

The Effect of Using Duolingo Application on Students' Speaking Skills in Higher Education

Pipit Rahayu¹, Eripuddin², Ng Yu Jin³, Bayu Arya Dinata⁴

¹ Universitas Pasir Pengaraian, Indonesia; darariau2010@gmail.com

² Universitas Pasir Pengaraian, Indonesia; eripuddin85@gmail.com

³ UNITAR University College Kuala Lumpur, Malaysia; yujin.ng@unitar.my

⁴ Universitas Pasir Pengaraian, Indonesia; bayuaryadinata1@gmail.com

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ABSTRACT

Speaking skills remain a core component of English language proficiency, yet many EFL learners struggle to develop it effectively through conventional instruction alone. This study investigates whether the use of the Duolingo application can enhance the speaking skills of fourth-semester students in the English Department at Pasir Pengaraian University. A quantitative, pre-experimental design was employed using a one-group pretest-posttest model. The participants consisted of 24 fourth-semester students selected through cluster total sampling. Students' speaking skills were assessed before and after a treatment period involving the use of Duolingo as a supplementary learning tool. The findings revealed a notable improvement in students' speaking performance following the intervention. The average pretest score was 63.96 with a standard deviation of 18.11, which increased to 82.92 in the post-test with a standard deviation of 11.60. This improvement suggests a positive effect of Duolingo on students' speaking proficiency. The results indicate that mobile-assisted language learning applications such as Duolingo may serve as effective supplementary tools in higher education contexts. While the findings demonstrate short-term gains, further longitudinal research is necessary to evaluate the sustainability and broader applicability of these outcomes. Nonetheless, this study supports the integration of digital learning platforms into English language instruction to foster more engaging and autonomous learning experiences.

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Corresponding Author:

Pipit Rahayu

Universitas Pasir Pengaraian, Indonesia; darariau2010@gmail.com

1. INTRODUCTION

Speaking skills are one of the most critical aspects of English language learning because they directly reflect learners' ability to communicate effectively (Hadi & Syafira Junor, 2022; Rahayu, 2015a; Rahayu et al., 2024). In higher education, where students are expected to deliver presentations,

participate in academic discussions, and engage in professional communication, the ability to speak confidently and fluently in English is indispensable (Rahayu, 2015b; Rahayu & Eripuddin, 2023).

Then, Qizi & Gayratovna, (2021) emphasize the importance of speaking skills by stating that “without grammar, little can be conveyed; without speaking, nothing can be conveyed.” This statement underlines the idea that grammar provides a foundation, but it is speaking that allows learners to share knowledge, express opinions, and interact meaningfully. Similarly, Harmer (in Haris, 2021) describes speaking as the “vital organs and flesh” of language, where grammar functions only as the skeleton. Without speaking, communication cannot be sustained, and language learning becomes incomplete.

Despite its importance, Indonesian students often face challenges in mastering English speaking skills. Traditional instructional methods remain dominant in many classrooms, relying heavily on grammar-translation techniques, rote memorization, and textbook-centered drills. While these approaches may support speaking skills, recall, and grammatical accuracy, they rarely provide sufficient opportunities for students to engage in authentic communicative practice. As a result, many students can understand written texts but still struggle to articulate their ideas fluently and confidently in spoken English (Rahman & Putri, 2022).

The continued use of teacher-centered practices also contributes to student demotivation. English is frequently perceived as a difficult and tedious subject, especially when speaking activities are limited to scripted dialogues rather than interactive communication. This lack of engagement leads to reduced confidence, low motivation, and minimal progress in speaking proficiency (Dewi, 2021). Consequently, the gap between students’ receptive skills (reading and listening) and productive skills (speaking and writing) continues to widen in higher education contexts.

To overcome these challenges, educators have increasingly turned to digital technologies. Technology integration in the classroom creates opportunities for interactive, student-centered, and personalized learning experiences. One notable innovation in this area is mobile-assisted language learning (MALL), which leverages smartphones and applications to extend learning beyond the classroom (Xu & Brown, 2021). Mobile devices have become ubiquitous among Indonesian university students, providing an accessible platform for flexible language learning (Andriana et al., 2022).

Mobile applications designed for English learning, such as U-Dictionary, Cake, and Indonesia-Ingens, have demonstrated potential in improving speaking skills retention and listening comprehension. These apps incorporate interactive tasks that encourage repeated practice, supporting long-term language acquisition (Putri & Kartowagiran, 2020). However, while these tools have benefits, few directly target speaking skill development in an engaging and systematic way.

Among mobile applications, Duolingo has gained widespread recognition as a gamified learning tool. Its interactive design, audio-visual exercises, and progress tracking mechanisms encourage students to practice regularly in a playful, low-pressure environment (Wilbert et al., 2020). The app provides learners with immediate feedback and motivational rewards, such as badges and streaks, which enhance engagement and encourage consistent practice (Nguyen & Tran, 2021).

Another strength of Duolingo is its flexibility. Learners can use the app anytime and anywhere, adapting practice sessions to their schedules. This makes it especially relevant for university students who require supplementary practice beyond classroom hours (Putri & Islamia in Tiara & Rahman, 2021). Through its personalized approach, Duolingo creates a sense of autonomy, allowing students to take responsibility for their learning while still benefiting from structured guidance.

A growing number of studies have examined the impact of mobile-assisted learning tools. Hapsari (2020) found that mobile applications improved overall English proficiency, while Dewi (2019) reported that they fostered greater learner motivation and autonomy. Both studies highlight the transformative potential of MALL in contexts where traditional teaching remains dominant. Research focusing specifically on Duolingo has also yielded encouraging results. Arifin (2021) found that the application significantly enhanced student motivation and learning satisfaction, suggesting that gamification plays an important role in sustaining engagement. Similarly, Santos et al. (2022) observed that Duolingo

offered a positive learning experience for English as a Foreign Language (EFL) students, particularly in speaking skills development.

Despite these promising findings, there are clear limitations in the existing body of research. Most studies on Duolingo have emphasized general proficiency, speaking skills acquisition, or learner attitudes. Speaking skills have rarely been the primary focus of investigation, and public speaking as a specific domain has been largely overlooked (Rofiq et al., 2021). The ability to speak in public, however, requires not only linguistic knowledge but also confidence, fluency, and effective delivery strategies.

The lack of research on Duolingo's impact on speaking skills in higher education leaves a significant gap in the literature. While mobile learning tools are widely used by Indonesian university students, little empirical evidence demonstrates whether Duolingo can directly enhance speaking performance in academic settings (Andriana et al., 2023). Most prior studies have concentrated on general English outcomes in secondary schools or informal learning contexts, leaving unanswered questions about its role in public speaking proficiency among university students.

Public speaking is particularly relevant for higher-education learners, as it prepares them for professional contexts that demand confident oral communication. Students in English departments are often required to deliver speeches, presentations, and seminar papers, yet many lack the fluency and assurance necessary for effective delivery. Research investigating how Duolingo might support this need is both timely and necessary (Liang et al., 2022).

The rationale for this study, therefore, lies in the need to examine whether Duolingo can be used not only as a supplementary tool for speaking skills or general proficiency but as a targeted approach for improving public speaking skills. Unlike traditional methods, Duolingo offers interactive, gamified practice that encourages learners to speak more frequently and confidently in authentic contexts. The purpose of this research is to investigate the effect of using Duolingo on the public speaking skills of higher-education students. The study specifically aims to evaluate whether there is a significant improvement in speaking performance after students engage with Duolingo as part of their learning activities. It also seeks to analyze which aspects of speaking such as fluency, pronunciation, and speaking skills, benefit most from the intervention.

Additionally, this study intends to explore students' perceptions of Duolingo as a learning tool. Understanding learners' experiences and attitudes toward the app is crucial for assessing its potential integration into higher-education curricula. By examining both performance outcomes and perceptions, the study provides a comprehensive perspective on Duolingo's role in speaking skill development.

To guide this research, hypotheses have been formulated. The null hypothesis states that the use of Duolingo does not significantly improve public speaking skills among higher-education students. In contrast, the alternative hypothesis posits that Duolingo significantly improves public speaking skills among higher-education students. By addressing this research problem, the study contributes both theoretically and practically. Theoretically, it extends the literature on mobile-assisted language learning by focusing specifically on speaking skills, an area often neglected in prior studies. Practically, the findings may inform educators, curriculum developers, and policymakers about how Duolingo can be integrated into English teaching practices to enhance student outcomes.

Ultimately, this study aims to demonstrate that Duolingo can serve as an effective complement to traditional instruction, providing students with accessible, engaging, and motivating opportunities to improve their public speaking skills. By doing so, it responds to the challenges faced by Indonesian university students and offers a model for integrating mobile technology into higher-education language programs.

2. METHODS

2.1 Research Design

This study employed a Pre-Experimental Design using the One-Group Pretest–Posttest Design, which emphasizes a quantitative approach. According to Duli (2019), quantitative research involves the objective collection, processing, analysis, and presentation of data to solve a problem or test a hypothesis, often with the aim of producing generalizable findings. In this design, the independent variable was the use of the Duolingo application (X), while the dependent variable was students' speaking skills acquisition (Y). This design was chosen because it allows researchers to measure improvement within a single group before and after an intervention, thereby providing insight into the effectiveness of Duolingo.

2.2 Population and Sample

The population consisted of all fourth-semester students of the English Department, totaling 24 students. Cluster total sampling was applied because the target population was small and naturally organized into a single intact class, making it more feasible to involve all members as participants (Creswell, 2017). No exclusion criteria were applied, as every student in the class participated in the study. This approach ensured representativeness of the group while minimizing potential sampling bias.

2.3 Procedures

The data collection procedures consisted of three stages:

- a. Pre-test: Students were given a speaking skills test prior to treatment to establish their baseline knowledge of English speaking skills.
- b. Treatment: Students participated in three treatment sessions using Duolingo. Each meeting focused on different speaking skills themes:
 - 1) Meeting 1: Transportation and public spaces
 - 2) Meeting 2: Animals and verbs
 - 3) Meeting 3: Household speaking skills (kitchen, bedroom, bathroom, food, and drink items)

Duolingo presented speaking skills through interactive, gamified exercises that encouraged active engagement and repeated exposure to new words.

- c. Post-test: At the end of the treatment, students completed a post-test comparable in structure and content to the pre-test. This allowed for direct measurement of speaking skills improvement.

2.4 Instrumentation

The main research instrument was a speaking test designed to measure students' oral performance in relation to the target vocabulary introduced during the treatment. Unlike written assessments that focus only on recognition or recall, this speaking test required students to produce spoken language actively. The test consisted of short oral tasks in which students responded to prompts, described pictures, and constructed simple dialogues using the target vocabulary in meaningful contexts.

The scoring of the speaking test was guided by an analytic rubric that evaluated four key components: pronunciation, fluency, grammatical accuracy, and vocabulary use. Each component was rated on a four-point scale, allowing for a detailed and balanced assessment of students' strengths and weaknesses. To enhance reliability, two independent raters evaluated the students' recorded responses, and inter-rater reliability was calculated to ensure consistency in scoring.

The inclusion of this oral component ensured that the instrument reflected the actual construct of speaking skills, rather than merely receptive vocabulary knowledge. In this way, the speaking test

provided valid and reliable data about students' communicative competence and their ability to apply newly learned vocabulary in authentic spoken interaction.

2.5 Data Collection Techniques

The collection of data in this study was carried out through two complementary procedures. The first procedure involved the administration of the speaking test as both a pre-test and a post-test. The pre-test was given at the beginning of the research to establish a baseline of students' speaking ability, while the post-test was conducted after the treatment to measure progress and improvement. Each test session took place under controlled classroom conditions to ensure fairness and consistency. Students were called individually to perform the assigned oral tasks, and their responses were recorded using an audio device. Recording the performances allowed the researcher to preserve the data for detailed evaluation and to provide raters with the opportunity to review responses multiple times if necessary.

The evaluation process of the speaking data followed an analytic scoring rubric with four assessment categories: pronunciation, fluency, grammatical accuracy, and vocabulary use. Two independent raters assessed all the recordings, and their scores were compared to check for consistency. Any significant discrepancies were discussed and resolved, while inter-rater reliability was also calculated statistically to confirm the dependability of the scoring process. This procedure ensured that the results of the test accurately reflected the students' speaking ability.

The second procedure consisted of collecting supporting documentation throughout the implementation of the treatment. Lesson plans were compiled as evidence of instructional design and alignment with research objectives. Classroom photographs and video recordings were taken to document teaching activities, student participation, and the overall learning atmosphere. These additional materials not only provided contextual information but also strengthened the validity of the findings by showing how the treatment was carried out in practice.

It is important to note that the duration and scope of the treatment in this study were limited. The intervention consisted of only three sessions and focused on a restricted set of vocabulary themes (transportation, animals and verbs, household-related items). While this design allowed for controlled observation of improvement, it also means that the findings should be interpreted with caution, as the short duration and narrow content coverage may not fully represent the broader potential of Duolingo in language learning.

2.6 Data Analysis Techniques

Data were analyzed using SPSS version 16.0. Three main procedures were carried out:

- a. Normality Test: The Kolmogorov–Smirnov test was used to assess whether the data followed a normal distribution. A significance value greater than 0.05 indicated that the data were normally distributed, making parametric testing appropriate.
- b. Paired-Samples t-test: A paired-samples t-test was conducted to compare pre-test and post-test scores. This test is appropriate because it evaluates whether there is a statistically significant difference in means for the same group measured at two different times (Al-Kassab, 2022).
- c. Hypothesis Testing: The null hypothesis (H_0) stated that there was no significant difference in students' speaking skills scores before and after using Duolingo. The alternative hypothesis (H_1) stated that there was a significant improvement in speaking skills after using Duolingo.

3. FINDINGS AND DISCUSSION

3.1 Findings

The analysis of students' speaking test scores indicated a notable improvement after the treatment with Duolingo. The mean pre-test score was 63.96 (SD = 18.11), while the mean post-test score increased to 82.92 (SD = 11.60). This descriptive result suggests a positive change in students' speaking

performance. To statistically verify the improvement, a Paired-Samples t-test was conducted. The results showed a significant difference between pre-test and post-test scores, $t(23) = 5.85$, $p < 0.001$. The effect size, measured using Cohen's $d = 1.19$, represents a large effect, indicating that the Duolingo treatment had a strong influence on students' speaking skills. These findings suggest that, even within a relatively short intervention consisting of only three sessions and limited vocabulary themes, the use of Duolingo contributed substantially to the enhancement of students' oral performance in pronunciation, fluency, grammatical accuracy, and vocabulary use.

Table 1. Descriptive statistics of pretest and posttest of using the Duolingo application in speaking skills

Descriptive Statistics						
	N	Mean	Std. Deviation	T (df)	p-value	Cohen's d
Pretest	24	63.96	18.11			
Posttest	24	82.92	11.60	$t(23)=5.85$	< 0.001	1.19 (large)

The descriptive statistics provide an overview of students' speaking skills performance before the use of Duolingo. The pre-test results showed an average score of 63.96, which indicates that students' initial speaking skills mastery was relatively modest and below the level expected for satisfactory proficiency. The wide score range, from 20 to 90, further illustrates considerable variation among students' abilities. This disparity is supported by the relatively high standard deviation of 18.11, suggesting that while some students had already acquired substantial speaking skills knowledge, others struggled significantly at the baseline stage.

Following the treatment, the post-test scores demonstrated a marked improvement in overall performance. The mean increased to 82.92, reflecting an average gain of nearly 19 points when compared with the pre-test. This significant rise highlights the effectiveness of the Duolingo application in supporting speaking skills acquisition. The increase in the mean score not only suggests overall progress but also demonstrates that students as a group benefited substantially from the intervention.

Another important finding lies in the reduced variability of scores in the post-test. The standard deviation decreased from 18.11 in the pre-test to 11.60 in the post-test, showing that students' performance became more consistent. This narrowing of score dispersion indicates that weaker students made notable progress, reducing the performance gap that had been apparent in the pre-test. Thus, Duolingo not only improved the overall speaking skills scores but also contributed to greater equity among students.

Finally, changes in the minimum and maximum scores offer additional insight into the intervention's effectiveness. The minimum score increased sharply from 20 in the pre-test to 60 in the post-test, demonstrating that even the lowest-achieving students experienced meaningful gains. At the same time, the maximum score improved slightly, from 90 to 95, confirming that higher-achieving students were able to maintain or even strengthen their speaking skills proficiency. Taken together, these results show that the Duolingo application elevated students' overall speaking skills mastery while also narrowing the achievement gap, thereby promoting more balanced learning outcomes across the class.

The improvement chart is as follows :

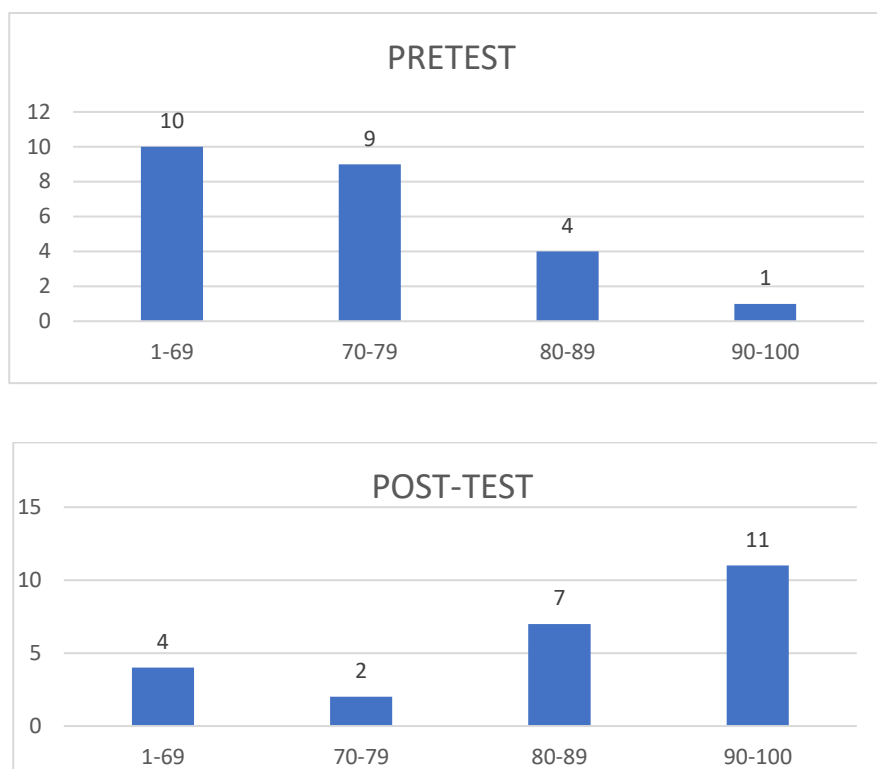


Figure 1. The Improvement of Speaking Skills

The distribution of pre-test scores provides a comprehensive overview of students' initial speaking skills proficiency prior to the implementation of Duolingo. The largest subgroup, consisting of 10 out of 24 students (41.7%), achieved scores within the 1–69 range, reflecting very limited mastery of speaking skills and indicating performance well below a satisfactory standard. This suggests that nearly half of the class entered the study with weak recognition and recall abilities, which likely constrained their capacity to engage in more complex communicative tasks.

The second-largest subgroup, comprising 9 students (37.5%), obtained scores between 70–79. These learners may be categorized as “borderline” performers, demonstrating partial mastery of speaking skills but lacking consistent proficiency. While they possessed some foundational knowledge, their ability to apply these skills effectively in extended communicative contexts was likely limited.

A smaller proportion of 4 students (16.7%) scored within the 80–89 range, indicating stronger baseline competence and a readiness to build on their existing knowledge. Their results imply prior exposure to English speaking practice, either through academic instruction, extracurricular engagement, or self-directed learning. Nevertheless, their scores still suggested potential areas for refinement. Only one student (4.1%) achieved a score in the 90–100 range, signaling advanced competence prior to the intervention. This outlier may reflect factors such as higher motivation, access to additional learning resources, or prior language exposure. Taken together, the pre-test distribution reveals a cohort predominantly clustered at lower and mid-levels of proficiency, highlighting both the necessity of an instructional intervention and the challenge of addressing diverse ability levels within a single classroom context.

In contrast, the post-test distribution demonstrated substantial improvement in speaking skills following the use of Duolingo. The largest subgroup, comprising 11 students (45.8%), achieved scores

within the 90–100 range, representing a significant increase compared to the pre-test, in which only one student reached this level. This indicates that the intervention facilitated marked gains in advanced proficiency.

Additionally, 7 students (29.2%) scored in the 80–89 range, suggesting that more than one-quarter of the class achieved strong speaking skills mastery. When combined with those in the highest category, 18 students (75%) reached scores of 80 or above, reflecting a major upward shift in overall achievement. Conversely, only 2 students (8.3%) fell into the 70–79 range, and 4 students (16.7%) remained within the 1–69 range. Although a minority of learners continued to perform at lower levels, the reduction in this group from 10 to 4 students underscores the intervention's potential in supporting weaker learners.

Overall, the post-test outcomes demonstrate a clear upward redistribution of performance, with the majority of students advancing into higher achievement brackets and the number of low-performing learners substantially reduced. These findings suggest that Duolingo contributed not only to raising the average level of speaking proficiency but also to narrowing disparities in performance, thereby fostering more equitable learning outcomes across the cohort.

3.2 Discussion

The findings of this study reveal a significant improvement in students' mastery of speaking skills mastery after using the Duolingo application. These results suggest that Duolingo not only raised overall speaking skills performance but also reduced disparities among students, allowing weaker learners to catch up with their peers. Such outcomes are consistent with previous research emphasizing the role of mobile-assisted language learning (MALL) tools in promoting more equitable learning (Andriana et al., 2022). Similar findings were reported by Ta'amneh, Rasheed Al-Qeyam, and Al-Ghazo (2024), who found that EFL learners using Duolingo achieved significantly higher speaking skills competence compared to those using traditional methods.

Then, in the pre-test, there was wide variability, indicating gaps between stronger and weaker learners. After treatment, students' scores became more consistent, suggesting that Duolingo helped level the playing field. This mirrors findings by Smith (2024), who observed that Duolingo reduced performance gaps among university students learning Spanish, particularly supporting lower achievers through adaptive exercises. This aligns with Gualán (2025), who found that Duolingo was especially effective in raising the performance of students previously categorized as low-achieving, enabling them to meet baseline proficiency requirements. The implication is that Duolingo can serve as a remedial tool, providing equitable access to speaking skills learning resources. This dual effect—lifting the weakest students while sustaining or improving the performance of stronger ones—suggests that Duolingo's gamified and personalized design supports learners across different proficiency levels (Shortt, 2023, B & Rozimela, 2023; Rahayu et al., 2022, 2024).

The results also reinforce the importance of learner motivation and engagement in speaking skills learning. Several studies highlight how Duolingo's gamification—through badges, streaks, and immediate feedback—fosters motivation (Nguyen & Tran, 2021; Wilbert, Li, & Ng, 2020). Students in this study likely experienced similar motivational benefits, which contributed to their improved outcomes. Beyond motivation, the adaptive feedback mechanisms embedded in Duolingo provide a scaffolded learning environment. Cui and Sachan (2023) emphasized that personalized exercise generation enhances learning efficiency by targeting individual weaknesses. This could explain why students in the present study demonstrated not only higher mean scores but also reduced variability in performance.

The present findings also resonate with broader systematic reviews on mobile-assisted learning, in comparing these findings with secondary education studies, parallels are evident. Mevia (2024) reported significant speaking skills gains among eleventh graders after using Duolingo, while Zainudin (2025) confirmed its effectiveness with Grade 10 students. The consistency of outcomes across different age groups and educational levels underscores the broad applicability of Duolingo in speaking skills

instruction. Moreover, these findings contribute to the growing body of research demonstrating Duolingo's potential in higher education. Febrianti et al. (2024) found that university students improved speaking skills retention and reported greater autonomy when using Duolingo, echoing the improvements observed in the present study. Such consistency across contexts strengthens the generalizability of the findings.

However, it is important to acknowledge potential limitations. Mogavi, Guo, Zhang, Haq, Hui, and Ma (2022) cautioned that gamification, while motivating, can sometimes distract learners from deeper content mastery. While students in this study demonstrated significant speaking skills improvement, future research should consider whether learning was limited to short-term memorization or extended to long-term communicative competence.

Another consideration is that Duolingo primarily targets decontextualized speaking skills learning. Liang et al. (2022) argue that speaking skills acquisition is most effective when integrated into meaningful communicative contexts. Thus, while Duolingo provided measurable gains, its integration with classroom discussion and practice would likely enhance transfer to authentic communication. Ethical and practical aspects also deserve attention. The positive results demonstrate Duolingo's potential to bridge equity gaps by offering free, accessible learning opportunities. As Xu and Brown (2021) note, mobile technology reduces barriers to learning by enabling students to practice anywhere and anytime. This accessibility may explain the sharp improvement among low-achieving students in this study.

Future research might explore longitudinal outcomes, examining whether improvements persist beyond the intervention period. Almeida, Kalinowski, Uchoa, and Feijo (2023) highlighted that novelty effects in gamified tools may fade over time, potentially reducing long-term impact. Longitudinal studies could test whether Duolingo's effects endure with continued use. In addition, future studies could triangulate quantitative results with qualitative data, such as student reflections and teacher observations. Kamsik (2023) found that students' perceptions of Duolingo were largely positive, but also highlighted areas needing improvement, such as the lack of contextualized speaking practice. Mixed-methods approaches would provide a richer understanding of the tool's impact.

Nevertheless, it is important to note that this study is not without limitations. The research design applied was a one-group pre-test and post-test without the inclusion of a control group. This absence of a control group reduces the internal validity of the findings, since it is difficult to confirm with certainty that the observed improvement in students' speaking skills resulted exclusively from the integration of Duolingo. Other external factors may have contributed to the outcome, such as the students' natural maturation, their increasing familiarity with speaking tasks, the practice effect from repeated testing, or even the influence of parallel classroom activities. Because of this, the positive results reported in this study must be interpreted with caution, as the gains cannot be attributed solely to Duolingo.

In addition, the lack of randomization and the limited sample size further constrain the generalizability of the results. While the data indicate that Duolingo can serve as a supportive tool in developing speaking proficiency, the findings may not reflect the experience of a broader or more diverse population of learners. Therefore, the evidence presented here should be viewed as preliminary rather than definitive. To strengthen future investigations, researchers are encouraged to adopt more rigorous experimental designs. For example, including a control group, employing random assignment, and extending the duration of the intervention would provide stronger grounds for causal claims and allow for deeper insights into the long-term impact of Duolingo on speaking performance. Such methodological improvements would not only increase the reliability of the results but also enhance the study's contribution to the field of technology-assisted language learning.

Overall, the present findings confirm that Duolingo is an effective mobile-assisted tool for improving speaking skills acquisition in higher education. It not only raised overall achievement but also reduced disparities, particularly benefiting lower-achieving students. These outcomes are

supported by a growing body of research across educational levels and contexts, strengthening the case for integrating Duolingo into formal instruction.

This study provides initial evidence of the potential of Duolingo to support speaking skills development among higher education students. However, its scope was limited by two main factors: the short duration of the intervention and the restricted range of vocabulary topics covered during the treatment. Because the intervention lasted for only three sessions and included only a small set of speaking themes, the findings cannot be generalized to long-term language learning outcomes or to broader communicative competencies. Future research with longer duration, expanded content coverage, and diverse participant groups is needed to confirm and extend these preliminary results.

4. CONCLUSION

This study investigated the use of Duolingo as a supplementary tool for speaking skills acquisition through a one-group pretest–posttest design. The results indicated a marked improvement in students' performance, with higher post-test scores and reduced variability among learners. These findings suggest that Duolingo has potential as a supportive platform that can enrich language learning, encourage consistent practice, and provide opportunities for both stronger and weaker students to develop their speaking skills.

While the results are promising, the research design does not permit definitive claims about causality. The observed improvement cannot be attributed solely to the use of Duolingo, as other factors, such as students' prior exposure, practice effects, or parallel classroom activities may have influenced the outcomes. Therefore, the findings should be interpreted as evidence of a positive association rather than causal proof of effectiveness.

Nevertheless, the study contributes to the growing literature on mobile-assisted language learning by highlighting the pedagogical value of integrating digital applications into language instruction. Duolingo's gamified features, interactivity, and accessibility make it a useful complement to traditional teaching, particularly in fostering engagement and reducing learning disparities. Future research employing more rigorous designs—such as randomized controlled trials or mixed-method approaches—is recommended to confirm these findings and explore their long-term implications.

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