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Abstract

This study examines the impact of Duolingo on enhancing reading comprehension skills among young EFL learners. With the increasing integration of technology into education, particularly digital platforms like Duolingo, there has been growing interest in the potential of these tools to optimize language acquisition. A randomized controlled intervention study was conducted with 150 middle basic education students in the Guayas province, divided into a control group and an experimental group. The latter used Duolingo for 60 minutes daily in addition to following the standard curriculum activities. The results, analyzed using statistical tests in Jamovi (a free and open-source software for data analysis and statistical testing), revealed improvements in the reading comprehension scores of the experimental group compared to the control group. The findings highlight Duolingo's effectiveness as a supplementary tool for enhancing reading comprehension and expanding vocabulary acquisition.

Keywords:

Duolingo, reading comprehension, language learning, educational technology, digital tools, English as a Foreign Language (EFL).

Resumen

Este estudio analiza el impacto de Duolingo en la mejora de las habilidades de comprensión lectora entre jóvenes estudiantes de inglés como lengua extranjera. Con la creciente integración de la tecnología en la educación, particularmente de plataformas digitales como Duolingo, ha surgido un interés creciente en el potencial de estas herramientas para optimizar la adquisición de idiomas. Se realizó un estudio de intervención controlado y aleatorizado con 150 estudiantes de básica media en la provincia de Guayas, divididos en un grupo control y un grupo experimental. Este último utilizó Duolingo durante 60 minutos diarios, además de seguir las actividades del currículo estándar. Los resultados, analizados mediante pruebas estadísticas en Jamovi (un software libre y de código abierto para el análisis de datos y pruebas estadísticas), revelaron mejoras en las puntuaciones de comprensión lectora del grupo experimental en comparación con el grupo control. Los hallazgos destacan la efectividad de Duolingo como una herramienta complementaria para mejorar la comprensión lectora y ampliar la adquisición de vocabulario.

Palabras clave:

Duolingo, comprensión lectora, aprendizaje de lenguas, tecnología educativa, herramientas digitales, inglés como lengua extranjera (EFL).

Introduction

Educational technology, commonly referred to as EdTech, has emerged as a cornerstone in the pursuit of knowledge, equipping students with cutting-edge resources delivered with a level of immediacy that would have been unfathomable in the past. Language instruction has been no exception to this paradigm shift. In this context, digital tools have proven highly effective in encouraging autonomous learning, reinforcing vocabulary retention, and honing essential language skills, including reading comprehension (Chen, Wang & Zhang, 2019; Johnson & Smith, 2021). Platforms such as Duolingo, Babbel, and Rosetta Stone, among many others, have redefined how students engage with foreign languages and language acquisition itself, introducing far more interactive and personalized methodologies (now further enhanced by technological advancements like AI) that profoundly enrich the educational experience (Shortt, Clark & Reeves, 2023). Moreover, research has demonstrated that when educational technology is seamlessly integrated into teaching and learning processes, it possesses the capacity to heighten student engagement, fortify knowledge retention, and cultivate higher-order thinking skills (Zhang & Wasie, 2023).

Among these platforms, Duolingo has arguably established itself as one of the most widely utilized language learning applications worldwide, drawing millions of users due to its gamified and interactive approach (Kumar, 2020). Furthermore, within the educational context, the integration of gamification strategies has been shown to significantly enhance student motivation and academic performance (Lampropoulos et al., 2024). This underscores not only the potential for academic improvement but also the way in which students approach the challenge of learning itself; their intrinsic drive to acquire knowledge.

However, despite its widespread appeal, its actual effectiveness in developing reading comprehension (an essential skill in mastering any language) remains a point of scholarly contention. As Smith and Lee (2020) observe, digital platforms have garnered considerable attention for their ability to enrich education through engaging, interactive, and undeniably innovative methodologies. From this perspective, the present study explores the extent to which digital platforms, particularly Duolingo, contribute to the advancement of reading comprehension and vocabulary acquisition among young learners in the context of English as a foreign language.

Theoretical framework

To theoretically ground this investigation, it is essential to define what reading comprehension entails. More than a mere decoding exercise, it involves a highly complex cognitive process that requires the interaction of various linguistic and metacognitive skills, such as word recognition, making inferences, and integrating new information into pre-existing cognitive structures (Grabe & Stoller, 2019). The systematic phonics instruction has been proven effective in helping children develop essential reading skills. It allows them to recognize letter sounds, blend those sounds into words, learn syllable patterns, and build reading fluency (Wallingford, 2024). Considering this, and within the context of acquiring a second language, reading comprehension takes on even greater significance as it facilitates the expansion of vocabulary, the internalization of grammatical structures, and the development of communicative competence in diverse contexts (Nation, 2009).

This process is decisively influenced by the accessibility and ubiquity of modern technology. In Ecuador, as in the rest of the world, the process of acquiring linguistic skills has been transformed by digital tools. In this sense, applications like Duolingo,

based on technology-enhanced learning (TEL) and Siemens' (2005) principles of connectivism, highlight the crucial role of digital interaction in knowledge construction. The massive availability of these platforms has redefined traditional teaching paradigms, making language

 learning more interactive and accessible, and it is precisely here that the importance of Krashen's (1985) concise hypothesis, such as the concept of comprehensible input, lies. He underscores the importance of meaningful exposure in linguistic development, a factor that technology-based learning environments actively facilitate. Thus, we could argue that technology has brought about the democratization of learning, making it easier for anyone to learn a new language, essentially, for anyone who decides to do so. Technology, in general, serves as a mediator between the learner's desire and the student, as well as a catalyst for autonomous learning; an idea that has been previously supported by Chen, Wang, and Zhang (2019).

Literature Review

Given the growing and sustained importance of technology in language teaching, along with the widespread availability of free learning platforms such as Duolingo, it is essential to examine prior studies on their impact on reading comprehension development. Research on digital applications in foreign language learning has highlighted their benefits, particularly in vocabulary acquisition and grammatical structures (Chen, Wang, & Zhang, 2019; Johnson & Smith, 2021). Jiang et al. (2021) found that Duolingo users can achieve reading comprehension levels comparable to those attained in traditional courses, often in a shorter time frame. Similarly, a systematic review by Shortt et al. (2023) identified a positive correlation between the use of Duolingo and improvements in linguistic competencies, particularly in vocabulary and communicative skills.

Another relevant study, which examined university students' experiences using Duolingo alongside traditional foreign language courses, revealed that the platform enhanced the learning process and encouraged independent learning through its gamified approach. This suggests that Duolingo can serve as a valuable supplement to conventional instruction, potentially improving reading comprehension by providing additional practice and engagement (Peláez-Sánchez & Velásquez-Durán, 2022). As Luis von Ahn, one of Duolingo's founders, states: "Gamification is probably the most important thing. We try to turn everything into a game, but we also try to tell a story" (Guerrero, 2025). He further emphasizes that "Engagement is the key, because simply showing up is the cornerstone of actually making progress with language learning" (Patel, 2025).

Despite these promising findings, questions remain regarding Duolingo's effectiveness in promoting comprehensive reading comprehension, particularly when compared to conventional methods or when integrated as a complementary tool. These concerns become even more relevant within the specific context of the Ecuadorian educational system, warranting further investigation.

Research question

This leads to the need to address the research question that guides the present study: determining the role of Duolingo in enhancing reading comprehension in young learners of English as a foreign language. In this sense, the hypothesis supporting this research is that the use of Duolingo significantly contributes to the development of reading comprehension, facilitating vocabulary acquisition and the internalization of linguistic structures in a dynamic and interactive manner (Pratasik, 2022). In this study, titled The Role of Duolingo in the Development of Reading Comprehension Skills Among Young Learners, we aim to provide empirical evidence on the impact of this digital tool on the reading comprehension learning process within Ecuadorian educational contexts.

Methodology

Research Design

The study follows a controlled and randomized educational intervention model, with a control group that did not participate in the educational intervention and the experimental group, which was exposed to the intervention. According to Brown (2023), "in intervention studies, the control group does not receive any experimental manipulation, while the experimental group is exposed to the intervention." The subjects were systematically exposed to 60 minutes of daily interaction with Duolingo; the activities on Duolingo were assigned to the students who were part of the experimental group. They were instructed to register for a free Duolingo account and engage with the platform through its web version, mobile app, or tablet version. The students worked with the free version of the application. They were subsequently asked to practice for 60 minutes daily over the course of eight weeks, starting immediately after completing the pre-intervention assessment. The platform includes a feature known as "experience points" (XP), awarded "whenever you complete lessons, read a story, do some practice, or challenge yourself with timed exercises" (Blanco, 2024). Additionally, the students' progress was monitored through a feature called "Streak," which tracks "the number of days in a row you've studied" (Blanco, 2024). Maintaining a streak of 56 days, corresponding to the duration of the intervention, was a requirement for the experimental group.

Population and Sample:

Target Population: Boys and girls; regular students in Middle Basic Education, in a school in the Guayas province, Ecuador, South America.

Eligible Population: Boys and girls between the ages of 9 and 11, who gave informed consent to participate in the study program titled: "The Role of Duolingo in the Development of Reading Comprehension Skills Among Young Learners."

Study Participants: 150 boys and girls randomly assigned to the intervention group, with a total of 75 participants, and the remaining 75 assigned to the control group. The selection of participants was random, as "random assignment is a key component of experimental design. It helps ensure that all groups are comparable at the start of a study: any differences between them can be attributed to random factors rather than research biases, such as selection bias" (Bhandari, 2023). Python programming language was used for the random selection. The script employed for the selection was the following:

```python
import random

# Lista de 150 personas

personas = ["Persona 1", "Persona 2", "Persona 3", ..., "Persona 150"] # Mezclar la lista aleatoriamente

random.shuffle(personas)

# Dividir en dos grupos de 75 personas grupo_1 = personas[:75]

grupo_2 = personas[75:] # Mostrar los dos grupos

print("Grupo 1:", grupo_1)

print("Grupo 2:", grupo_2)
```

Measurements:

Dependent Variable: Difference and Score 2, which represents the score out of 10 with two decimal points measuring the level of reading comprehension of the selected texts after the educational intervention program, compared with Score 1, which reflects the pre-intervention reading comprehension assessment.

Independent Variable: Educational intervention program: control group - no intervention, and experimental group - participated in the educational intervention program designed to improve reading comprehension.

Control Variables: Age (in completed years) and biological sex (male and female).

Statistical Analysis:

For statistical analysis, the statistical software package JAMOVI version 2.5.6.0, a public domain tool, was used.

Working Hypothesis:

1. H_0: The average post-intervention evaluation score is the same for the intervention and control groups: $x\_gc = x\_gI$

2. H_1: The average post-intervention evaluation score differs for the intervention and control groups: $x\_gc \neq x\_gI$

Descriptive Statistics for All Variables:

1. Sex: Number and percentage

2. Age, Score 1, Score 2, and Difference: Measures of central tendency and dispersion, including mean, median, and standard deviation.

Inferential Statistics: To analyze the relationship between the dependent and independent variables and test the hypothesis, the differences between the control variables and the variables Score 1, Score 2, and Difference were first evaluated. This was to ensure that these variables did not influence the final relationship between Score 2 and Difference by group (Control and Intervention). The t-test for independent samples was employed for the variable "sex," and no influence or significance was considered when the p-value exceeded 0.05.

Following the establishment of the lack of influence of the sex variable (due to statistical insignificance with a p-value greater than 0.05), the impact of the educational intervention was assessed by correlating the variables Score 2 and Difference (post-intervention) with Score 1 (measured pre-intervention). Since the variable follows a normal distribution, a parametric test, specifically the student's t-test for independent samples, was used. This test allows us to determine the absence of differences in the mean scores (Score 1) before the intervention, and the presence of significant differences in the post-intervention scores (Score 2 and Difference). A significant difference post-intervention is considered when the p-value from the test is less than 0.05.

Results

A total of 150 students from Middle Basic Education, in a school in the Guayas province, Ecuador, South America, participated in the educational intervention program designed to develop reading comprehension skills, adapted to their educational level. Among the participants, 76 (50.7%) were female and 74 (49.3%) were male, with an average age of 10 years, a minimum of 9, and a maximum of 11 years (Table 1, Figure 1).
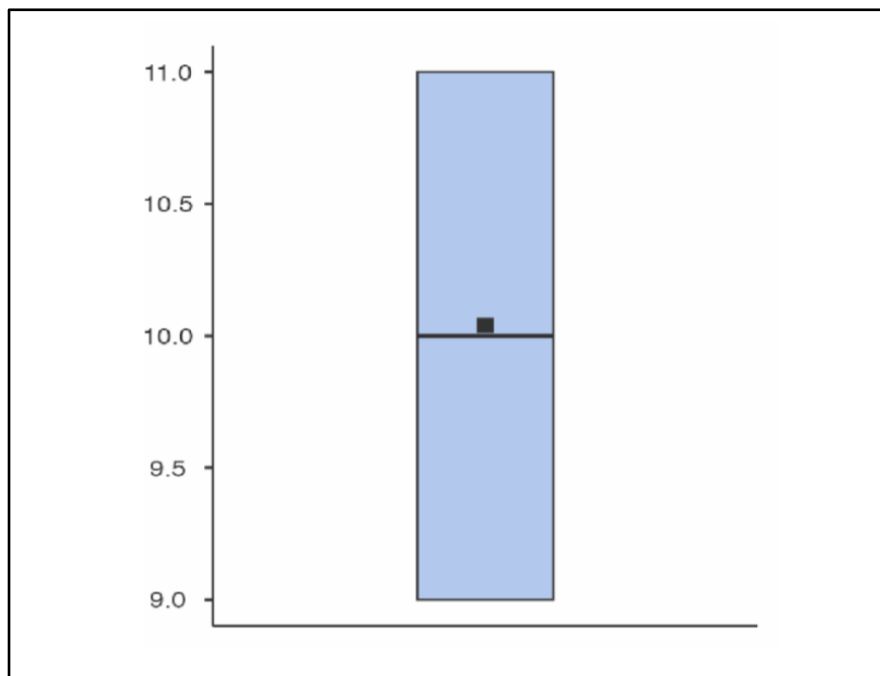
Table 1.

Descriptive Statistics Of The Age Variable

Descriptive Statistics

AGE

N =	150
Missing data =	0
Mean =	10
Median =	10
Mode =	10
Standard Deviation	0.802
Minimum	9
Maximum	11
Skewness	-0.0726
Standard Error of Skewness	0.198
Kurtosis	-1.44
Standard Error of Kurtosis	0.394

Figure 1
Boxplot of Participants' Age in Completed Years

Two study groups were formed, with participants randomly assigned: 75 students in the intervention group and 75 in the control group. The descriptive statistics for each group regarding the measured variables are detailed in the following tables. These data indicate that, at baseline, both groups were homogeneous and comparable, with no statistically significant differences in the variables assessed prior to the intervention. Specifically, the mean scores of Score 1, disaggregated by study group and sex, showed no significant differences, as indicated by the t-test results, where p-values exceeded 0.05. This confirms that the groups were initially equivalent, with no statistically significant disparities based on sex or group assignment in the pre-intervention reading comprehension evaluation.

Table 2

T-tests for independent samples; Score 1

T-test for independent samples

		Statistic	gL	p
Score 1	T Student	1.36	148	0.175

Nota. H_a $\mu_{HOMBRE} \neq \mu_{MUJER}$

Group Descriptive Statistics

	Group	N	Mean	Median	DE	EE
Score 1	M	76	7.45	7.37	0.852	0.0977
	F	74	7.27	7.32	0.838	0.097

T-test for independent samples

		Statistic	gL	p
Score 1	T Student	-0.484	148	0.629

Nota. H_a $\mu_{GRUPO\ INTERVENCION} \neq \mu_{GRUPO\ CONTROL}$

Group Descriptive Statistics

	Group	N	Mean	Median	DE	EE
Score 1	Intervention	75	7.33	7.41	0.873	0.101
	Control	75	7.4	7.3	0.826	0.095

To assess the impact of the educational intervention on reading comprehension of English texts related to health, the post-intervention scores (Score 2) were compared between the intervention and control groups. Additionally, the mean difference between the initial and final scores was analyzed to provide a more precise estimate of the intervention's effect. The results indicated a statistically significant difference in Score 2, with $p < 0.05$. The mean score for the intervention group was 7.30, whereas the control group achieved a mean score of 9.16. These findings suggest that participation in the intervention was associated with an improvement in reading comprehension performance (Table 3, Figure 2).

Table 3

T-tests for independent samples; Score 2

T-test for independent samples

		Statistic	gL	p
Score 2	T Student	16.8	148	<001

Nota. H_a μ GRUPO INTERVENCION ≠ μ GRUPO CONTROL
[a] La prueba de Levene significativa (p < 0.05) sugiere que las varianzas no son iguales

Group Descriptive Statistics

	Group	N	Mean	Median	DE	EE
Score 2	Intervention	75	9.16	8.88	0.527	0.06
	Control	75	7.3	7.32	0.805	0.09

Figure 2

*Score 2; Differences between the intervention group and the control group.*
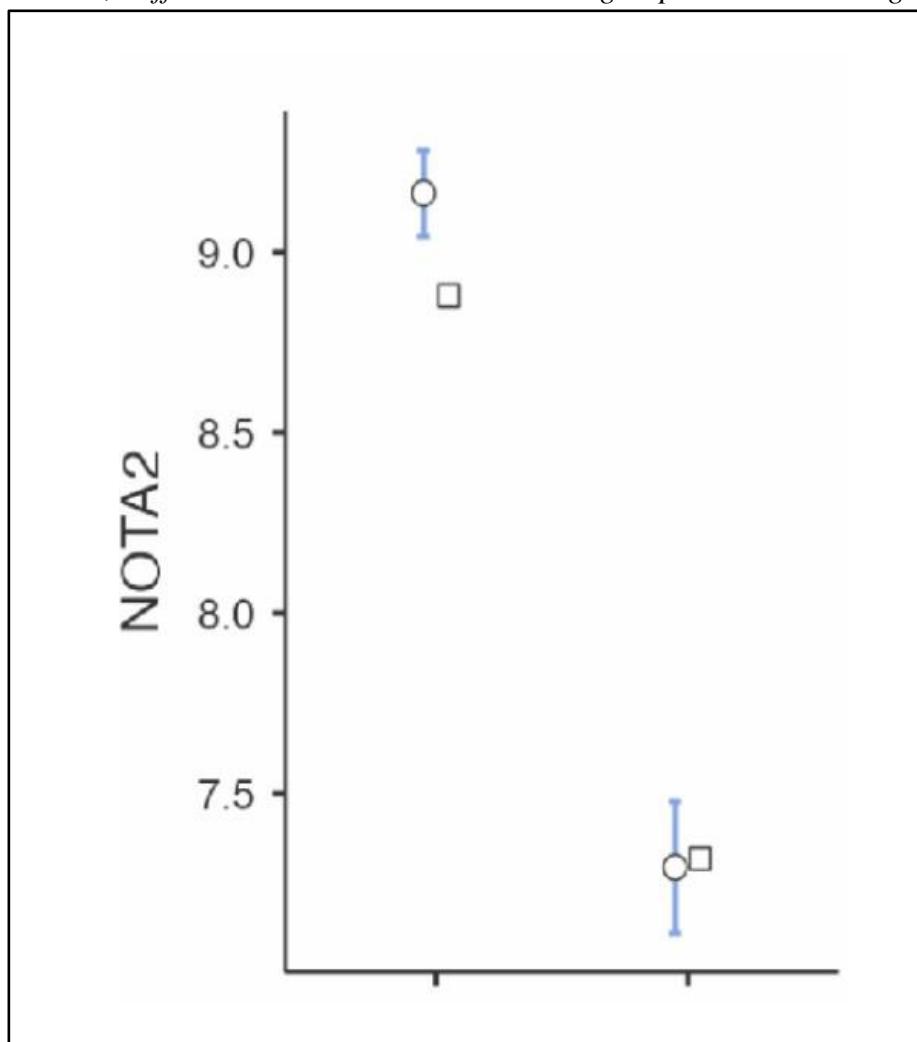
Furthermore, the mean differences between the initial (Score 1) and final (Score 2) evaluation scores were analyzed. The results revealed a statistically significant difference between these means, as determined by an independent samples t-test ($p < 0.05$). The average difference for the intervention group was 1.84, whereas for the control group, the difference remained at 0.00 (Table 4, Figure 3).

 These findings support the rejection of the null hypothesis of no difference, thereby confirming the alternative hypothesis: the mean reading comprehension scores of English texts were significantly higher in the group that underwent the educational intervention compared to the control group, which did not receive any intervention.

Table 3

T-tests for independent samples; Difference

T-test for independent samples

		Statistic	gL	p
Dif.	T Student	10.9	148	<001

Nota. H_a μ GRUPO INTERVENCION ≠ μ GRUPO CONTROL

Group Descriptive Statistics

	Group	N	Mean	Median	DE	EE
Dif.	Intervention	75	1.84	1.87	0.969	0.112
	Control	75	-0.098	-0.16	1.19	0.137

Figure 3
Difference between the intervention group and the control group..
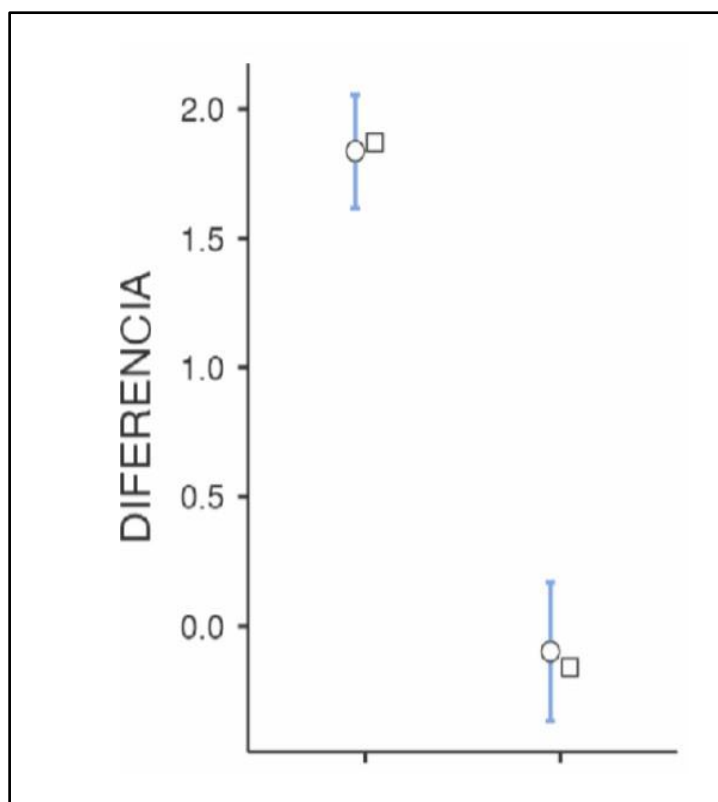
Conclusions

The findings of this study provide compelling evidence of the efficacy of educational interventions integrating Duolingo in enhancing reading comprehension of English texts among young learners. The observed improvement in mean scores underscores the potential of digital tools as valuable complements to traditional instructional methodologies. Notably, the absence of significant differences between groups at baseline confirms the robustness of these results, as the intervention's effects cannot be attributed to pre-existing disparities in age or sex.

By employing an objective assessment framework rather than subjective self-reported measures, this study offers a more precise evaluation of reading comprehension outcomes. The methodological approach grounded in measurable accuracy rather than perception-based appraisal reinforces the validity of the findings and contributes to the growing body of literature advocating for evidence-based digital pedagogical strategies.

Given these results, the integration of Duolingo into educational programs should be approached with careful pedagogical planning. While the application demonstrably enhances reading comprehension, its effectiveness is maximized when paired with structured guidance, targeted feedback, and complementary literacy practices. Future research should explore longitudinal effects, the role of adaptive learning within digital platforms, and the potential for integrating Duolingo with broader literacy development frameworks to further refine its pedagogical application.

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