

Technology-Based English Language Learning in Improving EFL Learners' Digital Literacy and Reading Comprehension

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Abstract

This study investigated how technology-based English language learning supports the development of digital literacy and reading comprehension among EFL learners and identified the pedagogical factors that influence its effectiveness. The study employed a qualitative research design to capture learners' experiences and classroom practices in depth. Participants were 37 EFL learners from private schools in Thailand who were accustomed to online learning classrooms and digital reading activities. The data were collected through semi-structured interviews and classroom observation, then analyzed using data condensation, data display, and conclusion drawing or verification. The findings revealed that technology-based English learning strengthened learners' digital literacy by increasing their ability to navigate online platforms, access digital resources, and use tools such as links, dictionaries, and interactive features for academic purposes. It also supported reading comprehension by making texts more accessible, interactive, and multimodal through highlighting, translation aids, audio support, and opportunities for rereading. In addition, the findings showed that technology encouraged learner autonomy, as students became more independent in solving comprehension difficulties and managing their own reading processes. However, the study also found that these benefits were shaped by pedagogical conditions. Teacher scaffolding, purposeful task design, learner readiness, interaction and feedback, and classroom management determined whether technology functioned as a meaningful learning support or merely as a delivery tool. The study concludes that technology can enhance EFL learners' digital literacy and reading comprehension when it is integrated with clear instructional goals and guided pedagogical support. These findings imply that effective technology integration in EFL classrooms should prioritize both literacy development and pedagogically structured learning experiences.

Keywords: English learning; Technology-based English learning; Digital literacy; Reading comprehension

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INTRODUCTION

Technology-based English language learning has become a defining feature of contemporary education because it reshapes how learners access language input, interact with texts, and participate in communicative practice. In EFL contexts, where opportunities for authentic exposure may be limited outside the classroom, digital tools such as learning management systems, mobile applications, e books, online articles, AI-supported platforms, and collaborative learning environments offer new pathways for language development. These technologies make English learning more flexible, personalized, and connected to students'

real communicative needs, while also expanding access to authentic materials and immediate feedback (Hu, 2025; Kundu & Bej, 2025; Hazaymeh et al., 2024; Sabandal & Azarias, 2024). Yet the pedagogical value of technology does not lie in the tools themselves. Its effectiveness depends on how technology is integrated into instructional design, how teachers scaffold learners' engagement, and how digital activities are aligned with meaningful language outcomes. Without such pedagogical direction, technology may encourage fragmented attention, passive consumption, or superficial interaction with content rather than genuine language learning (Hazaymeh et al., 2024; Hu, 2025; Kundu & Bej, 2025).

This issue is especially important in English language teaching because digital environments increasingly require learners not only to acquire linguistic knowledge but also to function effectively in information rich, multimodal, and technologically mediated contexts. Recent scholarship shows that technology enhanced English learning can foster learner autonomy, self regulation, and motivation when digital resources are paired with clear goals, feedback, and autonomy supportive practices (Guang-hui, 2025; Wang et al., 2024; Yi & Chen, 2025; Luo & Gan, 2022). AI enabled systems, adaptive platforms, and flipped learning models, for instance, can support individualized pacing, diagnostic feedback, and learner control over content and practice, all of which strengthen engagement in EFL settings (Kundu & Bej, 2025; Yang et al., 2025; Yi & Chen, 2025). However, these benefits are mediated by teacher readiness, infrastructure, and learners' own capacity to navigate digital environments productively (Han & Hamzah, 2024; Hazaymeh et al., 2024; Zhao & Abidin, 2024). Therefore, the current research landscape suggests that technology based English learning should be understood not merely as digital delivery of language content, but as a broader pedagogical ecosystem in which language proficiency, learning agency, and digital competence are mutually reinforcing.

Within this ecosystem, digital literacy has emerged as a central competence. Digital literacy is more than technical ability; it involves locating information, evaluating sources, interpreting multimodal texts, communicating appropriately in digital spaces, and using digital tools critically and ethically for learning purposes (Diab, 2022; Hamidah, 2021; Rinekso et al., 2021; Wu & Zhang, 2024). In EFL education, this competence is crucial because learners increasingly encounter English through online modules, websites, discussion boards, digital assignments, social media, and AI assisted applications. If learners lack digital literacy, they may struggle to identify credible sources, navigate hyperlinked texts, or use digital tools strategically for academic purposes. Studies have shown that explicit digital literacy support can improve students' participation in technology rich language environments and strengthen engagement with online learning tasks (Al-Maashani & Mudhsh, 2023; Ismail, 2023; Jiang et al., 2022; Vega et al., 2023). Thus, digital literacy should not be treated as a peripheral skill in EFL instruction. Rather, it is a necessary condition for ensuring that technology serves language learning in intellectually meaningful ways.

At the same time, reading comprehension remains a foundational dimension of successful English learning in digital contexts. Much of the linguistic input in technology mediated instruction is delivered through written texts, including digital readings, online discussions, multimedia resources, and task instructions. As a result, learners need strong reading comprehension to identify main ideas, make inferences, interpret vocabulary in context, and respond critically to information presented on screen (Aprianto, 2020; Hamidah, 2021; Murphy & Arciuli, 2024; Soomro et al., 2024). Digital reading, however, differs from conventional print reading because it often involves hyperlinks, audio, visuals, annotations, and interactive features that demand additional strategic processing. Lim and Toh (2020) and Coiro (2020) emphasize that digital reading requires learners to engage with multiple semiotic resources and to move flexibly between deep reading, navigation, and source evaluation. This means that technology can strengthen reading comprehension when it supports guided meaning

making, but it can also hinder comprehension when excessive interactivity increases distraction or cognitive load (Krenca et al., 2024; Öztürk, 2021; Yang et al., 2024). The implication is clear: technology based English learning must be designed not only to deliver content attractively, but also to cultivate the strategic reading practices necessary for understanding digital texts.

The relationship among technology based English learning, digital literacy, and reading comprehension therefore deserves closer scholarly attention because these constructs are deeply interconnected in EFL classrooms. Existing studies have shown that multimedia texts, e books, web based platforms, and internet supported reading environments can enhance comprehension, vocabulary growth, motivation, and learner engagement when implemented with coherent instructional design (Rezaee et al., 2020; Kanellopoulou & Giannakouloupoulos, 2021; Mellisa & Saputri, 2023; Yang et al., 2024). Other studies further suggest that digital literacy enables learners to navigate these environments successfully, while reading comprehension determines how effectively learners process and respond to the textual input that technology provides (Al-Maashani & Mudhsh, 2023; Hamidah, 2021; Mohammed & Ali, 2023; Murphy & Arciuli, 2024). Despite these insights, the literature often examines technology integration, digital literacy, and reading comprehension as parallel rather than fully integrated concerns. Some studies emphasize technological affordances, others focus on motivational outcomes, and still others examine reading performance in isolation. This fragmentation leaves an important gap in understanding how technology based English instruction can simultaneously cultivate digital literacy and reading comprehension as interdependent competencies that support EFL learning more broadly.

For this reason, the present study focuses specifically on the role of technology based English language learning in fostering digital literacy and reading comprehension among EFL learners. The study is important because it addresses a practical and theoretical need in contemporary language education. Practically, teachers and institutions are increasingly expected to integrate technology into instruction, yet they require stronger evidence about which dimensions of learning should be prioritized and how technology can be used beyond surface level engagement. Theoretically, the study responds to calls for more integrated perspectives that connect digital competence, literacy practices, and language development in technology rich environments (Al-Maashani & Mudhsh, 2023; Jiang et al., 2022; Vega et al., 2023; Zhang & Liu, 2025). By examining these dimensions together, the study aims to contribute to a more coherent understanding of how technology can support EFL learners not only as language users but also as critical readers and competent digital participants.

Accordingly, the objectives of this research are to examine how technology based English language learning contributes to the development of digital literacy and reading comprehension among EFL learners, and to identify the pedagogical conditions that make such technology use effective and meaningful. The novelty of the study lies in its integrated analytical focus. Rather than treating technology, digital literacy, and reading comprehension as separate variables, this study positions them as interconnected dimensions of EFL learning and frames technology not as an end in itself but as a pedagogical medium whose value depends on literacy development, strategic reading, and instructional design. In this way, the study offers a more comprehensive perspective on technology enhanced English learning and addresses a gap in the literature by linking digital literacy and reading comprehension within a unified EFL framework.

Based on these objectives, the study is guided by the following research questions: How does technology based English language learning support the development of digital literacy and reading comprehension among EFL learners? And what pedagogical factors influence the effectiveness of technology based English language learning in enhancing EFL learners' digital literacy and reading comprehension?

RESEARCH METHOD

Research Design

This study employed a qualitative research design to explore how technology-based English language learning supports the development of digital literacy and reading comprehension among EFL learners. A qualitative approach was considered the most appropriate because the study sought to understand participants' experiences, perceptions, and learning practices in depth rather than to measure variables statistically. Since the research questions focus on how learners engage with online English learning environments and how pedagogical factors shape that experience, qualitative inquiry allows the researcher to capture rich descriptions of classroom realities, learner responses, and the meanings participants assign to their learning experiences.

The choice of a qualitative design was also suitable because the study addressed a context-sensitive educational issue. Technology use in EFL classrooms is shaped by interaction, teacher scaffolding, learner readiness, and the specific reading tasks used in online settings. These dimensions cannot be fully understood through numerical data alone. By using qualitative methods, the researcher was able to investigate how learners experienced online reading activities, how they navigated digital tools, and how they perceived the relationship between technology use, digital literacy, and reading comprehension. In this way, the design supported a deeper interpretation of the processes behind learning rather than only its outcomes.

Nevertheless, qualitative research has several limitations and potential biases. First, the findings may not be statistically generalizable because they are based on a relatively small and context-bound group of participants. Second, researcher subjectivity may influence data interpretation, particularly during coding and thematic analysis. Third, participants may provide socially desirable answers during interviews, especially when discussing their use of online learning tools. To address these issues, several strategies were applied. The researcher used interview and observation triangulation to compare what participants said with what they actually did in learning activities. Member checking was also conducted by returning summaries of the interpreted data to participants to confirm accuracy. In addition, an audit trail was maintained throughout the research process to document data collection procedures, coding decisions, and analytic reflections. These steps helped improve the trustworthiness, credibility, and dependability of the study.

Research Participants

The participants in this study were 37 EFL learners from private schools in Thailand who were accustomed to participating in online learning classrooms and reading activities. These learners were selected because they had direct experience with the phenomenon under investigation, namely the use of digital technology in English learning and reading-related tasks. Their familiarity with online classroom platforms and digital reading activities enabled them to provide relevant and information-rich responses to the research questions.

The participants were selected through purposive sampling. This sampling technique was chosen because the study required participants who met specific criteria related to the objectives of the research. The inclusion criteria were as follows: the participants had to be enrolled as EFL learners in private schools in Thailand, actively participate in online English learning activities, and engage in reading tasks through digital platforms. Learners who had limited exposure to online English classes or who did not regularly take part in reading activities were not included because they would not provide sufficient insight into the focus of the study.

In terms of participant profile, the study recorded relevant demographic information to support contextual interpretation of the findings. This information included school setting, grade level, gender, length of English study, and prior experience with online learning

activities. These demographic details were not treated as variables for comparison, but as background information to help explain the learning context and to enrich the interpretation of participants' experiences. By selecting participants who were directly involved in online English learning, the study ensured that the data were closely aligned with the research focus.

Research Instruments

The primary instruments used in this study were semi-structured interviews and classroom observation. These two instruments were selected because they complemented each other in capturing both participants' perspectives and their actual learning behavior in online English learning contexts. The interview was used to explore learners' views, feelings, and experiences regarding the use of technology for English learning, particularly in relation to digital literacy and reading comprehension. Observation, on the other hand, was used to document how learners interacted with online platforms, responded to reading tasks, and demonstrated digital literacy practices in authentic classroom situations.

The semi-structured interview guide was developed based on the research objectives and the main themes identified in the literature, including technology-based English learning, digital literacy, online reading practices, learner engagement, and teacher support. The guide consisted of open-ended questions that allowed participants to explain their experiences freely while still keeping the discussion focused on the study objectives. Follow-up questions were included to probe more deeply into participants' answers and to clarify emerging issues. This format allowed flexibility while ensuring that all major themes were covered consistently across participants.

The observation instrument was developed in the form of an observation sheet and field note protocol. The observation focused on several aspects, including learners' participation in online classroom activities, their ability to navigate digital tools, their engagement with reading tasks, their use of reading strategies in digital environments, and the forms of teacher scaffolding provided during online instruction. The researcher recorded both descriptive notes and reflective notes in order to capture events, interactions, and preliminary interpretations during the observation process.

To ensure validity and reliability, several procedures were undertaken. First, the interview guide and observation sheet were reviewed by experts in EFL education and qualitative research to ensure content relevance and clarity. Their feedback was used to revise ambiguous wording and strengthen alignment with the research questions. Second, the instruments were piloted with a small group of learners who had similar characteristics to the target participants but were not included in the final sample. The pilot process helped identify unclear questions, improve sequencing, and refine the observation categories. Third, trustworthiness was strengthened through triangulation between interview and observation data. Consistency in data collection was also maintained by using the same interview guide structure and the same observation focus across settings. In addition, interviews were audio-recorded and transcribed verbatim to preserve the accuracy of participants' responses.

Data Analysis

The data in this study were analyzed using the qualitative procedures of data condensation, data display, and conclusion drawing or verification. After the interviews were transcribed and the observation notes were compiled, the researcher began with data condensation. At this stage, the raw data were selected, focused, simplified, and organized in relation to the research objectives. Irrelevant statements were removed, while meaningful units related to technology use, digital literacy practices, reading comprehension experiences, learner challenges, and teacher support were identified and coded. Similar codes were then grouped into broader categories and emerging themes. The second stage was data display. In this phase, the condensed data were organized into visual and textual forms that made

interpretation easier. The researcher used matrices, thematic tables, and narrative summaries to compare responses across participants and to identify recurring patterns. Interview excerpts and observation evidence were placed side by side to reveal points of convergence and divergence. This stage helped the researcher see how learners' reported experiences corresponded with their observed classroom behavior and how different themes were connected.

The final stage involved drawing conclusions and verifying the findings. The researcher interpreted the displayed data to generate broader meanings about how technology-based English learning influenced learners' digital literacy and reading comprehension. These conclusions were not drawn at once, but developed gradually through repeated reading, comparison, and reflection. Verification was conducted by revisiting the original data, checking the consistency of themes, and confirming interpretations through member checking and peer discussion. Through this process, the analysis moved from descriptive accounts to more analytical explanations, allowing the study to produce credible and meaningful findings grounded in participants' experiences.

RESEARCH FINDINGS AND DISCUSSION

Research Findings

How does technology based English language learning support the development of digital literacy and reading comprehension among EFL learners?

The interview and observation data showed that technology based English language learning supported the development of students' digital literacy by placing them in regular contact with online platforms, digital reading materials, and interactive learning tools. The participants became more familiar with navigating learning management systems, opening digital assignments, accessing reading passages, using search features, and responding to tasks through online platforms. In the classroom observations, learners were seen moving between online texts, teacher instructions, discussion boards, and digital dictionaries with increasing confidence. This suggests that digital literacy developed not only as a technical skill, but also as a functional academic practice. The learners gradually learned how to locate information, manage online reading tasks, and use digital tools as part of their English learning routines.

Another important finding was that technology supported reading comprehension by making texts more accessible and interactive. Many learners reported that they understood reading passages more easily when they could use built in features such as highlighting, translation tools, online dictionaries, audio support, and teacher shared links. These digital supports appeared to reduce learners' anxiety when facing unfamiliar vocabulary and helped them focus on the main ideas of the text. Observation data also showed that learners were more willing to revisit difficult passages when the material was presented online, especially when the teacher combined reading tasks with guiding questions, vocabulary previews, or follow up discussions. In this sense, technology functioned as a scaffold that supported meaning making and encouraged students to engage more actively with English texts.

The findings also indicated that technology based English learning improved learners' ability to deal with multimodal texts. Through online reading activities, students were not only exposed to written passages but also to visual cues, hyperlinks, audio explanations, and digital annotations. As a result, they developed a broader form of reading practice that involved interpreting information from different modes at the same time. Interview responses suggested that this multimodal exposure helped learners connect ideas more easily, especially when visual support clarified the content of the reading. This means that technology contributed to reading comprehension not only through text delivery, but also through the integration of supportive digital features that enriched understanding.

A further theme that emerged was learner autonomy. Technology based instruction encouraged learners to take greater responsibility for their reading and learning processes.

Several participants explained that online learning made them more independent because they could reread texts, search for word meanings, check supporting resources, and complete reading tasks at their own pace. This autonomy was also visible during classroom observations, where some learners independently used digital tools to solve comprehension difficulties before asking the teacher for help. Such behavior suggests that technology can strengthen self-directed learning habits, which are closely related to both digital literacy and reading development. Learners were not merely receiving information; they were actively making choices about how to access, interpret, and respond to English texts in digital environments.

At the same time, the data suggested that the development of digital literacy and reading comprehension through technology was not automatic. Learners benefited most when they were guided in how to use digital tools for academic purposes. Without clear instruction, some students tended to rely too heavily on automatic translation or became distracted by non-academic features of the digital environment. Therefore, the findings indicate that technology supported learners' development most effectively when it was paired with structured reading tasks, teacher guidance, and opportunities for reflection. Overall, the qualitative evidence suggests that technology-based English language learning supported EFL learners by increasing digital familiarity, strengthening reading engagement, encouraging independent learning, and helping learners process English texts through multimodal and interactive supports.

What pedagogical factors influence the effectiveness of technology-based English language learning in enhancing EFL learners' digital literacy and reading comprehension?

The findings revealed that teacher scaffolding was one of the most important pedagogical factors influencing the effectiveness of technology-based English learning. Interview data showed that learners understood online reading tasks more successfully when teachers provided step-by-step instructions, explained how to use digital tools, and gave examples of how to approach difficult texts. Observation data confirmed that students were more focused and responsive when teachers introduced the purpose of the task clearly, modeled reading strategies, and directed learners to specific digital features such as dictionaries, comment tools, or text markers. This indicates that technology alone did not produce meaningful learning. Instead, its impact depended heavily on the teacher's ability to guide learners in using digital resources strategically.

Task design was another influential factor. The study found that technology was most effective when online reading activities were purposeful, interactive, and connected to learners' language level. Participants responded positively to tasks that required them to identify main ideas, answer guiding questions, discuss meaning with peers, and reflect on their understanding after reading. In contrast, when reading tasks were too long, insufficiently structured, or disconnected from classroom discussion, learners became less engaged. This suggests that effective technology-based English learning requires carefully designed activities that balance challenge and support. Reading tasks need to move beyond simple text exposure and should instead guide learners to interact with content critically and meaningfully.

Learner readiness also emerged as an important pedagogical consideration. The participants had experience with online learning, but their ability to use digital tools and engage with English texts varied. Some learners adapted quickly to online reading environments, while others needed more support in navigating platforms, evaluating information, and maintaining concentration. Interviews revealed that students who were more confident with digital tools tended to participate more actively in reading tasks and showed greater independence in solving comprehension problems. This means that the effectiveness of technology-based learning depends partly on learners' prior familiarity with digital environments and their willingness to use technology as a learning resource. Teachers therefore need to consider students' digital readiness and provide gradual support when introducing more complex online tasks.

Interaction and feedback were also found to play a crucial role. The observation data suggested that students benefited most when online reading was combined with teacher feedback, peer discussion, and collaborative interpretation of texts. Learners often developed better understanding after discussing difficult passages with classmates or receiving clarification from the teacher during or after the activity. Interview data further showed that feedback helped learners feel more confident about their answers and encouraged them to reread the text more carefully. This implies that the pedagogical power of technology lies not only in delivering materials, but also in creating a responsive learning environment where interaction deepens comprehension and digital engagement.

Finally, the data indicated that classroom management and focus were essential for successful technology integration. Although digital tools provided many learning opportunities, they also created the possibility of distraction. Some participants admitted that reading on digital devices could reduce their concentration, especially when there were multiple tabs, notifications, or unrelated applications. This challenge was less visible when teachers maintained clear routines, monitored participation, and kept activities focused on specific learning goals. Therefore, the effectiveness of technology based English learning depends not only on access to digital tools but also on pedagogical discipline, structured guidance, and consistent monitoring. Taken together, the findings suggest that the key pedagogical factors include teacher scaffolding, purposeful task design, learner readiness, interactive feedback, and effective management of digital learning spaces.

Table 1. Technology-Based English Language Learning

Research Question	Major Theme	Evidence from Interviews and Observations	Interpretation
RQ1: How does technology based English language learning support digital literacy and reading comprehension?	Development of digital navigation skills	Learners used platforms, links, online dictionaries, and digital classroom tools more confidently over time	Technology helped learners develop practical digital literacy in academic contexts
RQ1	Improved access to reading support	Learners relied on highlighting, translation tools, audio support, and rereading options	Digital tools scaffolded comprehension and reduced difficulty with unfamiliar texts
RQ1	Multimodal meaning making	Learners interpreted text together with visuals, audio, and hyperlinks	Technology enriched reading comprehension by supporting multiple modes of understanding
RQ1	Greater learner autonomy	Learners reread texts, searched meanings independently, and completed tasks at their own pace	Technology encouraged self directed learning and active problem solving
RQ1	Conditional effectiveness	Some learners became distracted or overused translation tools without teacher support	Technology supported learning best when guided by clear instruction
RQ2: What pedagogical factors influence effectiveness?	Teacher scaffolding	Teachers modeled strategies, explained tool use, and guided task procedures	Teacher support made technology use more meaningful and academically focused

Research Question	Major Theme	Evidence from Interviews and Observations	Interpretation
RQ2	Purposeful task design	Learners responded better to structured reading tasks with guiding questions and follow up discussion	The quality of the task shaped the value of the technology
RQ2	Learner readiness	Students with stronger digital confidence engaged more independently in online reading	Digital literacy readiness influenced learning participation and outcomes
RQ2	Interaction and feedback	Peer discussion and teacher feedback helped students clarify text meaning	Comprehension improved when technology was paired with social and instructional support
RQ2	Classroom focus and monitoring	Distraction was lower when teachers maintained clear routines and monitored participation	Effective classroom management strengthened the impact of digital learning

Table 1 indicates that technology based English language learning supported EFL learners by strengthening their digital literacy practices, facilitating reading comprehension through multimodal and interactive support, and encouraging greater learner autonomy. However, the findings also show that these benefits were shaped by pedagogical conditions. Teacher guidance, thoughtful task design, learner readiness, feedback, and classroom management determined whether technology functioned as a meaningful learning support or merely as a delivery tool. Thus, the effectiveness of technology in EFL classrooms lies not simply in digital access, but in how instruction transforms that access into purposeful literacy development.

Discussion

The findings of this study show that technology-based English language learning supports EFL learners' digital literacy and reading comprehension by creating sustained opportunities to interact with online platforms, multimodal texts, and scaffolded digital resources. This result confirms earlier scholarship arguing that technology in EFL should not be understood merely as a delivery mechanism, but as a pedagogical environment in which language development, learner agency, and digital competence are intertwined (Al-Maashani & Mudhsh, 2023; Kundu & Bej, 2025; Vega et al., 2023). In the present study, learners became more confident in navigating learning management systems, digital assignments, links, and online dictionaries, suggesting that digital literacy developed through repeated academic use rather than through isolated technical training. This finding is consistent with Rinekso et al. (2021), who found that digital literacy in EFL contexts emerges through situated educational practices, and with Diab (2022), who emphasizes that digital literacy includes not only operating tools but also using them strategically for learning. The present findings extend this line of research by showing that, in a qualitative classroom context, digital literacy was visibly embedded in learners' reading routines. In other words, the study demonstrates that digital literacy can be cultivated through ordinary classroom practices when technology is integrated with meaningful English tasks rather than treated as a separate instructional target.

The study also found that technology supported reading comprehension by making texts more accessible, interactive, and revisitable. Learners reported benefits from highlighting, dictionaries, translation tools, audio support, and teacher-provided links, while observations showed that students were more willing to return to difficult passages in digital environments when guided by questions and vocabulary previews. This finding aligns with Rezaee et al. (2020), who reported that multimedia-based reading environments can strengthen receptive skills and motivation, and with Kanellopoulou and Giannakouloupoulos (2021), who argue that internet-assisted language learning supports reading development through dynamic and annotation-rich resources. It also resonates with Yang et al. (2024), whose study of e-book narration and mediated support suggests that digital features can improve comprehension when they help learners process meaning more effectively. However, the present study adds a more process-oriented perspective by showing that comprehension gains were tied not only to technological features themselves but also to how learners used those features while working through real reading tasks. This suggests that the value of technology lies less in novelty and more in its capacity to reduce barriers to comprehension, particularly for learners dealing with unfamiliar vocabulary and dense English texts.

Another significant finding concerns multimodal meaning making. Participants were exposed not only to written text but also to visuals, audio, hyperlinks, and annotations, and this appeared to broaden their reading practices. This supports Lim and Toh's (2020) argument that digital reading requires learners to interpret multiple semiotic resources, and it is also consistent with Coiro's (2020) view that digital reading is shaped by text features, reader behaviors, and social context. The present study confirms that multimodal texts can enrich comprehension by helping learners connect ideas through several channels at once. At the same time, the findings contribute to existing literature by illustrating how multimodality works in actual EFL classrooms rather than in experimental or purely theoretical settings. Rather than treating multimodality as a general feature of digital texts, this study shows how learners experienced it as a practical aid to understanding. This finding is also in line with work on multimedia and interactive e-books, which suggests that well-designed digital features can strengthen comprehension and engagement (Çırakoğlu et al., 2022; Mellisa & Saputri, 2023). Thus, the current study extends prior research by highlighting multimodal support as part of an integrated literacy ecology in which students read, interpret, and learn through multiple digital modes simultaneously.

The emergence of learner autonomy as a central theme also confirms and deepens prior findings on technology-enhanced EFL learning. Learners in this study described rereading texts independently, searching for meanings, consulting additional resources, and completing tasks at their own pace. Observation data similarly showed students attempting to resolve comprehension difficulties before turning to the teacher. These patterns support research showing that technology-enhanced learning can promote self-regulation, autonomy, and learner ownership when students are given meaningful digital choices and supportive learning conditions (Guang-hui, 2025; Luo & Gan, 2022; Wang, 2023; Yi & Chen, 2025). The findings are particularly consistent with Kundu and Bej (2025), who emphasize that AI and digital innovation can empower autonomy in EFL learning when learners are able to control pacing and access adaptive support. Yet the current study also refines this argument by showing that autonomy was not a simple consequence of digital access. Rather, autonomy emerged from repeated engagement with reading tasks in which learners were expected to act, interpret, and decide. This is important because it suggests that technology supports autonomy not automatically, but through pedagogical structures that invite responsibility. In this sense, the study supports self-determination-oriented research while also showing that autonomy in EFL reading is enacted through micro-level classroom practices.

At the same time, the findings complicate overly optimistic accounts of educational technology by showing that its effectiveness is conditional. Learners benefited most when they were guided in how to use digital tools for academic purposes; without such guidance, some overrelied on translation tools or were distracted by non-academic digital features. This confirms previous studies warning that digital texts and interactive features can hinder comprehension when they are poorly integrated or cognitively overwhelming (Krenca et al., 2024; Öztürk, 2021; Yang et al., 2024). The present findings therefore support the view that technology is not inherently transformative. Instead, its educational value depends on coherence, guidance, and design. This is an important contribution because it positions the study between two extremes in the literature: one that celebrates technology as inherently engaging and another that questions its instructional usefulness. The findings suggest that both views are incomplete. Technology can indeed support literacy and comprehension, but only when teachers shape it into a disciplined and purposeful learning environment.

This leads directly to the second research question regarding pedagogical factors. Teacher scaffolding emerged as one of the strongest influences on effectiveness, with learners responding more positively when teachers clarified task purposes, modeled reading strategies, and explained how to use digital tools. This strongly confirms prior research showing that teacher support remains central even in technologically advanced classrooms (Jeon & Lee, 2023; Wang et al., 2024; Yi & Chen, 2025). The result is also consistent with Hazaymeh et al. (2024), who note that the usefulness of AI and digital applications is shaped by instructors' pedagogical competence, and with Guang-hui (2025), whose study indicates that relational and motivational supports influence engagement in AI-assisted English classrooms. The present study extends this literature by providing qualitative evidence that scaffolding operates at the task level: teachers do not simply motivate learners, they direct attention, regulate tool use, and help students transform digital affordances into comprehension strategies. This reinforces the claim that human mediation remains indispensable in technology-based learning.

Task design, learner readiness, interaction, and classroom management were also found to be decisive. Purposeful and level-appropriate tasks promoted stronger engagement, while feedback and peer discussion helped learners clarify meaning and revisit texts more thoughtfully. These findings are closely aligned with research on flipped and collaborative learning, which emphasizes that technology becomes effective when paired with structured tasks, meaningful feedback, and social interaction (Han & Hamzah, 2024; Muhlisoh et al., 2020; Wang, 2023; Zhao & Abidin, 2024). They also echo Muslem et al. (2024), who found that platform features are most useful when embedded in communicative and feedback-rich learning activities. The role of learner readiness further supports literature arguing that digital competence and self-efficacy mediate the success of technology-enhanced language learning (Ivanytska et al., 2021; Luo & Gan, 2022; Vega et al., 2023). What this study adds is a more integrated explanation: pedagogical success in technology-based EFL learning depends on the interaction of teacher support, task quality, learner preparedness, and classroom regulation. Rather than treating these variables separately, the study demonstrates that they operate as a connected system. This integrated view represents one of the study's most important contributions to the literature, because it shows that improvements in digital literacy and reading comprehension are best understood as outcomes of pedagogically orchestrated digital learning rather than of technology use alone.

CONCLUSIONS

This study concludes that technology-based English language learning can make a substantial contribution to the development of EFL learners' digital literacy and reading comprehension when it is embedded in purposeful instructional practice. The qualitative findings indicate that regular engagement with online platforms, digital reading materials, and multimodal resources helped learners become more confident in navigating digital tools,

locating information, and responding to academic tasks in English. At the same time, technology supported reading comprehension by making texts more accessible through features such as dictionaries, highlighting, audio support, and rereading opportunities. These affordances enabled learners to interact with texts more actively and to process meaning through multiple modes rather than through linear reading alone. The study therefore confirms that digital literacy and reading comprehension are not separate outcomes of technology use, but interconnected dimensions of EFL learning that can develop together when digital tools are aligned with reading activities and literacy goals.

The study also concludes that the effectiveness of technology-based English learning is shaped decisively by pedagogical conditions. Teacher scaffolding, purposeful task design, learner readiness, interaction and feedback, and classroom management were found to determine whether technology functioned as a meaningful literacy support or merely as a delivery medium. This means that successful technology integration in EFL settings depends less on the presence of digital tools than on how teachers organize, mediate, and sustain learning with those tools. In this regard, the study extends previous research by showing that the benefits of technology emerge most clearly when digital literacy development, reading comprehension, and pedagogy are treated as a unified framework. For EFL teachers and institutions, the implication is that technology should be implemented not simply to modernize instruction, but to cultivate strategic reading, critical digital participation, and learner autonomy in coherent and well-supported classroom environments.

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DECLARATION OF USING AI TOOLS

AI tools were used in a limited and supportive manner during the writing process to assist with language refinement, organization of ideas, and improvement of academic expression. All arguments, interpretations, data analysis, and final decisions regarding the content of the manuscript were conducted and verified by the authors.

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