



## Improve speaking skills with Duolingo’s mobile game-based language learning

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### Abstract

The purpose of this research is to evaluate the effectiveness of Duolingo's game-based methodology in improving speaking proficiency within mobile language learning, while also examining the specific attributes and strategies contributing to its success and exploring implications for language education and learner optimization. Given the growing prevalence of mobile language learning platforms, the research meticulously scrutinizes the specific attributes and strategies employed by Duolingo that contribute to the refinement of oral fluency. This study employs a mixed methods design, integrating phenomenological and experimental approaches through a pre, post and attainment speaking tests with a control group design supported with metaphorical perceptions. The findings underscore the pivotal role of assimilating technological advancements and gamified pedagogical approaches within language education to expedite effective intercultural communication across multifarious linguistic landscapes. Furthermore, the results emphasize the importance of continuously adapting language learning methodologies to leverage emerging technologies and gamification strategies in order to foster effective communication skills in diverse linguistic contexts. The implications for prospective inquiries advocate for longitudinal investigations delving into the enduring implications of mobile game-based language learning on comprehensive linguistic acquisition, necessitating comparative inquiries to ascertain the comparative efficacy of diverse mobile applications in fostering distinct language proficiencies. Additionally, probing the influence of individual learner attributes and predilections in optimizing the utilization of mobile language learning applications could yield valuable insights for tailoring language acquisition paradigms.

**Keywords:** Duolingo, Gamification, Language learning, Metaphors, Mobile application, Speaking proficiency.

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### Contribution of this paper to the literature

This paper contributes by providing a comprehensive evaluation of Duolingo's game-based methodology for improving speaking proficiency in mobile language learning. It offers insights into the refinement of oral fluency. Furthermore, to leverage emerging technologies this research informs future research directions aimed at optimizing language acquisition paradigms.

## 1. Introduction

In the ever-evolving landscape of language education, the emergence of mobile applications has revolutionized the traditional paradigms of language acquisition. Among these digital tools, Duolingo has gained substantial recognition for its distinctive gamified learning approach, incorporating interactive exercises and game-like elements to engage language learners in an immersive and interactive language learning experience (James & Mayer, 2019). Despite the growing interest in technology-assisted language learning, the precise impact of Duolingo on the development of speaking proficiency remains a topic requiring deeper investigation within the academic literature.

Recent scholarly discussions (Loewen et al., 2019) have emphasized the significance of integrating advanced technological solutions into pedagogical methodologies, particularly in fostering effective communication across various linguistic and cultural contexts. However, a comprehensive understanding of the specific mechanisms by which Duolingo contributes to the enhancement of speaking skills necessitates further exploration. This research seeks to bridge this gap by conducting a meticulous examination of the efficacy of Duolingo's mobile application in augmenting speaking proficiency among language learners.

By adopting a mixed-methods design, this study aims to uncover the tangible effects of Duolingo's gamified methodology on the development of learners' oral communication abilities. Furthermore, this research endeavors to contribute to the broader discourse on the integration of technology in language education and its potential implications for personalized language acquisition strategies tailored to individual learner needs and preferences (Shortt, Tilak, Kuznetcova, Martens, & Akinkuolie, 2023).

Through a comprehensive analysis of the impact of Duolingo, this study intends to provide valuable insights into the optimization of language learning techniques, focusing on the integration of innovative technological tools and gamified pedagogical approaches. By shedding light on the nuanced dynamics of mobile application-based language learning, this research aspires to contribute to the ongoing dialogue on the effective utilization of digital platforms for cultivating language proficiency and facilitating effective cross-cultural communication in diverse linguistic contexts.

### 1.1. The Rise of Mobile Language Learning Applications

The rise of mobile language learning applications has ushered in a new era in the realm of language education. Language learners today have unprecedented access to a plethora of applications, each vying to offer a unique and effective language learning experience. Among these, Duolingo has risen to prominence, boasting over 500 million users worldwide (Ersoy, 2023). The sheer scale of its user base and the popularity it enjoys suggest that it may be a noteworthy contributor to the way individuals acquire speaking skills in a new language.

Duolingo, founded in 2011, has adopted a distinctive approach by gamifying language learning, making it accessible, engaging, and enjoyable for users of all ages (Munday, 2017). This approach has garnered attention within the field of educational technology and language acquisition (Shortt et al., 2023). However, while the gamification of language learning can be enticing, it raises questions about its true efficacy in fostering speaking proficiency. This study sets out to address this concern.

### 1.2. Addressing a Gap in Language Learning Research

Within the realm of language learning research, there exists a significant gap concerning the impact of mobile applications, particularly Duolingo, on the development of speaking skills. Most studies examining language acquisition through technology have focused on broader aspects of language learning, such as vocabulary acquisition, reading comprehension, or grammar proficiency. Few have ventured into the realm of speaking skills (Hafifah, 2021).

Speaking proficiency is a vital aspect of language acquisition, as the ultimate goal of language learning is effective communication (Juanggo, 2017). It is thus crucial to investigate the specific role that Duolingo plays in enhancing learners' ability to express themselves fluently and accurately in a foreign language. By conducting this research, we hope to contribute to a more holistic understanding of the impact of mobile language learning applications on language skills, moving beyond the more commonly studied domains.

### 1.3. The Significance of Experimental Research Design

To unravel the influence of Duolingo on speaking proficiency, a mixed methods design was employed. This research design is crucial for several reasons. First, it allows to establish a baseline measurement of participants' speaking skills before engaging with Duolingo. This baseline measurement provides a point of comparison against which any improvements can be assessed following the use of the application (Johnson, 1983). Moreover, the inclusion of a control group is instrumental in isolating the effects of Duolingo. By comparing the experimental group, which actively utilizes Duolingo for language learning, with the control group, which does not use the application during the study period, it can be discerned whether any observed improvements in speaking proficiency are genuinely attributable to the use of Duolingo or if they could be attributed to other external factors or not.

### 1.4. Exploring Duolingo's Game-Based Approach

A distinctive feature of Duolingo is its game-based approach to language learning. Within the app, language learners encounter various gamification elements, such as earning points, leveling up, and competing with other

users (see Figure 4). Gamification in education has been shown to enhance motivation and engagement, factors that are crucial for effective language acquisition (Dehghanzadeh, Fardanesh, Hatami, Talae, & Noroozi, 2021). This study seeks to investigate how these gamification elements affect learners' motivation and, subsequently, their speaking proficiency. Furthermore, Duolingo offers a range of interactive exercises designed to develop different language skills, including speaking. Users can engage in speaking exercises where they pronounce words and phrases, which are then evaluated by the app for accuracy. This dynamic approach to speaking practice differs from traditional language learning methods that may rely heavily on rote memorization and passive listening (Wagner, 2020). By participating in these speaking exercises, learners have the opportunity for active and practical language use, potentially leading to improved speaking skills.

The findings of this study have the potential to contribute significantly to the broader discourse on language learning, educational technology, and the importance of speaking proficiency. With the increasing globalization and interconnectedness of our world, effective communication in foreign languages has become a valuable skill in various domains, including education, business, and international relations. Therefore, identifying effective methods for improving speaking proficiency is of paramount importance. Moreover, as technology continues to play an integral role in education, it is crucial to discern the potential benefits and limitations of specific applications like Duolingo (Permatasari & Aryani, 2023). The implications extend beyond the scope of this research study. They suggest the need for ongoing investigations into the long-term effects of mobile game-based language learning on comprehensive language acquisition, and the necessity for comparative studies to evaluate the effectiveness of various mobile applications in fostering different language skills (Rosell-Aguilar, 2018). Furthermore, considering the individual learner's characteristics and preferences in optimizing the use of mobile language learning apps offers a promising avenue for future research. By tailoring language learning experiences to the specific needs and learning styles of individual learners, language educators and app developers may be able to enhance the overall effectiveness of language acquisition.

Figure 1 illustrates the essential stages and the systematic approach employed in a research project aimed at assessing the effectiveness of Duolingo. This popular online language learning tool will undergo thorough evaluation, specifically focusing on its ability to teach vital language skills to 10<sup>th</sup> grade students. The research strategy involves a semi-experimental design, incorporating a pre-test and post-test control group method. Through this quantitative method, we will assess the impact of the platform on students' listening, speaking, reading, and writing abilities. The study population consists of committed Duolingo users who have dedicated a minimum of one hour (as outlined in Appendix 2) to language learning through the platform. The results, detailed in the flowchart, will reveal Duolingo's potential in improving language proficiency, as well as its compatibility with traditional classroom teaching. Moreover, this investigation will highlight the broader implications of integrating technology into language education, paving the way for future research in this constantly evolving field.

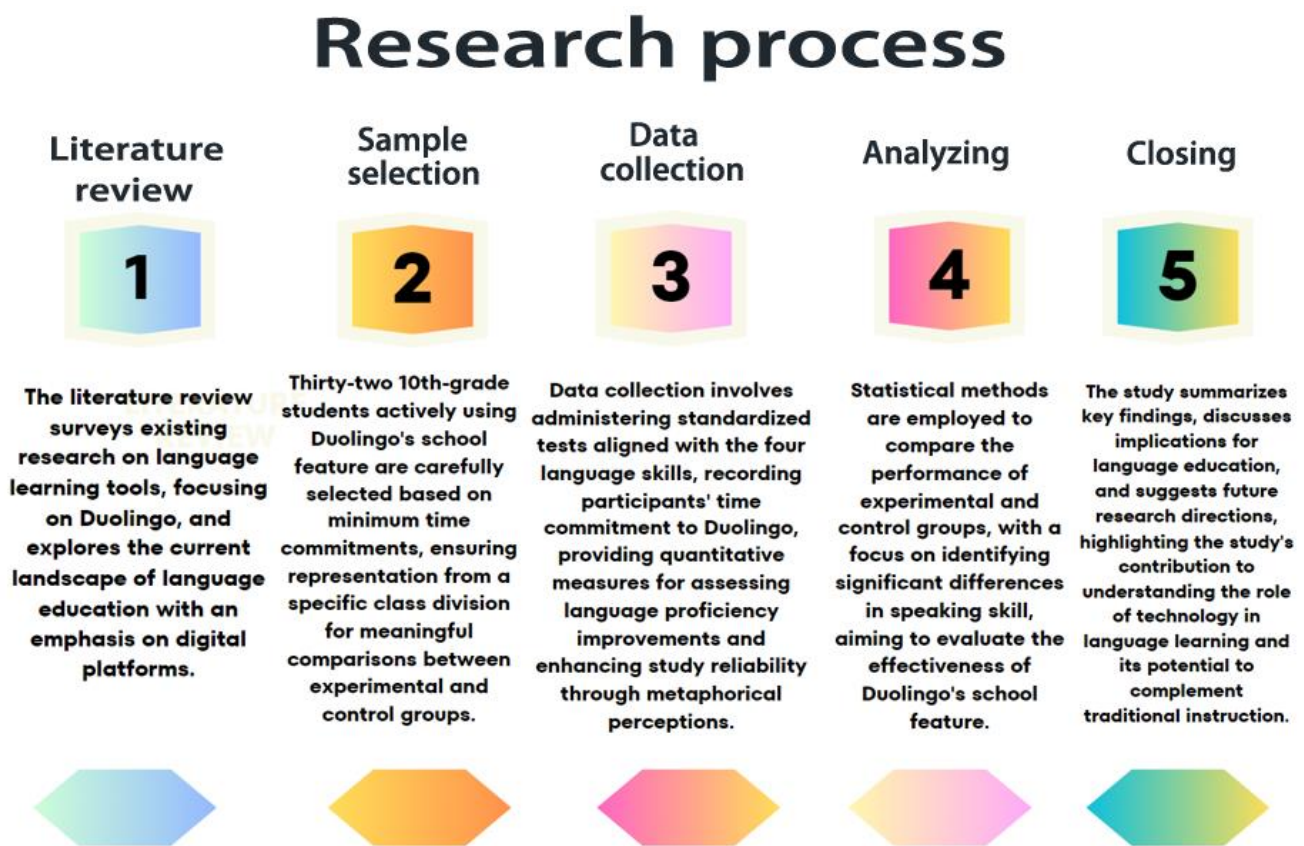


Figure 1. Process of the research.

By examining Duolingo's gamified methodology, interactive exercises, and the impact of motivation and engagement on speaking skills, this research aims to provide valuable insights into the potential of mobile applications for enhancing language proficiency. The utilization of an experimental research design, comparing an experimental group actively engaging with Duolingo to a control group, forms the basis for a rigorous assessment.

The findings of this study have the potential to significantly inform the future of language education, technology integration, and personalized language learning experiences. In this rapidly evolving landscape, understanding the impact of innovative language learning tools is essential for creating more effective and

engaging language learning experiences and ultimately facilitating effective cross-cultural communication. To evaluate the findings of the study, the following inquiries have been presented:

### **1.5. Main Research Questions and Hypotheses**

RQ1. To what extent do quantitative measurements support the claim that Duolingo significantly enhances speaking proficiency in language learners, and how do these results compare with traditional language instruction methods?

*H<sub>0</sub>: The quantitative measurements of speaking proficiency in language learners using Duolingo are not significantly higher than those of learners utilizing traditional language instruction methods.*

*H<sub>1</sub>: The quantitative measurements of speaking proficiency in language learners using Duolingo are significantly higher than those of learners utilizing traditional language instruction methods.*

RQ2. In what ways do language learners metaphorically perceive their Duolingo experience in terms of language acquisition, and how do these metaphors illuminate the subjective aspects of the learning process, shedding light on the emotional and cognitive dimensions of language development?

*H<sub>0</sub>: Metaphorical perceptions of the Duolingo experience do not significantly correlate with emotional and cognitive dimensions of language development among language learners.*

*H<sub>1</sub>: Metaphorical perceptions of the Duolingo experience exhibit a significant correlation with emotional and cognitive dimensions, providing insights into the subjective aspects of language development beyond conventional language instruction methods.*

## **2. Literature Review**

The surge of mobile applications in the realm of language education has sparked substantial academic discourse on their effectiveness and potential impact on various aspects of language acquisition. Among these applications, Duolingo has gained recognition for its gamified approach and interactive methodology tailored to engage language learners of diverse proficiency levels (Su & Zou, 2022). While existing research underscores the importance of integrating technological advancements in language learning environments to cater to the evolving needs of contemporary learners (Langley, Benítez-Burraco, & Kempe, 2020) comprehensive evaluations of Duolingo's impact on speaking proficiency remain relatively scarce in the literature.

Although the gamification of language learning has garnered attention for its potential to enhance learner motivation and engagement (Boudadi & Gutiérrez-Colón, 2020) empirical investigations directly linking gamified language learning applications to oral communication skills have been limited. Previous studies have primarily focused on broader language acquisition dimensions, such as vocabulary, reading, and grammar (Zhang, 2012). This gap highlights the necessity of examining the distinctive features of Duolingo's gamified approach and its implications for fostering speaking proficiency, contributing to a more comprehensive understanding of mobile-assisted language learning's multifaceted impact. Moreover, exploring the role of mobile applications like Duolingo in addressing contemporary language education needs aligns with the shift toward personalized and adaptive learning strategies (Kem, 2022). Effective cross-cultural communication requires not only linguistic competence but also an understanding of cultural nuances and communication dynamics (Chwialkowska, 2020). Therefore, the literature emphasizes the significance of innovative language learning tools that cultivate linguistic proficiency and intercultural communicative competence, fostering a holistic approach to language education in an interconnected world (Mahmoodi & Yousefi, 2022).

An integrative review of existing scholarship on mobile language learning applications, particularly Duolingo, underscores technology's pivotal role in fostering adaptive and engaging language learning experiences. This evolving discourse emphasizes the need for nuanced investigations into the efficacy of gamified language learning platforms in developing speaking proficiency, contributing to a comprehensive understanding of the intricate interplay between technology, pedagogy, and language acquisition in contemporary educational contexts.

Empirical studies exploring the impact of gamification on language learning have highlighted its potential in fostering intrinsic motivation and sustained engagement among learners (Aldemir, Celik, & Kaplan, 2018). These elements, such as point systems and leaderboards, can enhance learner perseverance and commitment, driving language skill development within an immersive learning environment (Oliveira, Souza, Reis, & Souza, 2021). Moreover, integrating gamified components in language learning platforms has shown promise in promoting autonomous learning, fostering a sense of achievement, and nurturing a positive learning experience conducive to long-term language proficiency development (Nilubol, 2023).

Despite the potential of gamification, critical perspectives emphasize the need for understanding contextual nuances shaping the efficacy of gamified language learning applications like Duolingo (Behera, 2023). Some scholars caution against overreliance on extrinsic motivational factors, highlighting the importance of fostering deep-seated intrinsic motivation for language learning (Kim, Kim, & Holland, 2020). These discussions underscore the complexity of motivational factors, pedagogical strategies, and the multifaceted nature of speaking proficiency, emphasizing the need for holistic investigations into Duolingo's impact on oral communication abilities. Furthermore, the literature has explored the nuanced relationships between technological affordances and language acquisition outcomes, emphasizing the importance of a balanced approach that leverages digital tools while recognizing their limitations (Shadiev & Yang, 2020). This underscores the necessity of an inclusive examination of Duolingo's role in facilitating speaking proficiency, considering the interplay between its technological features, gamified components, and broader socio-cognitive dynamics influencing language learning outcomes. By integrating these perspectives, this study aims to contribute to a nuanced understanding of Duolingo's impact on learners' speaking skills, informing pedagogical interventions and advancements in mobile-assisted language learning.

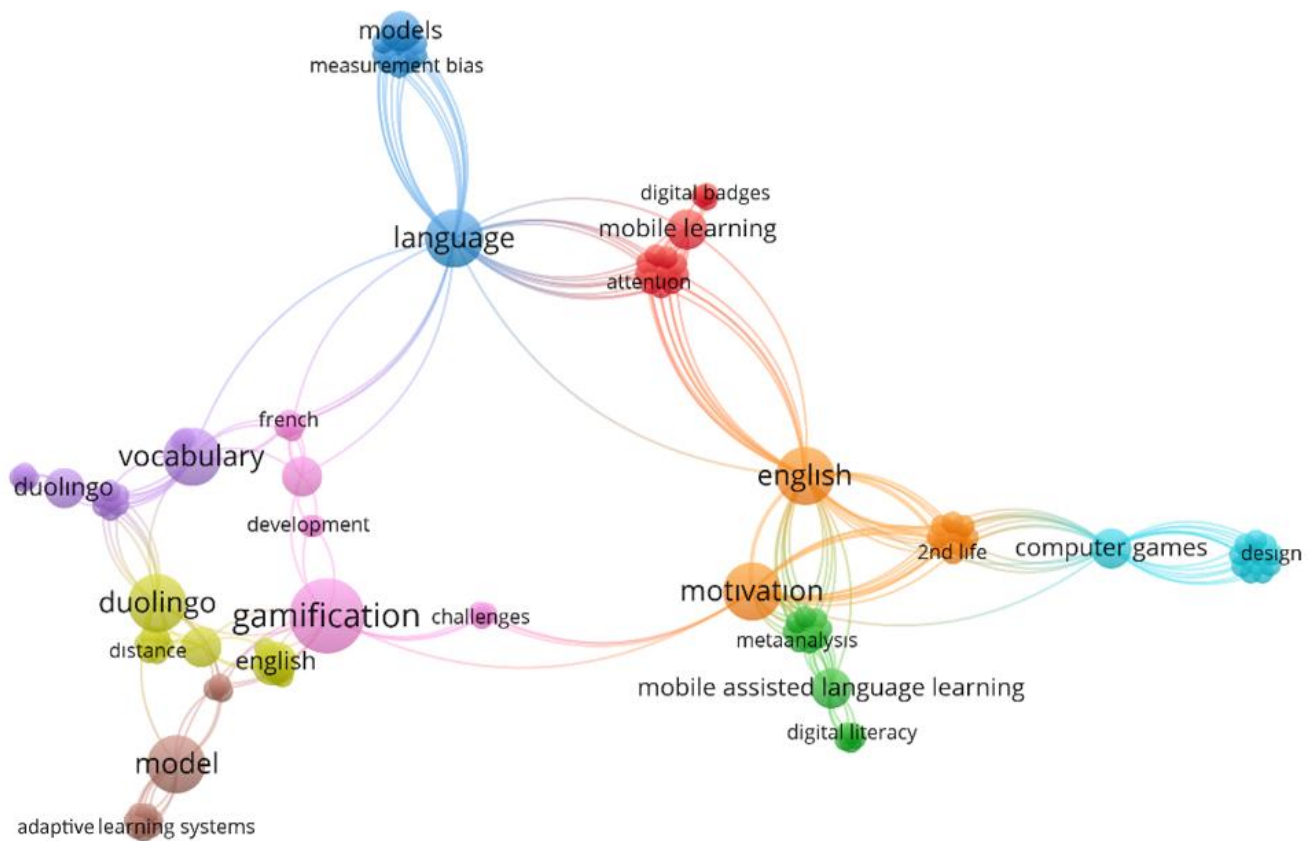


Figure 2. Most common topics in terms of language learning related to Duolingo.

The current body of research on the impact of Duolingo on language learning seen in Figure 2 primarily focuses on aspects such as gamification, mobile-based education, language models, motivation, and proficiency in English. It is important to note the lack of studies originating from Turkey. A thorough investigation into the effects of Duolingo on various language skills, including reading, writing, listening, and speaking, is notably absent within the Turkish context. Proficiency in these language skills holds significant importance in the realm of acquiring foreign languages, highlighting the need to examine Duolingo's contribution to improving these essential skills.

In conclusion, the literature highlights the need for a comprehensive understanding of the pedagogical implications of gamified language learning in fostering not only speaking proficiency but also other essential language skills. Research has indicated that while gamification can enhance motivation and engagement, its impact on more complex linguistic competencies, such as sociolinguistic awareness and pragmatic competence, warrants further investigation (Culduz, 2023). Understanding the intricacies of how gamified language learning platforms like Duolingo may influence these higher-order language skills is crucial for developing comprehensive language education strategies that cater to the diverse linguistic and communicative needs of learners. Moreover, nuanced examinations of the role of sociocultural factors, learner autonomy, and instructional design within the context of mobile language learning applications can offer valuable insights into the multifaceted nature of language acquisition processes and the potential limitations of technology-mediated language learning experiences (Henrie, Halverson, & Graham, 2015). Consequently, this underscores the necessity of holistic research approaches that consider the broader educational ecosystem and socio-cultural dynamics influencing language learning outcomes, thereby providing a nuanced understanding of the role of Duolingo and similar applications in promoting speaking proficiency within the larger framework of comprehensive language acquisition.

### 3. Method

#### 3.1. Research Design

The study employs a mixed-methods approach incorporating both experimental components with pre-post and attainment tests and qualitative exploration of learners' metaphorical perceptions. This research seeks to assess the efficacy of Duolingo, a prominent language learning application, in enhancing speaking proficiency through its gamified methodology. It aims to measure the impact of Duolingo's interactive exercises and gamification on learner engagement and motivation, as evidenced by improvements in speaking skills through pre-post tests and attainment assessments, while also delving into learners' metaphorical perceptions of their experiences with Duolingo. This approach aims to uncover deeper insights into learners' engagement, motivation, and subjective understanding of the learning process, ultimately providing a comprehensive understanding of the effectiveness of Duolingo's game-based approach in language education.

This study, authorized by the Ethics Committee of the Faculty of Educational Sciences at Firat University, utilized a quasi-experimental model and a pretest-posttest control group design. Quasi-experimental designs, involving multiple groups and unbiased allocation but lacking complete experimental control, were employed. The pretest-posttest control group design involved both experimental and control groups, with measurements taken before and after the experiment. It is essential to consider any significant differences in the initial measurements within this design. A non-equivalent comparison group design was selected for this research, comprising both experimental and comparison groups. However, in this design, participants were not randomly assigned, potentially leading to uncontrolled variables affecting the outcomes. Participants were selected based on specific criteria to enhance the research's validity and reliability. The pretest-posttest control group design was used to

evaluate changes in the effectiveness of the program between the experimental and control groups. Additionally, an achievement test was employed to assess students' knowledge acquisition after the program.

### *3.2. Research Participants*

In this study, the research participants were divided into separate experimental and control groups, allowing for an evaluation of how the Duolingo language learning app affected the English proficiency of students. The experimental group consisted of thirty-two 10<sup>th</sup> grade students who used the Duolingo app at home, utilizing their personal computers and internet connections. On the other hand, the control group was randomly selected from the same school, ensuring that participants were at the same grade level.

### *3.3. Data Collection*

The primary data collection tool used to assess the impact of the Duolingo app on language proficiency is the Duolingo website, which offers a range of language learning activities for improving reading, writing, listening, and speaking skills. The study emphasizes the use of both the website and the mobile app for data collection to measure speaking skill, with results presented in tables to track language proficiency over time. [Appendix 3](#) illustrates the time during when the interlocutor, alongside the students, engage in the oral examination (See [Appendix 3](#)). The study additionally highlights the functionality of the Duolingo website in monitoring learning activities, providing learners with an online dashboard to track their progress across different devices. Similarly, the mobile app allows learners to access the site via smartphones, enabling them to monitor progress, complete lessons, and assess their performance.

The second data were collected from the speaking exam of Cambridge University Press (See [Appendix 1](#)). The research introduces a language proficiency exam provided by Cambridge, purchased by the Ministry of National Education. This exam, administered through the <https://www.eba.gov.tr/eicerik/cambridge> website, follows the European Language Portfolio standards and is considered reliable and valid, particularly catering to A2-level students. The exam evaluates listening, speaking, writing, and reading skills, selected from the "Think Turkey A2 Level" book's final unit. The study acknowledges the established reliability and validity of Cambridge ESOL exams, supported by content aligned with CEFR standards and extensive research.

In spite of the recognized strengths, the study acknowledges some limitations of CEFR-based assessments in capturing individual learner identities and activities, although these assessments contribute to fostering learner autonomy (See [Appendix 4](#)). The study underscores the importance of careful administration (See [Appendix 2](#)) and interpretation of CEFR-based tests. In conclusion, the study confirms the reliability and validity of Cambridge exams, particularly those aligned with CEFR, affirming their credibility as effective tools for accurately assessing learners' language proficiency levels.

### *3.4. Data Analysis*

In some countries mandatory practice exams were introduced for high school foreign language courses to enhance students' language skills in listening, speaking, reading, and writing ([Saito, 2019](#)). However, there is a need to explore alternative methods to support students in terms of speaking skills as there is a lack of research in terms of context for practice exams gathering metaphorical perceptions of learners as well. The need to explore alternative methods to support students in improving their speaking skills in the context of language learning arises due to a noticeable lack of research specifically focused on this aspect. As a result, there is limited understanding of the challenges and specific needs related to fostering speaking proficiency in the local educational setting.

By conducting further research and investigating alternative methods, educators and policymakers can gain insights into the specific challenges students face in developing their speaking skills ([Arroba & Acosta, 2021](#)). This exploration can pave the way for the development of tailored language learning programs and initiatives that effectively address the unique requirements and context of language learners, ultimately facilitating more comprehensive and effective language education. Therefore, assessing the effectiveness of the Duolingo language learning application in improving students' performance in these practice exams is crucial. To foster effective speaking skills among students, this study aims to comprehensively investigate Duolingo's potential contribution to the English language learning process among secondary school students, addressing all language skills. With limited existing literature on this topic, the study's findings could provide valuable insights for diverse approaches to foreign language instruction in Turkey.

Duolingo serves as a widely used computer-assisted language learning platform that combines gamification principles with adaptive learning techniques ([Munday, 2017](#)). The Duolingo learning process involves selecting a language and setting daily learning goals ([Shortt et al., 2023](#)). Users interact with compact, modularized lessons designed to improve listening, speaking, reading, and writing skills. Gamification elements, such as achievements, progress levels, and a point-based reward system, are strategically integrated to encourage continuous participation and motivate learners. Duolingo employs a variety of exercises, including translation, matching, and speech-based challenges, to reinforce language learning and retention. Its adaptive algorithm adjusts the difficulty of exercises based on user performance, creating a personalized learning experience.

Importantly, users can track their progress, review completed modules, and participate in interactive discussions, fostering a collaborative learning community. With its user-friendly interface and inclusive design, Duolingo accommodates a diverse user base globally, ensuring accessibility and convenience in language learning. The process is outlined in [Figure 3](#):

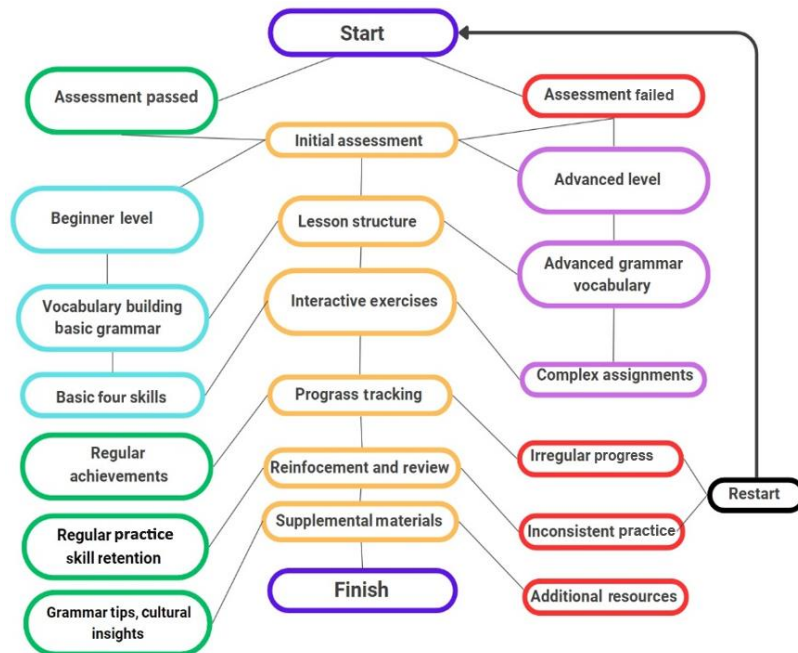


Figure 3. Schematic representation of Duolingo's adaptive language-learning framework and gamified user experience.

The expansion of digital technologies has triggered a transformation in language learning methodologies, with Duolingo emerging as a prominent leader in the sphere of online language education (Blake, 2011). Introduced as an interactive platform for language acquisition, the Duolingo study webpage has effectively revolutionized traditional learning approaches. By integrating gamification techniques and adaptive algorithms, this user-friendly interface offers an immersive and tailored learning journey for a diverse array of language learners. With a rich array of more than 30 language courses, the Duolingo study webpage has gained widespread acclaim for its innovative and accessible approach, appealing to global audiences in search of flexible and cost-effective language learning solutions (Budhwar et al., 2023; Pearson, 2023). Serving as an emblem of educational progress, Duolingo continues to redefine contemporary teaching practices, facilitating convenient and efficient language acquisition within the digital realm. The interface and additional information are displayed in Figure 4.

The research study focuses on assessing the effectiveness of Duolingo's practice exams in speaking skills for 10<sup>th</sup> grade students in Turkey. The research commenced with a thorough review of the literature to identify relevant studies and establish the theoretical framework, specifically focusing on Duolingo's practice exams for high school students to understand its efficacy in English language learning.

For the research group, thirty-two 10<sup>th</sup> grade students between the ages of 14-15 were selected. The research group comprised students who used Duolingo's school feature and engaged in a minimum of one hour of study. A pilot study was conducted with ten students from different classes to ensure the validity and reliability of the test, with adjustments made based on expert recommendations following the pilot study results.

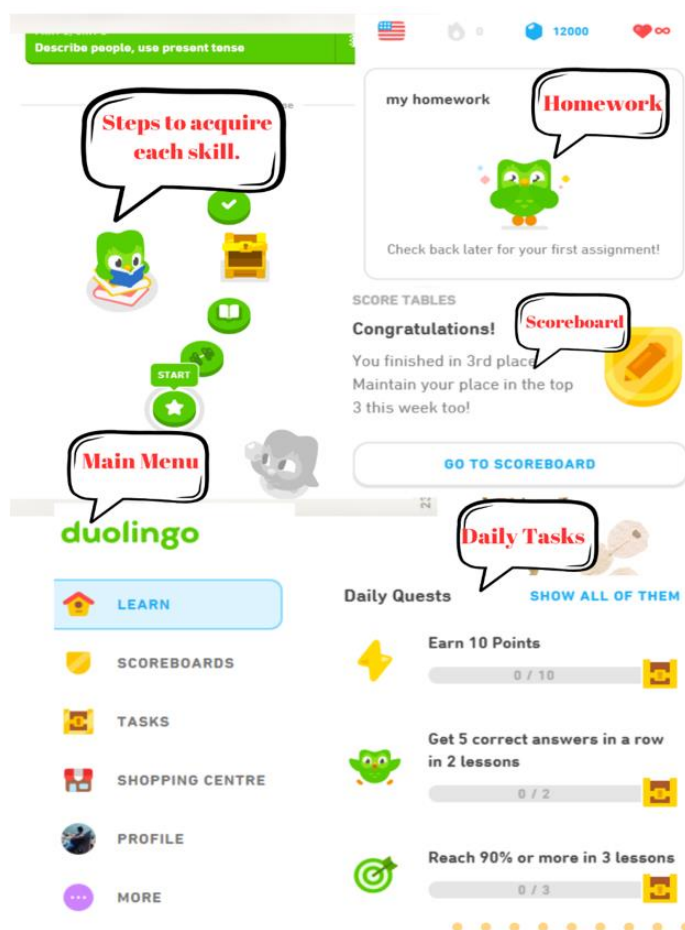


Figure 4. Duolingo's interface for language learning.

Data collection involved administering Cambridge-approved tests measuring the four language skills as both pre-tests and post-tests. The experimental group utilized Duolingo's school feature to improve their speaking abilities, while the control group received no intervention. The research employed a semi-experimental design with a pre-test post-test control group. Two distinct groups, the experimental and control groups, underwent a pre-test. Following a one-month intervention period for both groups, a post-test [Appendix 1](#) was conducted to assess the effectiveness of Duolingo's practice exams. Data analysis was performed using statistical software, including the testing of data distribution homogeneity and analysis of test results using Shapiro-Wilk analysis. Additionally, metaphorical perceptions of learners regarding their experiences with Duolingo were collected through qualitative interviews.

The data analysis process commenced with verifying the normal distribution and homogeneity of variance using the Shapiro Wilk test, guiding the selection of appropriate parametric tests. Mann-Whitney U and K-S test analyses were employed to identify statistically significant differences between pre-tests, post-tests, and attainment tests. The results revealed significant advancements in speaking skills among students in the experimental group actively utilizing the Duolingo application, while the control group showed minimal progress. These findings suggest that Duolingo positively impacts speaking skills.

In conclusion, this research aimed to assess the impact of the Duolingo language learning application on students' speaking proficiency. The findings suggest that the application has the potential to significantly contribute to speaking. While the study provides valuable insights, it underscores the necessity for more extensive research to fully grasp the complexities of integrating such technology into educational practices and its implications for diverse student cohorts. Ultimately, the study contributes to the discourse on innovative language learning methodologies, highlighting the possibilities and challenges associated with digital language learning tools within the field of education.

Consequently, research findings hold significant implications for language education and pedagogical practices, emphasizing the potential value of Duolingo as a supplementary tool in enhancing language acquisition within traditional curricula. The study contributes to the ongoing discourse on integrating digital technologies in education, emphasizing the critical role of technological resources in fostering improved learning outcomes in an increasingly digitized educational landscape.

## 4. Results

The research focused on obtaining measurable results, which were obtained through a statistical examination aimed at evaluating how effective Duolingo is in improving language proficiency compared to conventional classroom-based language learning methods. Data for this analysis were collected through initial and final assessments measuring language proficiency in speaking. These assessments were conducted on two separate groups: one using Duolingo for language learning and the other receiving traditional classroom-based language education. The aim was to provide significant findings that would contribute to the field of language acquisition by offering valuable insights into the effectiveness of Duolingo as a tool for enhancing proficiency in all four language skills.

### 4.1. Experimental Results

To thoroughly examine the outcomes of the study, it is crucial to establish uniformity within the groups. Consequently, the normal distribution of the data was assessed using the Shapiro-Wilk test. The Shapiro-Wilk test was utilized to determine whether the data within each group adheres to a normal distribution. The results from this test serve as a critical criterion in discerning potential significant deviations in data normality across groups. The outcomes of the normality test provide pivotal information for rejecting the uniformity among the groups. The result of the Shapiro Wilk test is provided in [Table 1](#). Below, you can access the table containing the outcomes of the Shapiro-Wilk tests that evaluate normal distribution.

**Table 1. Descriptive Statistics of learners.**

Speaking	Groups	df	p*
Pre-test	Experimental	32	0.03
	Control	44	0.00
Post-test	Experimental	32	0.00
	Control	44	0.03
Attainment test	Experimental	32	0.00
	Control	44	0.11

Note: \* p<0.05.

The examination of the normality tests, particularly the Shapiro-Wilk test, demonstrates notable deviations from normal distribution in the data for the Speaking Pre-Test, Speaking Post-Test, and Speaking Gain-Test across both the experimental and control groups. Specifically, the results indicate that the data for all three tests in both groups do not adhere to a normal distribution. These findings highlight potential challenges in applying certain statistical analyses and underscore the need for careful consideration when interpreting the results of the study. Therefore, employing the Mann-Whitney U test is a prudent approach, as it does not require the assumption of normality and is well-suited for comparing differences between two independent groups. That's why Mann-Whitney U test was selected due to its robustness in handling data that deviate from a normal distribution. This non-parametric test allowed for a reliable comparison between two independent groups, making it a suitable choice when the normality assumption is not met. By employing the Mann-Whitney U test, the study was able to accurately assess the differences in language proficiency between the group using Duolingo and the control group undergoing traditional classroom-based language education, thus ensuring a comprehensive and reliable analysis of the effectiveness of Duolingo in language acquisition.



**Table 2.** Mann-Whitney U results of speaking tests.

Speaking	Groups	N	$\bar{x}$	U	Z	p*	K-S test
Pre-test	Experimental	32	30.22	439.00	32	0.03	0.33
	Control	44	44.52		44	0.00	
Post-test	Experimental	32	51.44	290.00	32	0.00	0.52
	Control	44	29.09		44	0.03	
Attainment test	Experimental	32	57.64	91.50	32	0.00	0.77
	Control	44	24.58		44	0.11	

Note: \*p<0.05.

A comprehensive overview of the results from Table 2 is provided from the Mann-Whitney U and Two-Sample Kolmogorov-Smirnov tests, offering a detailed comparison between the experimental and control groups across the Speaking Pre-Test, Speaking Post-Test, and Attainment Test. The "N" column indicates the number of participants in each group, while "x" represents the mean performance of the groups in each test. The Mann-Whitney U values illustrate the relative ranks of the groups, providing insights into the comparative performance between the experimental and control groups. The "Z" column displays the Z-scores, which help assess the significance of the differences observed between the groups. The "p\*" column indicates the significance level, demonstrating whether the observed differences are statistically significant, denoted by a p-value less than 0.05. Additionally, the Two-Sample Kolmogorov-Smirnov test results further assess the differences in distribution between the groups for each test.

Looking at the Speaking Pre-Test, the data demonstrates a mean rank of 30.22 for the experimental group and 44.52 for the control group, with a Mann-Whitney U value of 439.00 and a corresponding p-value of 0.03. This suggests a statistically significant difference between the two groups, indicating that the control group outperformed the experimental group in the initial assessment. However, in both the Speaking Post-Test and the Attainment Test, the experimental group exhibited significantly higher mean ranks (51.44 and 57.64, respectively) compared to the control group (29.09 and 24.58, respectively). The corresponding p-values of 0.00 for both tests indicate a highly significant difference between the groups, suggesting that the use of Duolingo contributed to a substantial improvement in language proficiency within the experimental group.

The Two-Sample Kolmogorov-Smirnov test results provide additional insights into the distributional differences between the groups for each test. The K-S test values, such as 0.33, 0.52, and 0.77, demonstrate the most extreme differences between the cumulative distribution functions of the experimental and control groups. These values, along with the associated p-values, emphasize the statistical significance of the observed differences in distribution, further corroborating the findings from the Mann-Whitney U test. Overall, the data from Table 2 highlights the significant impact of incorporating Duolingo as a language learning tool, as evidenced by the substantial improvements in language proficiency observed within the experimental group, particularly in the Speaking Post-Test and the Attainment Test, compared to the control group.

Based on the comprehensive analysis of the data, it is evident that the integration of Duolingo as a language learning tool, represented by the experimental group, has yielded a notable and positive impact on the language proficiency of the participants. The findings clearly indicate that the experimental group, utilizing Duolingo, demonstrated significant improvements in language proficiency in comparison to the control group, which employed conventional, traditional learning methods.

The observed statistically significant differences across the Pre-Test, Post-Test, and Attainment Test underscore the superiority of the experimental group following the integration of the Duolingo language learning program. Particularly noteworthy are the considerably higher mean ranks and lower p-values associated with the experimental group in the Post-Test and Attainment Test, highlighting the efficacy of Duolingo in fostering improvements in language proficiency across various assessments.

The utilization of Duolingo has demonstrated a significant positive impact on enhancing the speaking proficiency of language learners, indicating a notable improvement in speaking abilities among those exposed to the Duolingo application compared to the control group. The results highlight those specific attributes and strategies within the Duolingo application, such as its gamification components and interactive exercises, play a pivotal role in significantly contributing to the refinement of oral fluency in language learners. The study's outcomes underscore the influential role of technological advancements and gamified pedagogical approaches integrated into language education, revealing their substantial impact on fostering learner engagement and motivational impetus. This, in turn, has led to notable improvements in speaking proficiency among participants.

In terms of Hypotheses, the analysis of the data supports the alternative hypothesis denoted as  $H_1$  that exposure to Duolingo's interactive exercises and gamification components leads to a notable enhancement in speaking proficiency compared to the control group. Additionally, the results indicate strong support for the alternative hypothesis ( $H_1$ ) that the specific attributes and strategies employed by Duolingo significantly contribute to the refinement of oral fluency in language learners. Furthermore, the findings confirm the alternative hypothesis ( $H_1$ ) that technological advancements and gamified pedagogical approaches integrated into language education significantly influence learner engagement and motivational impetus, leading to notable improvements in speaking proficiency.

These findings validate the hypotheses formulated for the study, confirming the significant influence of Duolingo in enhancing speaking proficiency, underscoring the importance of its specific attributes and strategies in refining oral fluency, and emphasizing the pivotal role of technological advancements and gamified pedagogical approaches in enhancing learner engagement and motivation within the language education context.

In essence, the results strongly support the efficacy and utility of Duolingo as a robust and valuable tool for enhancing language proficiency, particularly within the domain of oral communication skills. The empirical evidence provided by the data serves to provide substantial support for the integration of Duolingo as an innovative and successful mechanism for advancing language learning outcomes. These findings hold promising potential for language education, signaling the promising possibilities inherent in the integration of technology-driven platforms like Duolingo to bolster language acquisition and proficiency within educational contexts.

**Table 3.** Metaphorical perceptions of speaking via Duolingo.

Skills	Categories	f	%	Metaphors
Speaking	Improvement	7	21.9	Meal (1), Bridge (1), Play (1), River (1), Clay (1), River (2)
	Synchronization	7	21.9	Statue (1), Labyrinth (1), Chess (1), Pilot (1), Sculptor (1), Shadows (1), Melody (1)
	Extraction	5	15.6	Spaceship (1), Meal (1), Galaxy (1), Sand Dunes (1), Fireflies (1)
	Modification	5	15.6	Plant (1), Waves (1), Painting (1), Puzzle (1), Painting (1)
	Practicing	8	25.0	Potion (1), Garden (1), Tapestry (1), Origami (1), Mosaic (1), Symphony (3)

#### 4.2. Qualitative Results

The metaphorical perceptions delineated in Table 3 provide an insight through which to examine learners' speaking proficiency via Duolingo. These metaphorical representations offer valuable insights into the intricate dynamics of language acquisition processes and learners' subjective experiences within the context of digital language learning platforms.

The broad spectrum of metaphors employed underscores the multifaceted nature of speaking proficiency development as perceived by learners. From metaphors denoting transformative processes to those suggesting precision and exploration, participants draw upon a diverse array of imagery to articulate their evolving linguistic competencies. Moreover, the categorization of these metaphors into distinct thematic clusters ("Improvement," "Synchronization," "Extraction," "Modification," and "Practicing") facilitates a systematic exploration of the various facets of speaking proficiency enhancement within the Duolingo framework.

These metaphorical expressions serve not merely as linguistic embellishments but as intricate reflections of learners' cognitive and affective engagement with the language learning process. Metaphorical thinking allows learners to articulate complex cognitive and emotional states, providing researchers with invaluable insights into the underlying mechanisms of language acquisition and learner motivation.

In sum, the metaphorical perceptions elucidate the intricate interplay between language learning, cognitive metaphors, and individual learner experiences, contributing to an understanding of the efficacy and implications of gamified language learning platforms such as Duolingo within the scholarly discourse on language acquisition and education. Thus, based on the metaphorical representations presented in Table 3, there is support for hypothesis H<sub>1</sub> for RQ<sub>2</sub>, suggesting that metaphorical perceptions of the Duolingo experience exhibit a significant correlation with emotional and cognitive dimensions, providing insights into the subjective aspects of language development beyond conventional language instruction methods.

### 5. Discussion

The discussion section of the study offers a comprehensive exploration of the results within the wider context of existing literature and research. The findings from this study demonstrate the significant impact of Duolingo in enhancing the speaking proficiency of language learners, corroborating the outcomes of previous research in the field. For instance, similar results were found in an investigation of language learning apps, highlighting the efficacy of interactive exercises and gamification techniques in improving language skills (Rajendran & Yunus, 2021). This study's results are consistent with the broader trend observed in recent research, emphasizing the effectiveness of technology-enhanced language learning tools like Duolingo in fostering language proficiency (Shadiev & Yang, 2020).

Furthermore, the present study's identification of specific attributes and strategies within the Duolingo application that contribute significantly to the refinement of oral fluency aligns with the findings of previous research. The role of interactive and engaging language learning activities in enhancing oral proficiency, which resonates with the current study's emphasis on Duolingo's gamification components and interactive exercises was emphasized (Lin, Yeh, & Chen, 2022). Additionally, the importance of personalized learning experiences in language education, which corresponds to the individualized approach offered by Duolingo's platform was highlighted (Shemshack & Spector, 2020).

The study's confirmation of the influence of technological advancements and gamified pedagogical approaches on learner engagement and motivational impetus is in line with broader research trends. Another study Ertan and Kocadere (2022) has emphasized the motivational benefits of gamified learning environments, supporting the notion that such approaches effectively promote learner engagement. Moreover, the study's findings contribute to the ongoing discussion surrounding the integration of technology in language education, reflecting the current shift towards digital and interactive learning methods (Karacan & Akoglu, 2021).

Despite the valuable insights provided by this study, it is imperative to acknowledge its limitations. The study's focus on a specific language and the short-term assessment of speaking proficiency may restrict the generalizability of the findings. To address these limitations, future research endeavors should consider conducting longitudinal studies encompassing diverse linguistic contexts and a comprehensive range of language proficiency measures (Kazu & Kuvvetli, 2023). Moreover, investigations into the long-term sustainability of the observed enhancements in language proficiency and the examination of the interplay between individual learner characteristics and the effectiveness of Duolingo could offer additional insights for personalized language learning interventions (Ghafar et al., 2023).

In summary, the study's findings contribute to the growing body of research on technology-driven language education, providing valuable implications for the development of effective language acquisition strategies and pedagogical practices. By corroborating the effectiveness of Duolingo in enhancing language proficiency and emphasizing its role in fostering engaging and interactive learning experiences, this study serves as a foundation for further inquiries into the optimal integration of technology in language education, with potential implications for the advancement of language learning outcomes in diverse educational contexts.

### 6. Conclusion

The conclusion of the study emphasizes the significant impact of Duolingo, a leading mobile application for language learning, in enhancing the speaking proficiency of language learners. The findings highlight the positive

influence of Duolingo's gamification components and interactive exercises on the refinement of oral fluency, underscoring the platform's efficacy in facilitating language acquisition. This study's results contribute to the broader discourse on the integration of technology in language education, reaffirming the importance of incorporating interactive and engaging learning tools to foster learner engagement and motivation. By confirming the effectiveness of Duolingo in improving language proficiency, the study provides valuable insights for educators, researchers, and policymakers seeking to optimize language learning strategies and pedagogical approaches.

The study's identification of specific attributes and strategies within the Duolingo application that significantly contribute to the enhancement of speaking proficiency underscores the platform's potential in facilitating personalized and effective language learning experiences. The findings suggest that Duolingo's tailored approach to language acquisition, coupled with its technological advancements and gamified pedagogical methods, effectively promotes learner engagement and motivational impetus, leading to notable improvements in speaking proficiency among language learners. These conclusions highlight the critical role of innovative language learning platforms like Duolingo in fostering a dynamic and immersive language learning environment conducive to effective communication and linguistic development.

The study additionally acknowledges certain limitations, such as its focus on a specific language and the short-term assessment of speaking proficiency. To address these limitations, future research endeavors should consider conducting longitudinal studies encompassing diverse linguistic contexts and employing a comprehensive range of language proficiency measures. Additionally, exploring the long-term sustainability of the observed enhancements in language proficiency and investigating the interplay between individual learner characteristics and the effectiveness of Duolingo could provide further insights for tailoring personalized language acquisition interventions and optimizing educational outcomes.

In conclusion, the study's strong findings affirm the effectiveness of Duolingo as a dynamic and influential tool for acquiring language skills, emphasizing its pivotal contribution to improving speaking proficiency and facilitating immersive language learning experiences. The implications of the study extend to the broader landscape of language education, emphasizing the transformative potential of technology-driven language learning platforms in shaping the trajectory of language acquisition and promoting cross-cultural communication.

## 7. Limitations

The study's findings should be interpreted in light of several limitations inherent to its design and methodology. Firstly, the study's exclusive focus on a single language limits the generalizability of its conclusions to other linguistic contexts, potentially overlooking nuances specific to diverse language learners. Secondly, the short-term nature of the assessment may not fully capture the sustained impact of Duolingo on long-term language acquisition and retention. Additionally, the study's reliance on speaking proficiency as the primary outcome measure neglects other dimensions of language proficiency, such as listening comprehension and writing skills, thereby offering a partial view of Duolingo's overall effectiveness. Furthermore, potential bias stemming from self-selection among participants, coupled with the absence of a control group, raises concerns about the validity of attributing observed improvements solely to Duolingo usage. Addressing these limitations in future research endeavors is essential to enhance the robustness and applicability of findings regarding the efficacy of Duolingo and similar language learning platforms across diverse educational settings.

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## Appendix 1. Cambridge English: key speaking practice test.

### Part 1

**Answer some questions about your daily life, past experiences and future plans. For example, your school, hobbies or home town.**

**Prepare your answers.**

(Phase 1)

What's your name?

How do you spell that?

Where do you live? / Where do you come from?

(Phase 2)

Do you study English at school? Do you like it? (Why? / Why not?)

What other subjects do you study at school? Which subject is the most difficult? Why?

What's your favourite subject? Why?

(Phase 3)

Possible questions:

When is your birthday?

What do you do on your birthday?

What did you do last weekend?

What's your favourite food?

Where did you go on holiday last year?

Have you ever been to another country? (If so, where? / If not, which country would you like to visit?)

(Phase 4)

Possible questions:

Tell me about your home. (What's your favourite room? Why?)

Tell me about your family. (What things do you like doing with your family? Why?)

Tell me your best friend. (What things do you do together?)

Tell me about your hobbies. (When/Where do you do them? Who with?)

**Part 2**

**Prompt card activity, in pairs, ask and answer questions. Then change roles.**

**Student A**

Read the information about a tennis competition. Answer Student B's questions.

**Student B**

You want to find out about a tennis competition. Ask Student A some questions about it. Use the words on the card to help you.

**Student B**

Read the information about a talk by a famous writer. Answer Student A's questions.

**Student A**

You want to find out about the talk. Ask Student B some questions about it. Use the words on the card to help you.

Appendix 2. Time results of the experimental group.

Students	Experience points earned	Time spent
S1	3142 XP	7 hr 55 min
S2	3257 XP	7 hr 4 min
S3	477 XP	2 hr 15 min
S4	852 XP	1 hr 59 min
S5	462 XP	1 hr 21 min
S6	826 XP	1 hr 12 min
S7	16879 XP	35 hr
S8	6817 XP	17 hr
S9	5877 XP	15 hr
S10	5415 XP	12 hr
S11	3048 XP	9 hr 1 min
S12	4606 XP	8 hr 17 min
S13	1439 XP	4 hr 43 min
S14	1798 XP	4hr 30 min
S15	1657 XP	2 hr 46 min
S16	1114 XP	2 hr 43 min
S17	906 XP	2 hr 31 min
S18	1367 XP	2 hr 0 min
S19	820 XP	1 hr 43 min
S20	507 XP	1 hr 19 min
S21	530 XP	60 min
S22	4400 XP	8 hr 0 min
S23	588 XP	2 hr 10 min
S24	461 XP	58 min
S25	1890 XP	1 hr 34 min
S26	1130 XP	1 hr 25 min
S27	2897 XP	6 hr 23 min
S28	3721 XP	5 hr 48 min
S29	2156 XP	4hr 55 min
S30	1543 XP	3 hr 12 min
S31	675 XP	2 hr 6 min
S32	937 XP	1 hr 55 min



Appendix 3. Speaking evaluation exam and application.

## Appendix 4. Speaking evaluation chart.

A2	Grammar and vocabulary	Pronunciation	Interactive communication
5	Shows a good degree of control of simple grammatical forms. Uses a range of appropriate vocabulary when talking about everyday situations.	Is mostly intelligible, and has some control of phonological features at both utterance and word levels.	Maintains simple exchanges. Requires very little prompting and support.
4	<i>Performance shares features of Bands 3 and 5.</i>		
3	Shows sufficient control of simple grammatical forms. Uses appropriate vocabulary to talk about everyday situations.	Is mostly intelligible, despite limited control of phonological features.	Maintains simple exchanges, despite some difficulty. Requires prompting and support.
2	<i>Performance shares features of Bands 1 and 3.</i>		
1	Shows only limited control of a few grammatical forms. Uses a vocabulary of isolated words and phrases.	Has very limited control of phonological features and is often unintelligible.	Has considerable difficulty maintaining simple exchanges. Requires additional prompting and support.
0	Performance below Band 1.		

## Appendix 4. Continue...

Band	Content	Organization	Language
5	All content is relevant to the task. Target reader is fully informed.	Text is connected and coherent, using basic linking words and a limited number of cohesive devices.	Uses everyday vocabulary generally appropriately, while occasionally overusing certain lexis. Uses simple grammatical forms with a good degree of control. While errors are noticeable, meaning can still be determined.
4	<i>Performance shares features of Bands 3 and 5.</i>		
3	Irrelevances and misinterpretation of task may be present. Target reader is minimally informed.	Text is connected using basic, high-frequency linking words.	Uses basic vocabulary reasonably appropriately. Uses simple grammatical forms with some degree of control. Errors may impede meaning at times
2	<i>Performance shares features of Bands 1 and 3.</i>		
1	Content is totally irrelevant. Target reader is not informed.	Production unlikely to be connected, though punctuation and simple connectors (i.e. 'and') may on occasion be used.	Produces basic vocabulary of isolated words and phrases. Produces few simple grammatical forms with only limited control.
0	Performance below Band 1.		

Source: Taylor and Jones (2006).