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Technology Integration for Promoting Deep Learning in EFL Contexts

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Abstract

Background
This study explored how an EFL lecturer understands deep learning as a pedagogical approach, how digital and AI-supported tools are integrated into EFL speaking instruction, and what challenges emerge when these tools are used in a classroom located in the Indonesia-Malaysia border area.

Methodology
This study employed an interpretive qualitative case-study design at the English Education Department of Universitas Borneo Tarakan, North Kalimantan, Indonesia. The participant was one purposively selected EFL lecturer who taught a speaking class and had already used digital and AI-supported applications in classroom practice. Data were collected through a semi-structured interview, four classroom observations, field notes, and video recordings of classroom activities.

Findings
The findings suggested that technology-supported activities appeared to create classroom conditions associated with deep learning. Students participated in group discussions, short writing activities, spontaneous speaking, oral presentations, and communicative tasks related to familiar contexts such as tourism, travel, hotel booking, and personal experiences. The lecturer used digital and AI-supported tools, including Duolingo, Elsa Speak, Cake, Busuu, Blooket, speech-to-text tools, QuillBot, and Grammarly, to support vocabulary learning, pronunciation practice, speaking rehearsal, gamified review, language feedback, revision, and learner engagement. These tools extended classroom practice and made learning more meaningful and enjoyable. However, the findings also indicated that technology did not automatically create deep learning. Its value depended on the lecturer's pedagogical guidance and on how the tools were connected to speaking tasks, reflection, and communicative purposes.

Conclusion
In this observed case, technology integration appeared to support active participation, contextualized language use, learner autonomy, reflection, and positive engagement in an EFL speaking classroom. At the same time, some students tended to rely too quickly on AI tools for ready-made answers, highlighting the need for teacher mediation, digital literacy, and ethical awareness. Technology can enrich EFL learning when it is used with a clear pedagogical purpose, but it should not replace students' own thinking or the teacher's instructional role.

Originality
This study provided context-specific evidence from a higher-education EFL classroom in the Indonesia-Malaysia border area. It demonstrated how one lecturer interpreted and enacted technology integration to support learning conditions associated with deep learning in speaking instruction.

Keywords	:	deep learning approach; technology integration; EFL speaking; artificial intelligence in education; border area education
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1. INTRODUCTION

In recent years, efforts to improve educational quality in Indonesia have brought greater attention to deep learning. In educational practice, deep learning does not simply mean remembering information or completing classroom tasks. It refers to learning that helps students understand concepts, connect ideas, reflect on their learning, and apply knowledge in meaningful contexts. Unlike surface learning, which often emphasizes short-term memorization, deep learning requires students to engage more actively and thoughtfully with what they learn. Alsayed et al., (2021) explain that deeper approaches to learning are related to students' ability to make sense of knowledge and use it in broader academic and practical situations.

Deep learning is shaped by the quality of classroom experiences. Learning models such as community-based learning, case-based learning, and authentic practice may create opportunities for meaningful engagement. However, students do not always approach learning in the same way. Therefore, curriculum design, teaching strategy, classroom interaction, and teacher guidance remain important in supporting deeper learning orientations (Walankar et al., 2019). Gurav et al., (2020) emphasize that students are more likely to engage deeply when learning is relevant to their goals, while Tamire et al., (2022) found that deeper learning approaches are related to active participation, self-regulation, and academic success. These studies suggest that deep learning does not occur automatically. It requires learning environments that encourage participation, reflection, and purposeful effort (Öhrstedt & Lindfors, 2015). Technology and innovative teaching practices may help create such conditions when they are used carefully and pedagogically (Wang et al., 2024).

Discussions of deep learning are increasingly connected with educational technology. Digital tools are now widely used in teaching and learning, including in EFL classrooms. Wu & Pan, (2024) argue that emerging technologies can support personalized and adaptive learning environments. Weng & Wang, (2024) and Xu & Wong, (2024) also note that students' interaction with digital materials can support more effective learning pathways. In online and networked learning, technology may support communication, access to resources, flexibility, and instructional support (Guo et al., 2024; Weng & Wang, 2024; Zhang & Cao, 2021).

However, technology use does not automatically lead to deep learning. Digital tools may support engagement, practice, feedback, and learner autonomy, but they may also result in superficial participation when they are used without clear pedagogical direction. This issue is important in EFL classrooms, where technology is often expected to make learning more interactive and communicative. In practice, its value depends on how teachers understand its pedagogical function, select tools for specific purposes, and connect those tools with students' communicative needs.

This issue becomes more significant in border-area educational contexts. In the Indonesia-Malaysia border region, educational institutions respond to contemporary pedagogical and technological demands while also facing contextual challenges that may differ from those in more central areas. Border-area classrooms are often shaped by uneven access, limited support, infrastructure constraints, varying levels of teacher readiness, and unequal learning opportunities. Therefore, studying technology integration in this context is important because it shows how teachers negotiate technology, pedagogy, and local educational realities.

Previous studies have examined deep learning from different perspectives, including active engagement, inquiry, and problem-solving (Winje & Løndal, 2020; Wu & Liu, 2022). Other studies have explored adaptive systems, multimedia environments, artificial intelligence, and digital tools in improving learning experiences (Cui, 2024; Huang & Hoon-Yang, 2022; Pan et al., 2023). Research has also shown that technology can support differentiated instruction, participation, and richer learning when it is connected to clear instructional goals (Kandula & Kumar, 2023; Zhang, 2019). Nevertheless, limited attention has been given to how an EFL lecturer in a border-area higher-education context understands deep learning as a pedagogical approach and translates it into technology-supported speaking instruction.

This gap is important because EFL speaking classes require more than exposure to digital applications. They require classroom activities that help students use English for communication, interaction, reflection, and self-expression. Without examining teacher mediation, little is known about whether digital and AI-supported tools support deeper learning conditions or merely add technological features to classroom routines. This study addresses that gap by examining how an EFL lecturer at Universitas Borneo Tarakan understands deep learning, integrates digital and AI-supported tools into speaking instruction, and responds to challenges in technology-supported learning. The observed tools include Duolingo, Elsa Speak, Cake, Busuu, Blooket, speech-to-text tools, QuillBot, and Grammarly. These tools are examined as part of classroom practice that may support vocabulary learning, pronunciation

practice, speaking rehearsal, gamified review, feedback, revision, and learner engagement. The study also considers the risk of students' dependence on AI-generated answers and the need for teacher mediation, digital literacy, and ethical use.

This study explores how an EFL lecturer understands deep learning as a pedagogical approach, how digital and AI-supported tools are integrated into EFL speaking instruction, and what challenges emerge when these tools are used in a classroom located in the Indonesia-Malaysia border area. Rather than making a broad claim that technology promotes deep learning in all contexts, this study offered a context-specific account of how technology-supported activities may create conditions for deep learning when they are guided by pedagogical purpose (Tang, 2024).

2. LITERATURE REVIEW

2.1 Deep Learning as a Pedagogical Approach

Deep learning has become an important concept in contemporary education because it shifts learning from memorizing information to constructing meaningful understanding. In this study, deep learning is understood as a pedagogical approach that supports active engagement, conceptual understanding, contextual application, higher-order thinking, reflection, learner autonomy, and purposeful use of knowledge. It differs from surface learning because it encourages students to inquire, think critically, make connections, and apply knowledge beyond the classroom. Winje & Løndal, (2020) describe deep learning as an approach that helps learners connect knowledge with real-life situations. This is relevant to EFL instruction because language learning should not only help students memorize vocabulary, grammar, or expressions, but also enable them to use English meaningfully in communicative situations.

Research on student learning shows that students are more likely to engage deeply when they actively work with ideas, solve problems, and participate in learning activities rather than passively receive information (Wu & Liu, 2022). In EFL speaking instruction, this means that students need opportunities to formulate ideas, answer questions, negotiate meaning, and use English for real purposes. Therefore, deep learning in speaking classes can be seen when students use language not only to repeat forms, but also to communicate ideas, reflect, and think.

When classroom activities are rigid, pressured, or disconnected from meaningful interaction, students may return to surface-level learning (Awofala et al., 2020); (McDonald et al., 2017). For this reason, teachers need to design student-centered learning spaces that encourage engagement, collaboration, and reflection. Problem-based learning, cooperative

learning, inquiry-oriented teaching, and dialogic interaction may support deeper engagement with learning content (Krishnagiri et al., 2019). Collaborative and dialogic learning is also important because learners deepen their understanding through interaction, shared inquiry, and reflection (Andrews et al., 2020) (Huang et al., 2021).

2.2 Deep Learning, Technology, and EFL Speaking

Deep learning is linked to stronger learning outcomes because it encourages students to understand, apply, and transfer knowledge rather than simply reproduce information. In higher education, it supports critical thinking, problem-solving, decision-making, and academic independence. In this study, deep learning is understood as an educational and pedagogical concept, not as an algorithm or predictive system. Cao & Sun, (2024) show that deep learning involves cognitive, emotional, social, and collaborative dimensions. This is relevant to EFL speaking because students' speaking development depends not only on language knowledge, but also on confidence, motivation, interaction, and willingness to participate. Lau, (2015) argues that rote learning may limit critical thinking and problem-solving, while Mansfield et al., (2020) emphasize that deeper learning helps students use knowledge meaningfully beyond formal instruction.

Technology has also changed EFL teaching by supporting practice, feedback, interaction, and learner autonomy. In speaking instruction, digital tools can help students practice pronunciation, vocabulary, fluency, and spoken expression more flexibly. However, technology becomes meaningful only when teachers connect it with learning objectives, communicative tasks, and students' needs. Kandula & Kumar, (2023) note that technology can support differentiated instruction, while Su & Huang, (2022) explain that AI may contribute to emotional awareness and learning quality.

Blended and digital learning environments may further support deeper engagement. Pan et al., (2023) found that a hybrid SPOC model can enhance deep learning by combining online learning with classroom teaching. In EFL speaking, digital tools may provide input, practice, and feedback, while classroom interaction allows students to use English for communication. Multimedia resources, such as micro-videos, can also support knowledge construction and engagement when they are connected to meaningful tasks (Zhang, 2019). Therefore, technology should extend and enrich communicative pedagogy rather than replace it.

2.3 AI-Supported Practice, Learner Autonomy, and Teacher Mediation

AI-supported tools can support EFL learning by providing language feedback, grammar support, pronunciation assistance, vocabulary practice, and opportunities for independent rehearsal. In EFL contexts, conversational AI may offer immediate language support and interactive practice (Wang et al., 2024). These tools can also strengthen learner autonomy when students use them to practice beyond classroom time, monitor progress, and revise their language. This is consistent with Stasya & Emaliana, (2021), who found that online self-regulated learning is related to EFL students' achievement.

However, learner autonomy still requires teacher guidance. AI tools may support reflection and revision, but they may also encourage superficial learning when students use them only for ready-made answers. Therefore, AI use should be connected to pedagogy rather than treated as a technical solution alone (Zawacki-Richter et al., 2019). Meaningful technology integration requires teachers to combine technological, pedagogical, and content knowledge (Mishra & Koehler, 2006a, 2026b), especially because EFL teachers need competence in integrating technology with language pedagogy (Tovar Viera & Velasco Sanchez, 2020).

In EFL speaking instruction, teacher mediation includes designing communicative tasks, guiding interaction, providing feedback, encouraging reflection, and explaining ethical AI use. Students can be asked to draft their own responses first, compare them with AI suggestions, revise their language, and explain the changes they make. This guidance helps students use AI as a learning scaffold rather than a shortcut. Therefore, AI should support vocabulary, pronunciation, organization, and clarity while still allowing students to develop their own ideas and communicative ability.

2.4 Current Study

The literature highlighted that deep learning is a pedagogical approach involving active engagement, conceptual understanding, contextual application, reflection, autonomy, and meaningful use of knowledge. In EFL speaking, these aspects appear when students use English actively for communication, reflection, and independent practice. Technology and AI-supported tools may support these conditions through practice, feedback, motivation, and flexible access. However, their value depends on teacher mediation, meaningful task design, and ethical use. Therefore, this study examines how one EFL lecturer in an Indonesia–Malaysia border-area context integrates technology to support deep learning while addressing challenges such as AI dependence.

3. METHODOLOGY

3.1 Research Design

This study used an interpretive qualitative case-study design to examine one bounded teaching case: a technology-supported EFL speaking classroom in a border-area university context. The study did not aim to measure the statistical effect of technology, but to understand how deep learning was interpreted, enacted, and negotiated through classroom practice. The case was bounded by one lecturer, one speaking class, four classroom observations, and the use of digital and AI-supported tools during instruction (Creswell & Creswell, 2018).

3.2 Setting and Participants

The study was conducted at the English Education Department of Universitas Borneo Tarakan, North Kalimantan, Indonesia, located in the Indonesia–Malaysia border area. The main participant was one purposively selected EFL lecturer who taught a speaking class and had already integrated digital and AI-supported tools into classroom activities. The observed class consisted of 38 students enrolled in the speaking course. The students were involved as classroom participants whose learning activities were observed, but they were not interviewed. Therefore, claims about student engagement and participation were based on observation notes, field notes, video documentation, and the lecturer interview.

3.3 Data Collection

Data were collected through classroom observations, a semi-structured interview, field notes, and video documentation. The class was observed four times over one month. Each observation lasted approximately 100 minutes, following the time allocation of a two-credit speaking course. The observation schedule covered different technology-supported speaking activities, including vocabulary practice, pronunciation practice, speaking rehearsal, gamified review, short writing, discussion, and oral presentation. The observed tools included Duolingo, Elsa Speak, Cake, Busuu, Blooket, speech-to-text tools, QuillBot, and Grammarly. These tools were examined in relation to their pedagogical functions, such as vocabulary learning, pronunciation practice, speaking preparation, feedback, revision, learner engagement, and independent practice.

A semi-structured interview was conducted with the lecturer after the classroom observations. The interview lasted approximately 60 minutes and explored the lecturer's understanding of deep learning, reasons for using specific digital and AI-supported tools, perceived benefits, classroom challenges, and concerns about students' dependence on AI-generated answers. Field notes were written during and after each observation to record

classroom interaction, student participation, teacher guidance, technology use, and important incidents. Video recordings were used to revisit classroom events, confirm observation notes, and support more accurate interpretation.

3.4 Instruments

The study used an observation guide, a semi-structured interview guide, and a field-note protocol. The observation guide focused on indicators of deep learning in EFL speaking instruction, including active engagement, contextualized communication, reflection, learner autonomy, feedback, and meaningful use of technology. The interview guide contained open-ended questions about the lecturer's pedagogical understanding, technology choices, classroom implementation, benefits, challenges, and ethical concerns related to AI-supported tools. The field-note protocol helped the researchers record classroom events systematically, including lesson focus, speaking tasks, interaction patterns, technologies used, lecturer guidance, and students' observable responses.

3.5 Data Analysis and Trustworthiness

The data were analyzed thematically following (Braun & Clarke, 2006) stages of familiarization, coding, category development, theme construction, and interpretation. First, the interview recording was transcribed, and the observation notes, field notes, and video records were organized. Second, the researchers reviewed the transcript, field notes, and selected video segments repeatedly to identify recurring patterns. Third, meaningful data segments were coded based on the research focus, including learner engagement, contextualized language use, reflection, autonomy, technology use, teacher mediation, and AI dependence.

To strengthen coding validity, the researchers compared codes across interview data, observation notes, field notes, and video documentation. Selected codes and emerging themes were discussed among the researchers to check consistency and reduce individual bias. Selected interpretations were confirmed with the lecturer to ensure that the researcher's interpretation was consistent with the lecturer's intended meaning and classroom practice. Video documentation was not treated as separate quantitative data, but as supporting evidence to verify classroom events, interaction patterns, and students' observable responses. Trustworthiness was strengthened through triangulation across data sources, repeated review of video records, researcher discussion during coding, and member checking with the lecturer. Since the study involved one lecturer, one class, and four observations, the findings are context-specific rather than broadly generalizable.

3.6 Ethical Considerations

The lecturer and students were informed about the purpose of the study, the classroom observations, and the use of video documentation. Consent was obtained before data collection. Participation was voluntary, and the identities of the lecturer and students were anonymized. All interview recordings, classroom videos, and field notes were stored securely and used only for research analysis. Student identities were not reported individually.

4. FINDINGS

The results were generated from classroom observations, lecturer interview data, field notes, and video documentation. The analysis produced six main themes: active learner engagement, contextualized understanding, higher-order thinking and reflection, learner autonomy through digital tools, mindful-meaningful-joyful learning experiences, and AI dependence as a challenge. The interview excerpts in the table refer to different segments from the same lecturer interview, not to different participants.

Table 1 Triangulated Findings on Technology-Supported Deep Learning in EFL Speaking

Theme	Observation Evidence	Lecturer Interview Evidence	Cross-Source Meaning	Implication for EFL Pedagogy
Active learner engagement	Students participated in group discussion, short writing, spontaneous speaking, and oral presentation tasks.	"Learning becomes more interesting and students are more willing to practice English actively and enthusiastically when technology is integrated" (Lecturer Interview, Excerpt 1).	Technology-supported tasks appeared to encourage active participation in the observed classroom.	Digital tools can be used to stimulate communicative involvement when connected to speaking tasks.
Contextualized understanding	Tasks were linked to tourism, travel, hotel booking, and personal experiences.	"Students can practice real-life English usage through AI applications, both inside and outside the classroom" (Lecturer Interview, Excerpt 2).	Technology helped connect language forms with familiar communicative situations.	Technology use becomes more meaningful when linked to authentic language purposes.

Higher-order thinking and reflection	Students were asked to organize ideas, respond to WH-questions, compare answers, and revise responses.	"AI encourages students to think critically because they obtain rich and varied sources, compare answers, analyze feedback, and reflect on their learning results" (Lecturer Interview, Excerpt 3).	Technology-supported activities appeared to create opportunities for analysis, reflection, and reconsideration rather than simple answer production.	EFL technology integration can support reflective learning when guided carefully.
Learner autonomy and adaptive support	Students used applications beyond classroom explanation for continued vocabulary, pronunciation, and speaking practice.	"Students become more autonomous because they can learn and practice English independently without always depending on the teacher" (Lecturer Interview, Excerpt 4).	The data suggest that technology extended practice opportunities beyond teacher-led explanation.	Technology can strengthen guided independence and out-of-class language practice.
Mindful, meaningful, and joyful learning	Students appeared focused and positively engaged during interactive, application-based, and game-based activities.	"Learning feels more joyful because students enjoy games, quizzes, and interactive features, which keeps them motivated" (Lecturer Interview, Excerpt 5).	Technology shaped not only task performance but also attention, motivation, and emotional involvement.	Effective EFL technology use should address affective as well as cognitive dimensions of learning.
AI dependence as challenge	Some students turned quickly to AI-generated responses before attempting their own answers and needed lecturer prompts to revise or	"Some students depend too much on AI for quick answers, so teachers need to guide them to use it properly as a supplementary tool to support learning process" (Lecturer	The data reveal a tension between technological support and reduced cognitive effort.	Teacher mediation, digital literacy, and ethical AI use remain essential in AI-supported EFL classrooms.

	explain their responses.	Interview, Excerpt 6).

Classroom observations showed that students were actively involved in discussion, short writing, spontaneous speaking, and oral presentation tasks. In several activities, students first used digital tools to find vocabulary, check pronunciation, and prepare short responses before speaking. This appeared to make participation more accessible, especially for students who needed support before producing spoken English. However, the data do not prove that technology directly caused stronger participation; rather, technology-supported tasks appeared to encourage participation when they were linked to communicative classroom activities.

Besides, the speaking tasks were connected to practical contexts such as tourism, travel, hotel booking, and personal experiences. Students practiced expressions for asking for information, describing places, and making simple reservations. In these activities, digital and AI-supported tools provided language input, examples, pronunciation support, and feedback. This suggests that technology became meaningful when it supported authentic speaking purposes.

The data showed opportunities for reflection. Students were asked to answer WH-questions, compare responses, revise their language, and explain changes after receiving feedback. The lecturer did not allow students simply to copy AI-generated responses. Instead, students were guided to compare their own drafts with AI suggestions and improve their answers.

Moreover, technology also supported guided autonomy. Students used Duolingo, Elsa Speak, Cake, Busuu, Blooket, speech-to-text tools, QuillBot, and Grammarly for vocabulary learning, pronunciation practice, gamified review, speaking rehearsal, feedback, and revision. However, this autonomy still depended on lecturer guidance in selecting tools, setting tasks, and connecting technology use with speaking goals.

A key challenge was AI dependence. Some students turned quickly to AI tools before attempting their own answers. Others accepted instant corrections without checking meaning or explaining revisions. The lecturer responded by reminding students to use AI as a support tool, not as a replacement for their own thinking. Overall, the findings suggest that technology-supported activities created conditions associated with deep learning when they were connected to meaningful tasks, teacher guidance, reflection, and ethical AI use.

5. DISCUSSION

The findings suggest that technology-supported activities in the observed classroom created conditions associated with deep learning, including active engagement, contextualized understanding, reflective engagement, learner autonomy, and purposeful practice. However, this study does not claim that technology directly caused deep learning. Rather, the findings indicate that digital and AI-supported tools appeared to support deeper engagement when they were connected to meaningful speaking tasks, teacher guidance, and opportunities for reflection. This distinction is important because deep learning depends not only on access to information, but also on the quality of participation and meaning-making that follows (Fullan et al., 2018; Hattie & Donoghue, 2016).

One strength of this study is its evidence of speaking-oriented participation. Students in the observed class interacted, planned, responded, and delivered presentations in English on familiar topics rather than remaining passive recipients of instruction. Kusmaryani & Tanjung, (2023) found that mobile applications in digital project-based learning improved students' English-speaking skills and were perceived positively because they made learning more convenient, individualized, and supportive of practice beyond the classroom. Similarly, Fatimah & Santiana, (2017) found that technology use was associated with better learning experiences, increased motivation, stronger focus, and teacher confidence. These studies support the view that technology may contribute to meaningful EFL learning when it is used for clear pedagogical purposes rather than simply added to classroom practice.

The findings highlight the important role of contextualization. Students worked with topics such as tourism, travel, hotel reservations, and personal experiences. These topics gave students clearer communicative reasons to speak and allowed them to connect language forms with familiar situations. In this classroom, technology did not replace communicative pedagogy; instead, it extended it by providing language examples, feedback, and opportunities for rehearsal. Technology became meaningful because it was connected to authentic communication, not merely because digital tools were used.

Learner autonomy also emerged as a crucial dimension. Several applications gave students opportunities to practice vocabulary, pronunciation, and self-correction beyond direct teacher explanation. This finding is line with Stasya & Emaliana, (2021), who found that online self-regulated learning was associated with EFL students' achievement. However, the present findings do not suggest that technology made students fully independent. What emerged from the data was guided independence. Students had more opportunities to practice, but their

learning still depended on how the lecturer framed tasks, modeled responsible use, monitored progress, and connected application use with speaking goals.

The lecturer played a central role in making technology pedagogically meaningful. The lecturer was not only a user of digital tools, but also a designer, facilitator, mediator, and evaluator. As a designer, the lecturer selected tools and connected them to speaking tasks. As a facilitator, the lecturer created opportunities for students to practice, discuss, and present. As a mediator, the lecturer helped students interpret feedback from AI-supported tools and use it responsibly. As an evaluator, the lecturer monitored whether students used technology to support learning or merely to obtain quick answers. This reflects the importance of technological, pedagogical, and content knowledge (Mishra & Koehler, 2006a, 2006b) and supports Tovar Viera & Velasco Sanchez, (2020) view that EFL teachers need competence not only in using technology, but also in integrating it with language pedagogy.

At the same time, technology alone may not have created students' active participation. Other possible influences include the lecturer's facilitation style, the novelty of application use, the communicative nature of the tasks, assessment expectations, class size, and students' previous experience with digital tools. Therefore, the findings should be read as evidence that technology-supported activities created favorable conditions for deep learning in this case, not as proof of a direct cause-and-effect relationship. This caution is important because the study involved one lecturer, one classroom, and four observations.

Another important issue is students' dependence on AI. When students rely on AI tools for quick answers, their cognitive effort may be reduced. This is in link with Zawacki-Richter et al., (2019), who argue that AI in education should not be separated from pedagogy. It also aligns with (Limbong et al., 2024), who show that technology integration is shaped by contextual realities rather than technical readiness alone. In this study, AI was useful when it supported practice, feedback, and revision, but it became problematic when students treated it as a shortcut. This shows that digital innovation does not remove the need for professional judgment; instead, it increases the need for teacher mediation.

To address this issue, ethical AI use should be made explicit in EFL speaking instruction. Students can first be asked to write their own answers before using AI-supported tools. They can then compare their drafts with AI suggestions, revise their language, and explain why they made changes. They can also reflect on what they learned from the feedback and identify which parts of the response still represent their own ideas. In this way, AI is used

as scaffolding rather than as a substitute for thinking. Such practices can help students develop language accuracy, confidence, and digital responsibility at the same time.

This case is especially relevant in border-area education. The significance of this study lies not only in showing that technology was used, but also in showing how it was made meaningful in a peripheral higher-education EFL setting. The findings from the observed classroom indicate that technology-supported learning may encourage deeper EFL engagement when it is connected to authentic communication, guided reflection, and purposeful use of digital tools. However, pedagogical clarity, teacher mediation, ethical awareness, and contextual sensitivity remain essential for effective technology integration in EFL classrooms.

6. CONCLUSION

This study examined technology integration in an EFL speaking classroom in the Indonesia-Malaysia border area through the lens of deep learning. In this observed case, technology-supported activities appeared to create learning conditions related to active participation, contextualized communication, reflection, learner autonomy, and positive engagement. Digital and AI-supported tools were most useful when they extended speaking practice, feedback, revision, and meaning-making rather than when they were used only to produce quick answers. The findings also show that technology integration requires careful teacher mediation. Some students tended to rely too quickly on AI-generated responses, indicating the need for digital literacy, ethical AI use, and clear classroom guidance.

Therefore, technology may enrich EFL speaking instruction when teachers design meaningful communicative tasks, guide students' use of AI, monitor possible dependence, and connect digital tools to language-learning goals. This study is limited to one lecturer, one speaking classroom, four observations, and the absence of direct student interview data. Therefore, the findings are context-specific and should not be broadly generalized. Future studies may involve more lecturers, student perspectives, comparative classroom settings, or longer observation periods to examine how technology-supported deep learning develops across different EFL contexts.

DECLARATION OF GENERATIVE AI

The authors used AI-assisted tools, including ChatGPT, Grammarly, and QuillBot, to support language editing, grammar checking, and clarity improvement during manuscript preparation. The authors carefully reviewed, revised, and approved all AI-assisted outputs and take full responsibility for the content, accuracy, and integrity of the manuscript.

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