials before presenting them to others and assess their advantages and disadvantages.

Figure 2 displays the result of the second inquiry. The result explores how the students improved their English proficiency in many areas during the ITBISA session.
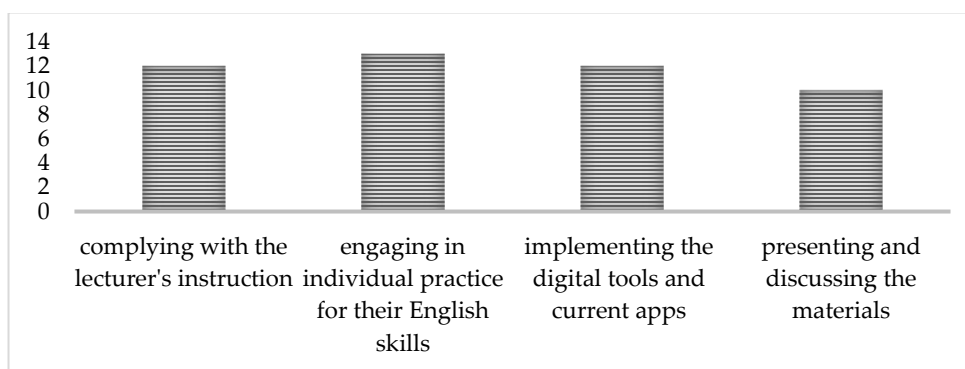
FIGURE 2. Dominant responses from the participants to the second question.

Figure 2 presents the main feedback from students regarding the activities they have engaged in to improve their English skills in the ITBISA class. There are four dominant reactions. At first, the students participate in practical exercises using web applications, digital tools, artificial intelligence (AI) integration, and current technologies such as Duolingo, Grammarly, Cake, Chat-GPT, Quillbot, Wordwall, twee.com, BBC Learning English, Canva, CapCut, any blog apps (weebly, blogger, WordPress), and many more. In addition, the participants faithfully comply with every instruction the teacher gives. They intently listen to the explanation, actively participate in the conversation, and autonomously accomplish the task using their computers/laptops, smartphones, and electronic devices. Moreover, the participants proceed to discuss the selected content with their peers. The presenters respond to the audience's questions, comments, and suggestions. The final and prevailing response is that the participants engage in individual practice in solitary practice. At this step, the participants are engaged in the project implementation.

Figure 3 shows the outcome of the third question. The final inquiry pertains to the digital media, digital tools, or applications employed by the teacher in implementing ITBISA.
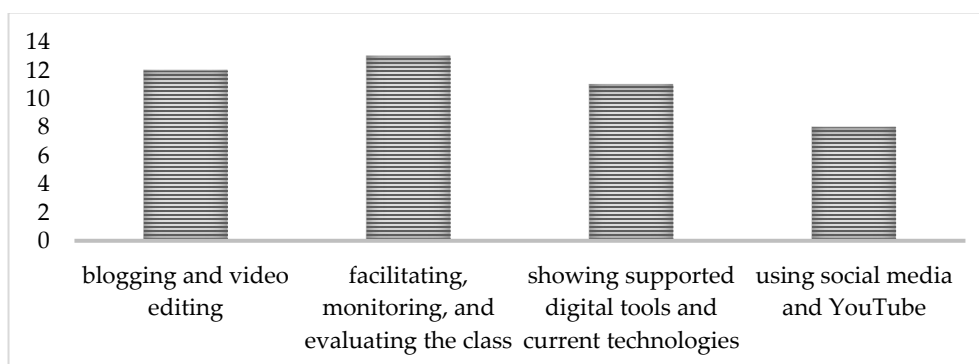

FIGURE 3. Dominant responses from the participants to the third question.

Figure 3 displays the primary responses from the students on web applications, digital tools, artificial intelligence (AI) integration, and current technology that the teacher utilized throughout the ITBISA class. There are four prevailing responses. One of the options is blogging and video editing. The second option is facilitating, monitoring, and evaluating the class. The third category comprises web applications, digital tools, artificial intelligence (AI) integration, and current technology. The final category is social media and YouTube.

The open-ended questionnaire findings support the observational data and student interactions related to implementing the IT-Based Integrated Skills Approach. The questionnaire was structured around three

key inquiries. The first inquiry focused on participants' actions to develop integrated digital technology skills during the IT-Based Integrated Skills Approach process. The second explored how participants enhanced their English proficiency throughout the IT-Based Integrated Skills Approach class. The third inquired about the specific digital media, tools, or programs the teacher used in implementing the IT-Based Integrated Skills Approach. Figure 1 illustrates the dominant responses to the first question, showing that students actively engaged in practical exercises using various digital tools and technologies, including web applications, AI integrations, and platforms like Duolingo, Grammarly, ChatGPT, and Canva. Students followed teacher instructions, participated in discussions, and completed tasks independently. They also evaluated ELT materials, assessing their benefits and drawbacks before presentation. Figure 2 shows responses to the second inquiry, detailing how students improved their English skills. Activities included practical exercises with digital tools, discussions of selected content, and responding to peer feedback. Students also engaged in individual practice and project implementation, improving their English proficiency. Figure 3 presents the outcomes related to the third question, revealing that teachers employed a variety of digital tools and media, such as blogging, video editing, social media, and YouTube, to facilitate the IT-Based Integrated Skills Approach process, monitor progress, and evaluate the students' views. The following histogram depicts the results of the participants after the end of the semester.

Test Result: Digital Literacy ITBISA

Test Result: TOEFL ITBISA

Test Result: Digital Literacy Traditional Way

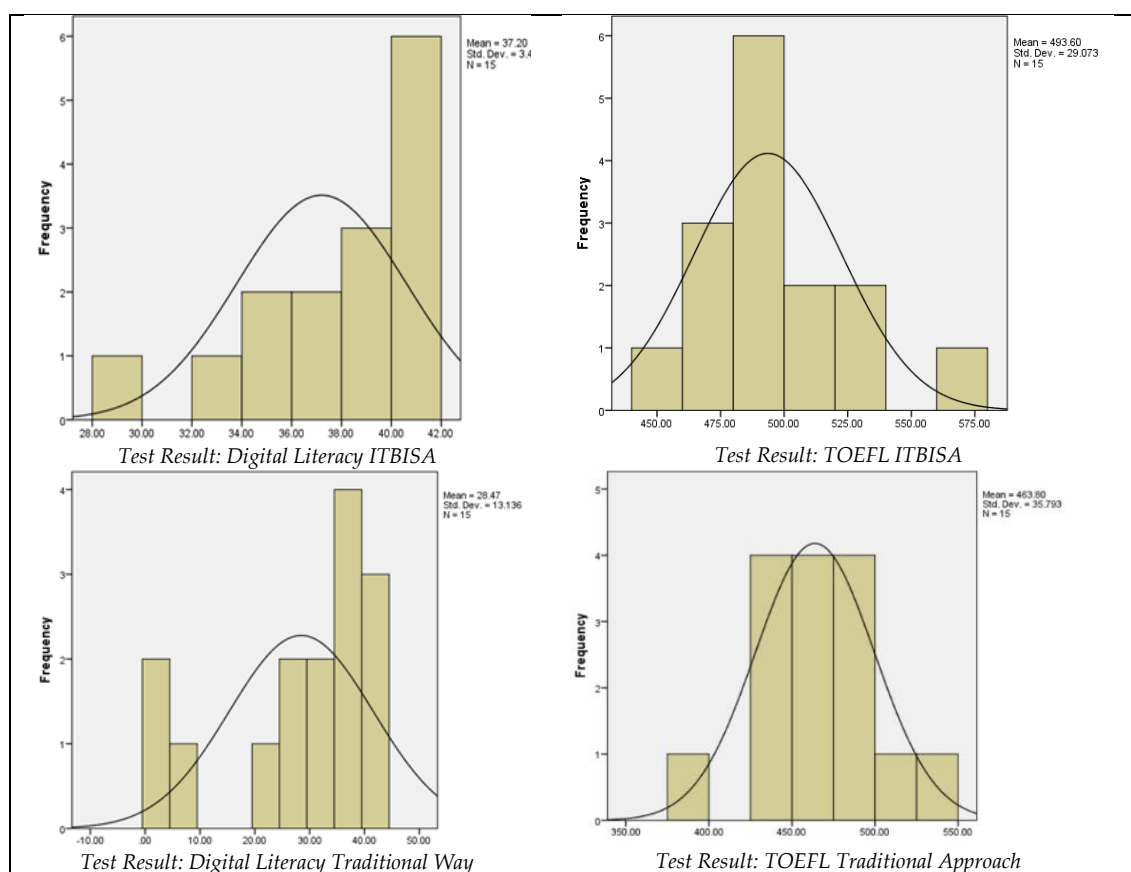*Test Result: TOEFL Traditional Approach*

FIGURE 4. Histogram of The Result of The TOEFL and Digital Literacy Test.

Figure 4 shows the results of the TOEFL and Digital Literacy test, which reveals that the ITBISA approach outperforms the traditional method in both domains. The ITBISA group demonstrated a higher mean score (37.20) in digital literacy compared to the traditional group (28.47), with a lower standard deviation, indicating more consistent performance. Similarly, in the TOEFL test, the ITBISA group achieved a mean

score of 493.60, surpassing the traditional group's 463.80, with less variability in performance. These results suggest that the integration of digital tools and technology-enhanced learning within the ITBISA framework significantly improves students' digital competency and English proficiency compared to conventional teaching methods. For further analysis, it is explored in the discussions section.

3. DISCUSSIONS

From the observation, the students accessed the webpages and made necessary preparations for IT-based language instruction, such as utilizing their laptops or mobile phones and connecting to the internet. The attendees adhered to the instructions provided by the teacher. The teacher facilitated independent practice for the students using web-based applications. Through this activity, students can assess their proficiency by actively engaging in tasks involving internet-based applications. The results support the notion that IT-based instruction fosters greater engagement, autonomy, and skill integration. The findings from Figures 1–2 indicate the highlight of integrating English proficiency with digital literacy through AI-powered platforms (ChatGPT, Grammarly, Quillbot), educational applications (Duolingo, BBC Learning English), and content creation tools (Canva, CapCut, blogs). Compared to traditional methods, ITBISA fosters greater engagement, autonomy, and skill integration, as evidenced by higher digital literacy (37.20 vs. 28.47) and TOEFL scores (493.60 vs. 463.80). Unlike traditional instruction, ITBISA aligns with technology-driven approaches like Blended Learning and CALL. However, challenges include technical limitations (internet access, device availability), teacher readiness, varying digital literacy levels, and the context-specific nature of the study. Practical implementation included structured activities where students used AI for grammar checking, automated feedback, and interactive exercises. These findings suggest that ITBISA enhances language learning and digital skills, providing a scalable model for technology-integrated instruction.

Furthermore, the role of the instructor in the ITBISA setting evolved beyond traditional lecturing. As indicated in Figure 3, the teacher acted as facilitators, monitors, and evaluators, leveraging digital platforms to track student progress, provide feedback, and incorporate real-world digital practices into language learning. This shift aligns with modern pedagogical principles advocating student-centered and technology-integrated learning environments. The result also indicates that ITBISA enhances digital literacy and English proficiency more effectively than traditional methods. The higher digital literacy score (37.20 vs. 28.47) suggests that students in ITBISA classes develop stronger tech skills. In contrast, the TOEFL scores (493.60 vs. 463.80) highlight the impact of IT-based instruction on language proficiency. The teacher observes and supervises the students' activities. The whole implementation is depicted in Figure 5.
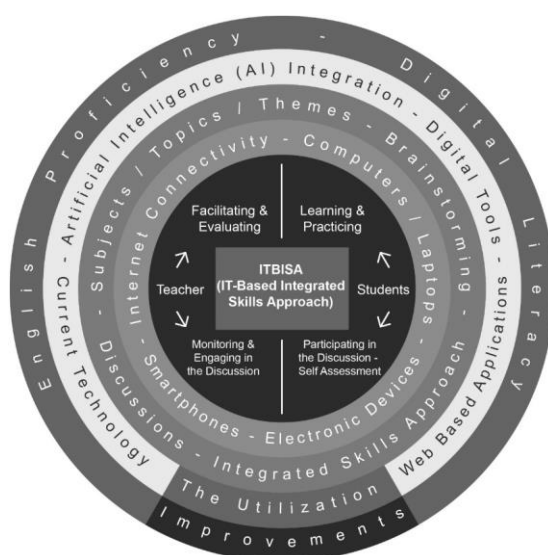

FIGURE 5. The concept of IT-based integrated skills approach.

From Figure 5, we can see that the teacher facilitates and evaluates the students' learning and practicing. The teacher engaged in the students' discussion and monitored students' self-assessments. The students must prepare their computers/laptops, smartphones, electronic devices, and internet connectivity. It is in line with Haleem et al. [3], who reviewed the role of digital technologies as a necessity in education and examined critical applications and issues in the field. It continues with the brainstorming facilitated by the teacher and moves on to the subjects/themes/topics discussed in the class. The language skills covered all skills, such as listening, speaking, reading, and writing (integrated skills approach). They utilize web applications, digital tools, artificial intelligence (AI) integration, and current technologies; in this context, Chat GPT, Duolingo, Canva and other tools are categorized as part of current technologies which were used as project and task-based language teaching in this study. It aligns with the research that Nguyen et al. [34] discovered that teachers know how to adapt their classroom management techniques to the digital learning environment, using new technologies to integrate and utilize them in their teaching practices. ITBISA aims to improve student's English proficiency and digital literacy skills, evaluated by their TOEFL and digital literacy scores. The teacher imparted instructions on creating digital creations and responded to the teacher's inquiries. During this project, the students selected a captivating and significant subject, documented, modified, and submitted the projects for learning. This process directly influenced the improvement of their English and digital literacy skills.

The findings of contriving ITBISA showed a positive relationship with the students. They enthusiastically adhered to the teacher's instructions, actively controlled the mobile devices (including mobile devices), and completed the work during the course. The outcome demonstrated that ITBISA enhances the instructional and educational process, rendering learning more efficient and adequate. It aligns with the study's findings conducted by [35, 36]; mobile technologies, including laptops, personal digital assistants, and mobile phones, have emerged as up-and-coming educational tools in traditional classroom settings and outdoor learning environments. They supplied digital resources for their peer teaching practice and were conversant with social media, web-based learning, blogs, and modern technologies [37, 38]. Initially, they took straight off the internet without doing any identification and evaluation.

The observation result aligns with the findings of Kawinkoonlasate [39]. This study was to recognize the importance of technological applications for teachers and the development of language skills in students, to examine the process of incorporating these new technologies into the classroom, and to evaluate potential challenges associated with introducing these new tools into the English classroom concerning listening, reading, writing, and speaking. The findings also demonstrated the implementation of student engagement and performance across integrated language skills, including listening, speaking, and writing, following the implementation of ITBISA. In another study, the findings' implications highlight how important it is to help educators become more technologically proficient while guaranteeing that all students have equal access to technology resources [40]. It indicated that the classroom in educational programs should be supported by a digital classroom, which requires quantitative examination, technological competence, and access from the teacher across subjects [41]. In this case, the subjects covered English and technology can be implemented to teach students English proficiency and digital literacy skills.

Additionally, it is corroborated by the findings of the study conducted by John [1]. It stated that universities should promote their faculty's use of new technologies to prepare and deliver lessons. Numerous other aspects influence the integration of resistance towards accepting these technologies like the use of AI such as ChatGPT, twee.com, Questionwell, etc. [42, 43, 44]. In this case, AI integration and current digital technologies/supports are rooted in the urges to adopt new technologies.

From these findings, technology and digital literacy skills are highly relevant and in demand in today's educational system. Our society relies on technology, which will continue to influence the future. By incorporating technology into education and fostering digital literacy, we prepare students for the demands of a world that is becoming increasingly digital. It includes preparing them to adapt to technological developments, partake in digital education, and contribute to technological advancement [45]. Teaching language skills can be integrated with IT-based tools in the TEFL classroom. In Indonesia, many TEFL teachers follow an organization named TEFLIN, which talks about problems and issues connected to language teachers, language teaching, and the education of language teachers [46]. One of the best topics is

using IT in language instruction. It started with the Covid pandemic that forced the teachers to do distance learning using IT-based technology. Teachers have been able to adapt to technological developments based on the reflections they have carried out. The reflections with IT-based platforms make space for teacher reflection without knowing the boundaries of space and time [47, 48, 49]. It is also integral to teachers' professional development [50, 51]. Teachers must learn from the reflections: learning before, learning while doing, and learning after doing.

This approach relies on technology, making integrating multimedia elements such as videos, images, and interactive simulations into educational materials possible. This is in line with Han [52], who mentions that extensive use of multimedia technology is prevalent in English education. With the advancement of multimedia technology, the application has also reached a new level of innovation [53]. This technology accommodates various learning styles and engages students dynamically and interactively. It aids in visualizing complex ideas, strengthens comprehension, and makes learning more engaging and memorable [54]. It is an important part of current education systems because it is an effective way to teach people [55]. Utilizing technology as a digital tool or platform in current education can adapt to individual needs and preferences, allowing personalized learning experiences [56, 57]. By evaluating the performance and development of the students, technology can provide them with individualized content, resources, and feedback [58, 59]. This individualized approach guarantees students adequate support, challenges, and growth opportunities. Technology facilitates communication and collaboration between students, instructors, and professionals [60]. Students can participate in discussions, exchange ideas, and collaborate on projects using digital platforms, regardless of physical location [61]. It encourages collaboration, social interaction, and the exchange of ideas.

The ITBISA framework (see Figure 5) highlights the synergy between digital tools, artificial intelligence, and the Integrated Skills Approach, fostering an interactive, student-centered learning environment. This approach equips learners with essential competencies for navigating the digital era by seamlessly integrating English proficiency and digital literacy. Its adaptability and emphasis on active participation position ITBISA as a forward-thinking and effective method in TEFL, offering a sustainable model for enhancing language education through technology. The findings reveal a positive student engagement with ITBISA, as they eagerly followed the teacher's instructions, effectively managed mobile devices, and completed their coursework. This indicates that ITBISA contributes to a more structured and interactive learning environment, enhancing both instructional delivery and the overall educational experience. As a result, the approach promotes greater efficiency in the learning process.The findings of this study align with its objective of exploring how ITBISA is implemented in developing students' English proficiency and digital literacy. English skills were frequently practiced in an integrated manner using the integrated skills approach, where students engaged in activities such as reading a text, discussing it in small groups, and then composing a response or delivering a presentation. This approach reinforced the connections between various language skills and fostered a holistic understanding of the language, reflecting ITBISA's role in enhancing linguistic and digital competencies. However, certain limitations must be acknowledged. The participants were exclusively from a TEFL class within the English literature department in an Indonesian university, making the findings context-specific and not necessarily generalizable to all TEFL classrooms or general English courses.

Additionally, technical issues such as internet connectivity and device availability may have influenced students' engagement with digital tools. Teacher training and readiness to adopt new technology also remain crucial factors in ensuring the successful integration of ITBISA, as educators require adequate support to effectively implement AI-driven learning platforms. Furthermore, students' varying levels of digital literacy and access to resources could impact their ability to fully engage with technology-enhanced instruction. Lastly, the context-specific nature of this study limits the generalizability of findings to other educational settings. To build on these insights, future research could explore alternative implementations of ITBISA, applying it to different learner groups and contexts. Experimental research designs and quantitative analysis could further enhance our understanding of ITBISA's effectiveness, offering a more comprehensive evaluation of student learning outcomes and its potential integration into online TEFL courses.

V. CONCLUSION

IT-Based Integrated Skills Approach (ITBISA) was implemented in a class to help students and teachers in the teaching-learning process of English proficiency and digital literacy. The findings of this study suggest that this approach can be seamlessly implemented in TEFL classes and helps students with their English and digital literacy skills. This is due to the combination of these two, which supports students in deconstructing their views and expressing their creativity by incorporating modern technology and digital tools like AI (Artificial Intelligence) without relying on teacher evaluation. The observation results produce the theoretical or design concept using ITBISA implementation. It is also supported by the participants' views, which positively give their perspective. Thus, the IT-based integrated skills approach can benefit students' English proficiency and digital literacy skills. Therefore, we endorse this approach as a good way to teach integrated skills.

IT-Based Integrated Skills Approach (ITBISA) has some limitations. The reliance on qualitative data and participants' self-reported perspectives may limit the generalizability of the findings and introduce bias. The study's context-specific focus may also restrict its applicability to other educational settings with different resources or student backgrounds. There was also no comparative analysis with other teaching methods, making determining ITBISA's relative implementation hard. Moreover, the initial lack of participants' verification of digital information highlights a gap in critical digital literacy skills. Future studies should Future research should address these constraints by expanding participant diversity, conducting cross-context studies, and exploring ITBISA's adaptability to varied educational environments address. .

Author Contribution

All authors made an equal contribution to the development and planning of the study. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data is available upon request from the corresponding author.

REFERENCES

1. John, S. P. (**2015**). The integration of information technology in higher education: A study of faculty's attitude towards IT adoption in the teaching process. *Contaduria y Administracion, 60*(1), 230–252.
2. Cerny, M. (**2015**). The way to open education through the modern technology. *Procedia - Social and Behavioral Sciences, 174*(1), 3194–3198.
3. Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (**2022**). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers, 3*(1), 275–285.
4. Ramaila, S., & Molwele, A. J. (**2022**). The role of technology integration in the development of 21st century skills and competencies in life sciences teaching and learning. *International Journal of Higher Education, 11*(5), 9–17.

5.   Rintaningrum, R. (**2023**). Technology integration in English language teaching and learning: Benefits and challenges. *Cogent Education, 10*(1).

6.   Lavidas, K., Voulgari, I., Papadakis, S., Athanassopoulos, S., Anastasiou, A., Filippidi, A., Komis, V., & Karacapilidis, N. (**2024**). Determinants of Humanities and Social Sciences Students' Intentions to Use Artificial Intelligence Applications for Academic Purposes. *Information, 15*(6), 314.

7.   Fadhila, A., & Gustira, I. (**2021**). Trend on TEFL research: A study in the English education department of IAIN Bukittinggi in the period of 2015 to 2017. *Proceedings of the Eighth International Conference on English Language and Teaching (ICOELT-8 2020)*, 264–270.

8.   Zhang, X. (**2019**). Re-conceptualizing techno-linguistics: Using technology for English language teaching? *International Journal of Emerging Technologies in Learning, 14*(17), 162–166.

9.   Hajar, A. (**2022**). Integrated Skills Approach (ISA) in writing class: A case study of Business English Communication (BEC) students of Universitas Negeri Makassar. *International Journal of Humanities and Innovation (IJHI), 5*(4), 134–140.

10. Mantiri, O., Hibbert, G. K., & Jacobs, J. (**2019**). Digital literacy in ESL classroom. *Universal Journal of Educational Research, 7*(5), 1301–1305.

11. Tinmaz, H., Lee, Y. T., Fanea-Ivanovici, M., & Baber, H. (**2022**). A systematic review on digital literacy. *Smart Learning Environments, 9*(1), 1–18.

12. Kazemi, A., & Narafshan, M. H. (**2014**). Technology and English Language Teaching (ELT). *Advances in Language and Literary Studies, 5*(6), 60–67.

13. Greene, J. A., Copeland, D. Z., Deekens, V. M., & Yu, S. B. (**2018**). Beyond knowledge: Examining digital literacy's role in the acquisition of understanding in science. *Computers & Education, 117*, 141–159.

14. Pangrazio, L., Godhe, A.-L., & Ledesma, A. G. L. (**2020**). What is digital literacy? A comparative review of publications across three language contexts. *E-Learning and Digital Media, 17*(6), 442–459.

15. Chee, T. S., Divaharan, S., Tan, L., & Mun, C. H. (**2011**). *Self-directed learning with ICT: Theory, practice and assessment*. Ministry of Education, Singapore.

16. Wei, Z. (**2023**). Navigating digital learning landscapes: Unveiling the interplay between learning behaviours, digital literacy, and educational outcomes. *Journal of the Knowledge Economy*.

17. Son, J.-B., Park, S.-S., & Park, M. (**2017**). Digital literacy of language learners in two different contexts. *JALT CALL Journal, 13*(2), 77–96.

18. Razak, H. M., Razak, N. A., & Krish, P. (**2022**). Enhancing students' digital literacy at EFL classroom: Strategies of teachers and school administrators. *Cakrawala Pendidikan, 41*(3), 653–664.

19. Mudra, H. (**2020**). Digital literacy among young learners: How do EFL teachers and learners view its benefits and barriers? *Teaching English with Technology, 20*(3), 3–24.

20. Kurniawati, N., Mayuni, I., & Lustyantie, N. (**2024**). A case study of millennial English teachers' awareness of digital media in EFL classrooms. *Studies in Media and Communication, 12*(1), 286–297.

21. Alsmari, N. A. (**2021**). The relationship between language proficiency level and L2 digital literacy self-efficacy: A study of EFL university students. *International Journal of Arabic-English Studies, 21*(2), 183–198.

22. Argawati, N. O., & Suryani, L. (**2020**). Digital-based instruction: Chances and challenges in English language teaching context. *International Journal of Evaluation and Research in Education, 9*(4), 1138–1144.

23. Murtafi'ah, B., & Setyo Putro, N. H. P. (**2019**). Digital literacy in the English curriculum: Models of learning activities. *Acta Informatica Malaysia, 3*(2), 10–13.

24. Nafi, N. N., Fauziati, E., & Supriyadi, S. (**2022**). Exploring the digital literacy of Indonesian Generation Z teachers in English instruction. *International Journal of Multicultural and Multireligious Understanding, 9*(5), 217–225.

25. Santos, A. I., & Serpa, S. (**2017**). The importance of promoting digital literacy in higher education. *International Journal of Social Science Studies, 5*(6), 90–93.

26. Soifah, U., Jana, P., & Pratolo, B. W. (**2021**). Unlocking digital literacy practices of EFL teachers. *Journal of Physics: Conference Series, 1823*(1), 1–10.

27. Pardede, P. (**2020**). Integrating the 4Cs into EFL Integrated Skills Learning. *JET (Journal of English Teaching), 6*(1), 71–85.

28. Oxford, R. (**2001**). Integrated skills in the ESL/EFL classroom. *TESOL France, 8*(1), 5–12.

29. Cote, T., & Milliner, B. (**2018**). A survey of EFL teachers' digital literacy: A report from a Japanese university. *Teaching English with Technology, 18*(4), 71–89.

30. Creswell, J. W., & Creswell, J. D. (**2018**). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE.

31. Anggeraini, Y. (**2021**). Exploring the implementation of digital tools in online classrooms. *International Journal of Computer-Assisted Language Learning and Teaching, 1*(2), 246–249.

32. Hampel, R. (**2009**). Training teachers for the multimedia age: Developing teacher expertise to enhance online learner interaction and collaboration. *Innovation in Language Learning and Teaching, 3*(1), 35–50.

33. Hubbard, P. (**2008**). CALL and the future of language teacher education. *CALICO Journal, 25*(2), 175–188.

34. Nguyen, L. T., Kanjug, I., Lowatcharin, G., Manakul, T., Poonpon, K., Sarakorn, W., Somabut, A., Srisawasdi, N., Traiyarach, S., & Tuamsuk, K. (**2023**). Digital learning ecosystem for classroom teaching in Thailand high schools. *SAGE Open, 13*(1).

35. Pedro, L. F. M. G., Barbosa, C. M. M. de O., & Santos, C. M. das N. (**2018**). A critical review of mobile learning integration in formal educational contexts. *International Journal of Educational Technology in Higher Education, 15*(1).

36. Sung, Y.-T., Chang, K.-E., & Liu, T.-C. (**2016**). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education, 94*, 252–275.

37. Hennessy, S., D'Angelo, S., McIntyre, N., Koomar, S., Kreimeia, A., Cao, L., Brugha, M., & Zubairi, A. (**2022**). Technology Use for Teacher Professional Development in Low- and Middle-Income Countries: A systematic review. *Computers and Education Open, 3*, 100080.

38. Van Den Beemt, A., Thurlings, M., & Willems, M. (**2020**). Towards an understanding of social media use in the classroom: A literature review. *Technology, Pedagogy and Education, 29*(1), 35–55.

39. Kawinkoonlasate, P. (**2019**). Technology integration and English language instruction for education. *IJELTAL: Indonesian Journal of English Language Teaching and Applied Linguistics, 3*(2), 203–213.

40. Alieto, E., Abequibel-Encarnacion, B., Estigoy, E., Balasa, K., Eijansantos, A., & Torres-Toukoumidis, A. (**2024**). Teaching inside a digital classroom: A quantitative analysis of attitude, technological competence and access among teachers across subject disciplines. *Heliyon, 10*(2).

41. Lin, R., Yang, J., Jiang, F., & Li, J. (**2023**). Does teacher's data literacy and digital teaching competence influence empowering students in the classroom? Evidence from China. *Education and Information Technologies, 28*(3), 2845–2867.

42. Nuryadin, R., & Marlina. (**2023**). The use of AI (Artificial Intelligence) in education (literature review). *Indonesian Journal of Primary Education, 7*(2), 143–158.

43. Okagbue, E. F., Ezeachikulo, U. P., Akintunde, T. Y., Tsakuwa, M. B., Ilokanulo, S. N., Obiasoanya, K. M., Ilodibe, C. E., & Ouattara, C. A. T. (**2023**). A comprehensive overview of artificial intelligence and machine learning in education pedagogy: 21 Years (2000–2021) of research indexed in the Scopus database. *Social Sciences and Humanities Open, 8*(1).

44. Williyan, A., Fitriati, S. W., Pratama, H., & Sakhiyya, Z. (**2024**). AI as Co-Creator: Exploring Indonesian EFL teachers' collaboration with AI in content development. *Teaching English With Technology, 2024*(2).

45. McDiarmid, G. W., & Zhao, Y. (**2023**). Time to rethink: Educating for a technology-transformed world. *ECNU Review of Education, 6*(2), 189–214.

46. Renandya, W. A., Hamied, F. A., & Nurkamto, J. (**2018**). English language proficiency in Indonesia: Issues and prospects. *Journal of Asia TEFL, 15*(3), 618–629.

47. Alenezi, M., Wardat, S., & Akour, M. (**2023**). The need of integrating digital education in higher education: Challenges and opportunities. *Sustainability (Switzerland), 15*(6).

48. Mhlongo, S., Mbatha, K., Ramatsetse, B., & Dlamini, R. (**2023**). Challenges, opportunities, and prospects of adopting and using smart digital technologies in learning environments: An iterative review. *Heliyon, 9*(6).

49. Tajeddin, Z., & Watanabe, A. (**2022**). *Teacher reflection: Policies, practices and impacts*. Channel View Publications.

50. Mailizar, M., Umam, K., & Elisa, E. (**2022**). The impact of digital literacy and social presence on teachers' acceptance of online professional development. *Contemporary Educational Technology, 14*(4).

51. Wohlfart, O., & Wagner, I. (**2023**). Teachers' role in digitalizing education: An umbrella review. *Educational Technology Research and Development, 71*(2), 339–365.

52. Han, Y. (**2016**). Integrated application of evaluation of multimedia technology in English system research and application of Matlab. *RISTI, 17*(3), 168–179.

53. Yu, W. (**2023**). The application of multimedia information technology in the moral education teaching system of colleges and universities. *Wireless Communications and Mobile Computing, 2023*(1), 1–8.

54. Bobek, E., & Tversky, B. (**2016**). Creating visual explanations improves learning. *Cognitive Research: Principles and Implications, 1*(1).

55. Al-Alwani, A. (**2014**). Information technology integration in higher education: A novel approach for impact assessment. *International Journal of Emerging Technologies in Learning, 9*(6), 32–36.

56. Kamalov, F., Santandreu Calonge, D., & Gurrib, I. (**2023**). New era of artificial intelligence in education: Towards a sustainable multifaceted revolution. *Sustainability (Switzerland), 15*(16).

57. Major, L., Francis, G. A., & Tsapali, M. (**2021**). The effectiveness of technology-supported personalised learning in low- and middle-income countries: A meta-analysis. *British Journal of Educational Technology, 52*(5), 1935–1964.

58. Contrino, M. F., Reyes-Millán, M., Vázquez-Villegas, P., & Membrillo-Hernández, J. (**2024**). Using an adaptive learning tool to improve student performance and satisfaction in online and face-to-face education for a more personalized approach. *Smart Learning Environments, 11*(1).

59. Montenegro-Rueda, M., Fernández-Cerero, J., Fernández-Batanero, J. M., & López-Meneses, E. (**2023**). Impact of the implementation of ChatGPT in education: A systematic review. *Computers, 12*(8).

60. Zamiri, M., & Esmaeili, A. (**2024**). Methods and technologies for supporting knowledge sharing within learning communities: A systematic literature review. *Administrative Sciences, 14*(1).

61. Gopinathan, S., Kaur, A. H., Veeraya, S., & Raman, M. (**2022**). The role of digital collaboration in student engagement towards enhancing student participation during COVID-19. *Sustainability (Switzerland), 14*(11).