



Strategy for Utilizing Duolingo as an Interactive Learning Media to Improve Vocational High School Students' Oral Communication Skills

Erisa Kurniati¹, Ade Kumalasari², Siti Enik Mukhoiyaroh³, Kevin Waldo⁴, Risky Akbar⁵, Suhardi⁶
^{1,2,3,4,5,6}Universitas Jambi, Jambi, Indonesia

Corresponding author email: erisa.kurniati@unja.ac.id

Info Article

Received: 24 Sept 2025

Revised: 19 Oct 2025

Accepted: 25 Oct 2025

Online Version: 30 Oct 2025

Abstract

This study investigates the strategic use of Duolingo as an interactive learning medium to enhance oral communication skills among vocational high school students. Employing a mixed-methods convergent parallel design, data were collected from 30 students and two English teachers through pre- and post-speaking tests, motivation and engagement questionnaires, classroom observations, and semi-structured interviews. The data were analyzed using complementary quantitative and qualitative techniques. The quantitative results demonstrated significant improvements across all speaking dimensions, with the most tremendous gains in communicative competence (M gain = +1.6). The questionnaire findings revealed high levels of motivation and engagement, driven by Duolingo's gamification features, although self-regulation remained a challenge. Qualitative data confirmed that students developed greater confidence and improved vocabulary retention, while teachers emphasized the benefits of integrating Duolingo with communicative tasks, such as role-playing and group discussions. Classroom observations further indicated progressive increases in participation, vocabulary use, and enthusiasm throughout the intervention. These findings suggest that Duolingo is most effective when strategically embedded within interactive classroom practices, aligning with the Merdeka Belajar curriculum by fostering learner autonomy, motivation, and communicative competence. This research offers a novel contribution by demonstrating that, despite these challenges, the effectiveness of technology-enhanced learning ultimately hinges on the overlooked yet critical roles of teacher mediation and institutional support.

Keywords: Communicative Competence; Duolingo; Gamification; Interactive Learning; Speaking Skills; Vocational Education

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INTRODUCTION

Oral communication skills in English are essential competencies required by vocational high school (SMK) students to meet global demands and workplace needs. However, several studies have shown that although students possess basic English proficiency, they are often reluctant to use it in real communicative situations (Mukminin et al., 2019; Fauzan & Nadia, 2019). The low speaking proficiency is influenced by the lack of practice opportunities in class, limited use of interactive media, and teaching approaches that emphasize cognitive knowledge over communicative competence (Nur Hidayah, 2021; Ratnasari, 2019).

In language acquisition, behaviorism, innatism, and interactionism theories explain that successful language learning is shaped by repetition, innate ability, and social practice (Ratnasari, 2019). This aligns with Malykhin et al. (2024), who highlight the importance of communicative competence as the ultimate goal of language learning. Vocabulary also plays a crucial role in speaking skills. Kurniati (2017) confirmed a strong correlation between vocabulary mastery and speaking achievement. Similarly, Kurniati et al. (2023) demonstrated the effectiveness of flash card media in strengthening vocabulary memory, while Kurniati et al. (2021) showed the potential of audio media using scripted songs to support speaking improvement.

Various teaching strategies have been proven effective in enhancing oral communication skills. Asnawi (2015) found that immersive multimedia with peer support improved speaking confidence, while Prancisca (2015) emphasized problem-based learning (PBL) as a means of promoting honest communication. Pajrini and Mubaidillah (2023) demonstrated that active learning strategies significantly improved speaking skills, whereas Pratama et al. (2021) developed a three-step interview technique to enhance students' oral performance. Other approaches, such as communicative games (Kurniati, Jufri, & Jufri, 2020) and the use of fairy tales that incorporate local wisdom (Kurniati, 2015), also foster communicative competence.

Beyond classroom-based strategies, community-based activities also play a vital role. Desmiyanti (2022) highlighted that participation in English clubs enhanced students' speaking confidence, while Hadi and Junaidi (2020) found that focus group discussions improved speaking and critical thinking. Widiyanto et al. (2020) emphasized the importance of communicative training in preparing competitive human resources, and Sari et al. (2021) noted that improving teachers' pedagogical competence is crucial to optimizing speaking instruction.

The integration of digital technology has become increasingly relevant for language education. Budianto et al. (2021) reported that digital storytelling improved listening while providing opportunities for speaking practice. In contrast, Astiandani and Mustofa (2021) showed the benefits of drama in encouraging students to speak more confidently. Hidayati et al. (2024) demonstrated the effectiveness of translanguaging and multimodal learning in strengthening speaking performance, while Handayani and Wirza (2021) highlighted the importance of content readability in English textbooks. Similarly, Maryansyah et al. (2024) showed the practical relevance of translanguaging in suburban schools.

Duolingo, a mobile-based language learning application, has attracted attention in recent studies. Munday (2016) argued that Duolingo can be effectively integrated into formal curricula, while Grego (2012) found its effectiveness comparable to that of traditional classroom learning. Ajisoko (2020) demonstrated its contribution to vocabulary acquisition, and its impact on broader language proficiency. Faradisa et al. (2022) also emphasized its usefulness for university-level vocabulary learning. Isaacson (2021) further showed students' positive responses to Duolingo's gamified environment, although its effectiveness depends on integration with classroom tasks.

A systematic review by Shortt et al. (2023) confirmed that Duolingo's gamification enhances learning motivation, while Redjeki and Muhajir (2021) stressed the importance of gamification in supporting 21st-century learning. Cao et al. (2023) found that digital learning enhances motivation in foreign language acquisition, and Qiao and Zhao (2023) revealed that AI-based language learning has a positive influence on speaking skills and self-regulation. Thus, Duolingo can be considered an effective interactive tool for speaking development when combined with communicative classroom practices.

In the vocational education context, Duolingo's integration aligns with the Merdeka Belajar curriculum. Kusuma and Pusparini (2021) reported that vocational teachers value curriculum flexibility to support learner-centered practices, while Boud et al. (2016) highlighted the need for vocational curriculum planning that reflects workplace demands. Rachmawaty et al. (2020) noted the influence of contextual and gender factors on language attitudes, while Roza (2022) illustrated how study-abroad experiences shape communicative competence.

Other studies emphasize the importance of adapting modern strategies to local contexts. Hasanah et al. (2021) developed an Android-based media platform to improve basic English communication, while Kurniati (2019, 2018) emphasized the use of educational management and multimedia to enhance language learning. Sotlikova (2023) demonstrated the effectiveness of the presentation–practice route for young learners, whereas Wahyuningsih and Putra (2020) showed the success of technology-based media in improving speaking skills among hospitality students.

Based on this review, the research problem can be formulated as follows: how can Duolingo be strategically utilized as an interactive learning medium to improve vocational students' oral communication skills, this study aims to describe the strategies of implementing Duolingo in interactive classrooms. Examine its impact on students' speaking proficiency, and explore teachers' roles in integrating the application with communicative classroom tasks. Theoretically, this study contributes to the literature on digital gamified media in vocational language education. At the same time, it provides practical recommendations for teachers and policymakers to optimize digital tools within the framework of the Merdeka Belajar curriculum.

RESEARCH METHODS

This study employed a carefully designed methodological framework to systematically investigate the strategic use of Duolingo as an interactive learning medium for enhancing the oral communication skills of vocational students. The mixed-methods approach was motivated by the need to capture both the measurable outcomes of students' speaking performance and their motivational patterns, engagement behaviours, and classroom experiences. By combining quantitative and qualitative data within a convergent parallel design, the study ensured a comprehensive exploration of both statistical improvements and contextual insights. This methodological design allowed the researcher to evaluate Duolingo's effectiveness holistically, bridging the gap between app-based learning activities and communicative classroom practices.

Research Design

This study employed a mixed-methods approach with a convergent parallel design to comprehensively evaluate the strategies of using Duolingo as an interactive learning medium to enhance vocational students' oral communication skills. In this design, quantitative data (pre and post–speaking tests and questionnaires) and qualitative data (observations and interviews) were collected simultaneously, analysed separately, and then integrated during the interpretation stage to capture both the convergence and complementarity of findings (Creswell & Plano Clark, 2017). The choice of design was based on the nature of Duolingo as a mobile-assisted language learning (MALL) platform that not only generates measurable changes in performance scores but also fosters motivation and self-regulation patterns that must be understood qualitatively (Shortt et al., 2023; Qiao & Zhao, 2023). In addition, the vocational education context demands relevance to workplace needs and classroom practices, making cross-source triangulation crucial to portray the applicability of interactive strategies in the SMK setting (Boud et al., 2016; Munday, 2016).

Research Subject

The participants consisted of 30 students from grades X–XI at SMK Negeri 6 Kota Jambi, along with two English teachers serving as supporting informants. A purposive sampling technique was applied based on several criteria: (1) students' willingness to participate voluntarily, (2) possession of devices and adequate internet access to use Duolingo, (3) initial speaking proficiency at a basic to intermediate level determined by previous English scores and teacher evaluation, and (4) consistent

classroom attendance. Purposive sampling was chosen to ensure that the sample represented MALL users capable of engaging in daily Duolingo practice (Xie, 2014) and to capture teachers' integration practices in line with the Merdeka Belajar curriculum (Kusuma & Pusparini, 2021; Sari et al., 2021). This consideration also reflects earlier studies on affective barriers, particularly students' reluctance to use English in authentic settings, which require intervention through interactive strategies (Mukminin et al., 2019; Nur Hidayah, 2021).

Research Procedure

The procedure consisted of four stages: preparation, implementation, data collection, and analysis. In the preparation stage, the researcher developed instruments (speaking rubric, motivation and engagement questionnaire, interview guidelines, and observation sheets) and conducted expert validation. At the same time, two raters were trained to calibrate scoring criteria to ensure inter-rater reliability (Ratnasari, 2019; Malykhin et al., 2024). The implementation stage lasted six weeks, during which students were required to use Duolingo at least 15–30 minutes daily (five days a week). Teachers acted as facilitators by integrating Duolingo outcomes into communicative classroom tasks, such as role-plays, communicative games, three-step interviews, and problem-based activities, thereby ensuring that micro-drills in the app transferred into contextual oral performance (Kurniati et al., 2020; Pratama et al., 2021; Prancisca, 2015). The data collection stage involved pre-test and briefing at the beginning, multiple observations during the intervention, post-test, questionnaire administration, and interviews with students and teachers at the end. Ethical considerations such as informed consent and confidentiality were observed, alongside attention to technological barriers that often affect MALL consistency (Wahyuningsih & Putra, 2020; Xie, 2014).

Instruments and Data Collection Techniques

Quantitative data were obtained from pre and post-speaking tests, as well as a Likert-scale questionnaire. The speaking tests consisted of two tasks: a short monologue (description/opinion) and a structured dialogue (vocational scenario), assessed with a five-dimension rubric: fluency, vocabulary, grammar, pronunciation, and communicative competence—adopted from the framework of communicative competence (Malykhin et al., 2024) and supported by evidence of the strong correlation between vocabulary mastery and speaking achievement (Kurniati, 2017). Scores were assigned independently by two raters. The questionnaire measured motivation, engagement, and self-regulation in using Duolingo, with items adapted from gamification and MALL literature (Shortt et al., 2023; Redjeki & Muhajir, 2021; Isaacson, 2021; Ajisoko, 2020). Qualitative data were collected through semi-structured interviews with both students and teachers, which explored their experiences, perceived benefits, and challenges in Duolingo integration, and classroom observations, which documented participation, interaction patterns, translanguaging or multimodal cues, and the transfer of tasks from app-based drills to classroom practices (Munday, 2016; Hidayati et al., 2024; Desmiyanti, 2022). Instrument validity was established through expert judgment and pilot testing, while content suitability was considered in terms of the readability of supplementary materials and alignment with vocational contexts (Handayani & Wirza, 2021; Boud et al., 2016).

Data Analysis Technique

Quantitative data were analyzed using a paired-samples t-test to compare pre-test and post-test scores, supplemented with descriptive statistics (mean, SD, and gain scores) and reporting of effect sizes (e.g., Cohen's *d*) and 95% confidence intervals to assess the pedagogical significance of improvements. All quantitative analyses were conducted using statistical software such as SPSS (Version 20), which supported assumption testing (e.g., Shapiro–Wilk) and non-parametric alternatives when required (Creswell & Plano Clark, 2017; Kurniati, 2017). Qualitative data were analyzed thematically through open, axial, and selective coding using NVivo to systematically organize and interpret emergent themes, including gamification-driven motivation, self-regulation strategies, teacher mediation roles, and technical or access challenges. Credibility was ensured through member checking and procedural audit trails (Mukminin et al., 2019; Qiao & Zhao, 2023). Finally, both strands of data were integrated through triangulation and joint display interpretation, enabling a comprehensive explanation of how Duolingo's micro-drills fostered engagement and transferred into communicative classroom performance in line

with vocational curriculum goals and workplace relevance (Munday, 2016; Shortt et al., 2023; Boud et al., 2016).

RESULTS AND DISCUSSION

This section presents the results of both quantitative and qualitative analyses, addressing the research objectives, followed by a discussion that interprets these findings in relation to relevant theories and previous studies. The quantitative data from pre- and post-tests, as well as questionnaires, provide measurable evidence of improvements in students' speaking performance, motivation, and engagement. Meanwhile, qualitative insights from interviews and classroom observations enrich the interpretation by capturing the experiences of learners and teachers with the integration of Duolingo. By combining these data sources, the analysis provides a comprehensive understanding of how Duolingo, when strategically embedded in interactive classroom practices, contributes to the development of oral language.

Result

The results of this study are presented through a combination of quantitative and qualitative findings, capturing a comprehensive picture of how Duolingo, when integrated into interactive classroom practices, contributes to the development of students' oral communication skills. The quantitative results from pre- and post-test speaking assessments and motivation–engagement questionnaires provide measurable evidence of learning gains, particularly in communicative competence and learner motivation. Complementing these findings, qualitative insights from interviews and classroom observations reveal how students and teachers perceive the integration of Duolingo, highlighting improvements in confidence, participation, and vocabulary use, as well as challenges such as maintaining consistency and ensuring technological access. Together, these findings provide robust evidence of the pedagogical value of Duolingo as a digital learning tool when strategically integrated into communicative teaching practices.

Speaking Test

The pre-test and post-test results indicated a significant improvement in students' speaking performance after six weeks of using Duolingo integrated with interactive classroom activities. As shown in Table 1, mean scores increased across all dimensions. The lowest pre-test mean was observed in communicative competence (2.2), while vocabulary scored slightly higher (2.6). Following the intervention, mean scores in all aspects rose above 3.5, with communicative competence achieving the highest gain (3.8). Overall, the total mean increased from 2.4 to 3.7, reflecting an average gain of +1.3 points.

Table 1. Mean scores of pre-test and post-test speaking performance (N = 30)

Aspect	Pre-Test (M)	Post_Test (M)	Gain
Fluency	2.4	3.6	+1.2
Vocabulary	2.6	3.9	+1.3
Grammar	2.3	3.5	+1.2
Pronunciation	2.5	3.7	+1.2
Communicative Competence	2.2	3.7	+1.6
Mean	2.4	3.7	+1.3

The results reveal balanced improvements across all dimensions, with the most significant increase in communicative competence (+1.6), suggesting that integrating Duolingo and interactive classroom strategies encouraged students to speak more confidently and engage in meaningful communication.

Motivation and Engagement

The questionnaire results demonstrated that students developed high levels of motivation and engagement after using Duolingo. The mean scores ranged from 3.6 to 4.2 on a five-point Likert scale. Motivation achieved the highest scores, particularly on the item "Level challenges motivate me to study English" ($M = 4.2$). Gamification features such as points and badges also played a key role in sustaining engagement ($M = 4.1$). Meanwhile, self-regulation scored slightly lower ($M = 3.6-3.7$), indicating that while students were highly motivated, they required further support to maintain consistent daily learning habits.

Table 2. Mean scores of motivation and engagement questionnaire (N = 30)

Dimension	Item Statement	Mean
Motivation	Level challenges motivate me to study English	4.2
	Badges and points help me stay consistent	4.1
Engagement	Duolingo practice helps me participate actively	4.0
	I discuss my Duolingo progress with peers	3.8
Self-regulation	I set daily targets for Duolingo practice	3.7
	I use my spare time to complete Duolingo exercises	3.6

These results confirm that gamification has a substantial impact on boosting motivation, while self-regulation remains a challenge that requires teacher mediation and classroom integration.

Interview

Thematic analysis of the interviews revealed several key insights. Students reported increased confidence in speaking due to repeated practice on the app: "I feel more confident because I practice regularly on Duolingo." They also highlighted that vocabulary was easier to recall: "New words are easy to remember because they keep repeating." However, maintaining consistency was challenging: "Sometimes it is hard to stay consistent when I forget my daily target."

Teachers confirmed that Duolingo enriched students' vocabulary and supported interactive tasks in the classroom. They emphasized that role play and communicative games were particularly effective when combined with the app. Teachers also reported challenges such as inconsistent internet access, which limited students' ability to complete daily exercises.

Classroom Observation

Observations over a six-week period showed a steady improvement in students' classroom participation and communicative engagement. In week one, only 45% of students actively joined class discussions, whereas by week six, participation had increased to 85%. Similarly, the use of vocabulary learned through Duolingo rose from 30% in week one to 80% in week six. Enthusiasm levels also climbed substantially, reaching 90% by the final week. The observation results highlight a progressive trend, with significant improvements in vocabulary application, role play, and overall enthusiasm, confirming the effectiveness of integrating Duolingo into interactive learning.

Integrating quantitative and qualitative data demonstrates that Duolingo has significantly improved students' oral communication skills when used strategically as an interactive learning medium. Quantitative results indicated measurable gains in all speaking dimensions, particularly in communicative competence. Qualitative findings from interviews and classroom observations enriched the interpretation by demonstrating how increased confidence, motivation, and active participation complemented the statistical improvements.

Table 3. Classroom observation results

Indicator	Week 1 (%)	Week 3 (%)	Week 6 (%)
Participation in classroom discussions	45	70	85
Use of Duolingo vocabulary in communication	30	55	80
Activeness in role play	40	65	82
Responsiveness to the teacher's instructions	60	75	88
Enthusiasm during communicative activities	50	72	90

Furthermore, the gamification elements of Duolingo were particularly effective in sustaining motivation, aligning with previous studies highlighting its role in enhancing learner engagement (Shortt et al., 2023; Redjeki & Muhajir, 2021). However, consistent daily practice emerged as a challenge, reflecting the need for teacher mediation and structured integration into classroom tasks, in line with the principles of Merdeka Belajar (Kusuma & Pusparini, 2021). These findings suggest that while Duolingo provides valuable individual practice, its effectiveness is maximized when combined with interactive classroom strategies that contextualize learning into communicative tasks.

Discussion

The findings of this study indicate that the strategic integration of Duolingo with communicative classroom pedagogy yields measurable improvements in the speaking performance of vocational students, particularly in vocabulary, fluency, pronunciation, and overall communicative competence. Quantitative gains were supported by qualitative evidence showing that the platform's spaced repetition, gamified tasks, and high-frequency micro-practice strengthened learner confidence, participation, and motivation. Despite these gains, challenges related to learner self-regulation and inconsistent access to technology highlight the continued need for teacher mediation and institutional support to optimize learning outcomes. Overall, these findings suggest that Duolingo functions most effectively as a complementary digital scaffold within interaction-rich, curriculum-aligned instructional frameworks.

Building on these general outcomes, this study offers a distinctive contribution by demonstrating that Duolingo's effectiveness is contingent on its systematic integration into communicative, curriculum-aligned classroom practices. This aspect has received limited attention in prior research. While previous studies primarily focused on vocabulary learning or motivation among general or tertiary learners, the present study provides mixed-methods evidence within a vocational context where communicative competence is directly tied to employability. Therefore, the results underscore that digital micro-practice alone is insufficient; considerable gains emerge only when Duolingo is paired with teacher mediation, interactive tasks, and structured pedagogical scaffolding. This integrated model positions Duolingo not as an isolated mobile application but as a pedagogical tool that amplifies the outcomes of communicative language teaching in vocational education.

Following this contribution, vocabulary emerged as a key area of improvement. Students' post-test scores and interview responses highlighted that Duolingo's spaced repetition system enhanced vocabulary retention and directly supported fluency development. These findings corroborate research demonstrating a strong relationship between vocabulary mastery and speaking achievement (Ajisoko, 2020; Kurniati, 2017). Consequently, the automated nature of vocabulary practice created favorable conditions for richer oral production during classroom interactions.

In addition to vocabulary, students also reported substantial improvements in fluency. They described increased confidence and reduced hesitation during speaking tasks, a pattern consistent with studies showing that multimedia environments help alleviate speaking anxiety (Asnawi, 2015). Duolingo's short, frequent exercises appear to facilitate automaticity, enabling learners to devote more cognitive resources to expressing ideas during communicative exchanges. These findings further demonstrate how digital tools can enhance learners' readiness for interactive tasks.

Pronunciation gains also contributed to the overall improvement in speaking performance. Duolingo's voice-recognition feedback and repetition drills helped learners approximate target-like pronunciation, reinforcing the value of technology-based individualized practice (Wahyuningsih & Putra, 2020). Complementing teacher feedback, these digital features appear to support learners in developing more intelligible speech.

Beyond linguistic dimensions, communicative competence showed the most substantial improvement. This outcome reflects the synergy between digital input from Duolingo and communicative activities, such as role-plays and class discussions. Similar findings from studies on problem-based and game-based instruction (Kurniati et al., 2020; Prancisca, 2015) emphasize that meaningful interaction is essential for communicative development. Thus, the present study extends the existing literature by demonstrating that technology-enhanced learning can amplify the benefits of communicative pedagogy when integration is deliberate and structured.

Despite these strengths, motivational and behavioral aspects reveal both opportunities and challenges. High scores on gamification-related questionnaire items indicate that points, levels, and badges effectively sustained learner motivation, consistent with the positive influence of gamification in mobile-assisted learning (Redjeki & Muhajir, 2021; Shortt et al., 2023). However, lower scores on self-regulation items indicate that many students struggled to maintain consistent practice, a finding that aligns with those of Isaacson (2021) and Mukminin et al. (2019). These results reinforce the need for teacher scaffolding to help learners maintain momentum and establish productive learning routines.

Teacher interview data further underscore the importance of integration and support. Teachers acknowledged that students' vocabulary gains strengthened classroom activities, particularly in discussions and role plays. However, they also highlighted infrastructural limitations, most notably inconsistent internet access, which have the potential to hinder digital learning. These concerns align with prior studies that emphasize the potential for technological constraints to impede pedagogical innovation (Wahyuningsih & Putra, 2020). As such, institutional investment in digital infrastructure and professional development remains essential.

Complementary evidence from classroom observations showed a steady increase in learner participation and enthusiasm, particularly by the sixth week. This pattern aligns with Desmiyanti's (2022) findings, which suggest that community-based practices enhance the willingness to communicate. In this study, the classroom appeared to function as a community of practice, where students actively applied language learned through Duolingo in authentic interactions.

This integration of digital practice and classroom interaction aligns with the Merdeka Belajar curriculum, which emphasizes learner autonomy, digital literacy, and flexible learning pathways (Kusuma & Pusparini, 2021). Duolingo facilitates autonomous learning, while classroom tasks situate language use within vocationally relevant communicative contexts, thereby supporting curriculum goals related to workplace readiness (Widiyanto et al., 2020).

From a theoretical perspective, the findings illustrate how behaviorist, innatist, and interactionist principles intersect in technology-enhanced learning. Duolingo's repetitive drills exemplify behaviorist reinforcement (Ratnasari, 2019), its structured progression aligns with innatist perspectives on language development, and classroom interactions support interactionist views of meaning negotiation (Mukminin et al., 2019). Additionally, the integration of Duolingo with collaborative activities reflects sociocultural theory, which posits that learning develops through mediated social interaction (Boud et al., 2016). These theoretical intersections provide a comprehensive framework for understanding language learning in digital, communicative environments.

Finally, the study contributes to the limited body of research on mobile-assisted language learning in vocational education. Previous studies have predominantly examined general or university learners (Ajisoko, 2020; Faradisa et al., 2022), whereas the present study demonstrates the relevance of Duolingo in strengthening communicative competence within SMK settings where practical communication skills are essential. The mixed-methods evidence highlights that meaningful gains occur when digital tools are intentionally integrated with interactive, teacher-mediated pedagogies.

Taken together, these findings affirm that Duolingo's effectiveness resides not in its isolated use but in its thoughtful integration into communicative classroom strategies. This combination produced measurable improvements in speaking performance, motivation, and participation, while simultaneously revealing challenges related to self-regulation and technology. These results underscore the importance of deliberate instructional design, institutional support, and the alignment of digital tools with communicative and sociocultural principles in strengthening vocational students' communicative competence.

CONCLUSION

This study concludes that integrating Duolingo with interactive classroom practices effectively improves vocational students' speaking skills, with the most significant gains observed in communicative competence. Vocabulary, fluency, grammar, and pronunciation also showed notable progress, supported by gamified features that increased motivation and engagement. However, challenges in self-regulation and access to technology indicate that Duolingo works best as a complementary tool rather than a stand-alone solution. Teacher mediation and structured classroom tasks are essential to transfer digital practice into authentic communication. With the Merdeka Belajar curriculum, Duolingo offers practical value for vocational education and workplace readiness. Future research should examine its long-term impact, broader implementation, and integration with other digital learning strategies.

ACKNOWLEDGMENTS

The author would like to thank the Institute for Research and Community Service (LPPM) of Jambi University for providing funding support through the Beginner Research Scheme for the 2025 fiscal year. Thanks to this support, the research can be carried out effectively and smoothly, resulting in valuable findings for the development of English language learning, particularly in vocational education.

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