

Exploring The Effect Of Online Applications In Supporting Vocabulary Acquisition And Word-Reading Development Among Adolescent EFL Learners In Public Saudi Schools

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Abstract

This research looks into the impression of incorporating online applications, particularly Duolingo, into English as a Foreign Language (EFL) instruction for adolescent learners in public schools in Saudi Arabia. A quasi-experimental design is used in the study to examine how online applications affect vocabulary acquisition and word-reading development. By exploring the potential of technology in enhancing language learning, the research aims to provide evidence-based insights that may improve existing EFL teaching practices and guide policy decisions. The outcomes of this research are predicted to benefit educational administrators, curriculum makers, and educators by offering practical insights on harnessing online tools to create engaging learning environments for digital-native adolescents. Furthermore, the study contributes to the wider field of language instruction and technological integration, with implications for improving language learning experiences and enhancing language competency in a dynamically shifting world.

Keywords: Online applications, Duolingo, Technology Integration

1.1. Background and context of this paper

Establishing the Scene for this paper Integrating technology into language teaching has become a prominent subject in an era when digital revolution is transforming educational paradigms. This is particularly true in the case of EFL instruction. This study starts on an exploratory journey to uncover the potential of online applications in enhancing vocabulary acquisition and word-reading progress among adolescent learners in the public schools of Saudi Arabia.

This research intends to combine traditional English as a foreign language (EFL) approach with the dynamic digital world considering the country's fast growth in educational technology and its focus to building global linguistic competencies. In keeping with Saudi Arabia's objective of introducing innovative ideas into its educational system, the study intends to give a full grasp of the effect of popular online platforms like Duolingo on the process of language learning.

This brief introduction lays the groundwork for a more in-depth analysis of how digital tools can change the way a new generation of "digital natives" learn languages, providing information that may influence the direction of English as a foreign language (EFL) program in Saudi Arabia and elsewhere.

The Kingdom of Saudi Arabia, with its legendary history and booming economy, realizes the value of English as a Foreign Language (EFL) programs in educating its young for global citizenship (Alharbi, 2020).

Recently, there has been a considerable push to modernize the Kingdom's educational system to meet the difficulties of the contemporary day, and one component of this transition has been the inclusion of technology into classrooms as a tool to enhance students' language learning results (Nomass, 2013).

Adolescents offer a vital demographic for English as a foreign language (EFL) lesson in Saudi Arabian public institutions. Vocabulary and word-reading growth are pillars of effective language learning, enhancing students' abilities to communicate, comprehend, and interact with a greater variety of information (Alqahtani, 2015).

However, although conventional educational techniques are essential, they may need to be modified to fit the different learning preferences and styles of today's students (Aloraini, 2012).

1.1.1. Rationale

Reasoning for the drive for this research originates from the convergence of two crucial factors: the need for effective language training and the potential of technology to alter teaching approaches. The research on EFL education in Saudi Arabia recognizes the difficulty encountered in responding to the different linguistic demands of students, frequently worsened by high class numbers and insufficient resources (Albahri et al., 2018). Concurrently, the rise of web apps as dynamic, interactive tools gives a chance to bridge this gap by offering individualized, engaging learning experiences.

As digital natives, students in Saudi public schools are used to navigating the internet terrain. Leveraging online apps in EFL education shows potential not just in resolving the pedagogical gaps but also in generating a pleasant and engaging learning environment (Pinto & Leite, 2020). By studying the effects of online apps on vocabulary acquisition and word-

reading development, this research attempts to add to the continuing conversation on effective language teaching in the Saudi context.

1.2. Statement of the problem

Despite the acknowledged relevance of English as a Foreign Language (EFL) in the globalized world, the efficiency of existing teaching approaches in public Saudi schools confronts serious issues. As Saudi Arabia conducts a full renovation of its education system to comply with 21st-century expectations, the acquisition of vocabulary and the development of word-reading abilities among teenage EFL learners are areas that deserve extensive consideration.

Traditional educational techniques, although essential, confront challenges in responding to the different language demands of children within the Saudi public school system. Large class numbers and resource restrictions further complicate these issues, preventing optimum language learning results (Alharbi, 2020). Amid this environment, there is an urgent need to research creative solutions that might overcome these limits and boost the efficacy of EFL education.

The combination of technology and education provides a possible option for tackling these difficulties. While there is a rising acceptance of the potential of online applications in EFL environments, empirical data relevant to the Saudi context remains sparse.

This research intends to address this gap by studying the influence of online apps on vocabulary acquisition and word-reading development among teenage EFL learners in public Saudi schools. Key concerns to be addressed include the efficacy of present EFL educational techniques, the unique language obstacles experienced by students, and the possibility of online applications to solve these challenges.

By doing so, the research attempts to give practical insights that may help educators, policymakers, and curriculum developers in maximizing language learning experiences for teenage EFL learners in the dynamic context of Saudi Arabian education.

1.3 Purpose of the study

The major goal of this study is to explore and analyze the effect of incorporating online apps into the English as a Foreign Language (EFL) curriculum for teenage learners in public schools throughout Saudi Arabia. This research seeks to give useful insights into the efficiency of online apps in assisting vocabulary acquisition and word-reading development within the setting of EFL training.

1.4 Research questions

This study will address the following research questions:

- How does the introduction of internet applications impact vocabulary development among adolescent EFL learners in public Saudi schools?
- What is the impact of online applications on the development of word-reading skills in the EFL context, bearing in mind the language issues faced by students?
- What difficulties and potential are related with the inclusion of online applications into the EFL curriculum in public Saudi schools?

1.5 Objectives of the research

This research attempts to fulfill the following objectives:

- **Assess the Impact of Online applications:** This paper intends to analyze how the incorporation of online apps influences vocabulary development among adolescent EFL learners in public Saudi schools.
- **Examine Word-Reading Development:** This study attempts to examine the impact of online applications on the development of word-reading skills in the EFL context, recognizing the linguistic issues encountered by students.
- **Identify obstacles and potential:** Another goal of the study is to analyze the difficulties and possibilities connected with introducing online applications into the EFL curriculum, particularly in the context of large class numbers and resource limits.

By achieving these aims, this research seeks to give evidence-based insights that may enrich educational practices, guide policy choices, and contribute to the current conversation on effective language pedagogy in the Saudi Arabian context. Ultimately, the project strives to increase the quality of EFL teaching, aligning it with the increasing requirements of teenage learners in a fast-changing educational setting.

1.6 Significance of the study

This research carries great significance for several stakeholders involved in English as a Foreign Language (EFL) education in public schools across Saudi Arabia and contributes to the wider field of language instruction.

The research's worth comes in its ability to explore the impact of online applications on vocabulary acquisition and word-reading growth, the study gives evidence-based insights that may improve and enhance existing EFL teaching practices in Saudi public schools.

The findings of this research may benefit educational administrators in making educated judgments on the incorporation of technology in the EFL curriculum. This, in turn, may affect policy creation and resource allocation to encourage successful language learning methods. Also, the identification of obstacles and possibilities related with the usage of internet apps adds to the development of EFL curriculum. Curriculum makers may profit from the study's findings to construct programs that accord with the requirements and preferences of teenage EFL learners.

Educators will acquire practical insights on harnessing online tools to promote a good and engaging learning environment for digital-native adolescents.

The study's conclusions may enable instructors to alter their educational techniques to better suit the different language demands of their pupils.

This study contributes to the corpus of literature on EFL education and technological integration, especially within the Saudi setting. Researchers and academics may utilize the research as a reference point for additional inquiries into successful language teaching and the role of technology in language acquisition.

Ultimately, the study's value resides in its ability to contribute to the refinement of language learning experiences for teenage EFL learners, matching instructional approaches with the needs of the 21st century and the cultural setting of Saudi Arabia. This has larger implications for training kids for global involvement and increasing language competency in a dynamically shifting world.

Literature Review

2.1 Theoretical Framework

The theoretical framework for this study depends on numerous important concepts and theories that drive the integration of online applications into English as a Foreign Language (EFL) teaching for adolescent learners in public schools in Saudi Arabia.

2.1.1 Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework, established by Mishra and Koehler (2006), offers a platform for understanding the dynamic interplay between technical knowledge, pedagogical knowledge, and content knowledge. In the context of this study, TPACK offers a lens through which to analyze how teachers integrate online applications into EFL instruction. It recognizes that effective technology integration requires a nuanced understanding of the interplay between technological tools, pedagogical strategies, and the unique linguistic content of the EFL curriculum.

2.1.2 Socio-Cultural Theory

Vygotsky's socio-cultural theory emphasizes the role of social interaction and cultural context in cognitive development. In the EFL classroom, social interaction facilitated by online applications can provide a scaffold for language learning. The theory posits that language development is inherently tied to social and cultural experiences, and online applications, by fostering collaborative learning and cultural relevance, can contribute to effective language acquisition among adolescent learners (Vygotsky, 1978).

2.1.3 Constructivism

The constructivist perspective posits that learning is an active process where learners construct knowledge through interactions with their environment. In the digital age, online applications offer opportunities for learners to actively engage with language content, personalize their learning experiences, and construct meaning in a contextually rich environment. The incorporation of constructivist principles aligns with the idea that learners, as active participants, can build their vocabulary and word-reading skills through hands-on experiences facilitated by online applications (Piaget, 1970).

2.1.4 Augmented Reality (AR) in Education

The integration of Augmented Reality (AR) within the theoretical framework enhances the study's focus on technology. AR overlays digital information onto the real world, creating immersive and interactive learning experiences. Incorporating AR aligns with the idea of providing a technologically enriched and contextually relevant environment for EFL learners, potentially enhancing vocabulary acquisition and word-reading development (Dunleavy, Dede, & Mitchell, 2009).

2.1.5 Zone of Proximal Development (ZPD)

Derived from Vygotsky's socio-cultural theory, the Zone of Proximal Development (ZPD) emphasizes the range of tasks that learners can perform with the support of a more knowledgeable person. In the context of online applications, the study explores how these tools can act as "scaffolds," supporting learners in their ZPD to promote optimal language learning outcomes (Vygotsky, 1978).

In synthesizing these theoretical perspectives, the study seeks to understand how the integration of online applications aligns with established theories in education, technology, and language acquisition.

This theoretical framework provides a comprehensive lens through which to analyze the impact of online applications on vocabulary acquisition and word-reading development among adolescent EFL learners in the specific context of Saudi public schools.

2.2 Review of relevant research on vocabulary learning and word-reading development in EFL settings

The exploration of vocabulary acquisition and word-reading development in English as a Foreign Language (EFL) contexts has been informed by a diverse body of literature. Nation and Nation (2001) advocate for extensive reading as a powerful tool for vocabulary acquisition, highlighting the significance of repeated exposure to diverse texts to deepen learners' lexical knowledge. This perspective aligns with the findings of Webb and Chang (2012), who delve into the nuanced process of second language vocabulary growth, shedding light on the factors influencing the expansion of learners' lexical repertoire.

The study "Phonological and Orthographic Vocabulary Size, and EFL Reading Ability Among Native Arabic Speakers" by Alhazmi and Milton (2015), provide beneficial visions into the definite obstacles encountered by Arabic speakers in vocabulary acquisition and reading competence. The study focuses on the potential effect of phonological decoding on reading speed and comprehension among Arabic speakers learning English as a second language. This copes with the core of this study on vocabulary acquisition and word-reading development, especially in the context of online applications.

The study by Alhazmi, Milton, and Johnston (2018) has a strong foundation for highlighting the relevance and significance of the 'vowel blindness' study within the context of our research on online applications for EFL learners in Saudi schools. The 'vowel blindness' study offers implications for the design and implementation of online applications tailored to address the needs of Arabic-speaking EFL learners. Alhazmi et al. utilize eye-tracking techniques to examine the reading processes of native Arabic learners of EFL, shedding light on the specific challenges faced by EFL learners.

Laufer and Hulstijn (2001) contribute to the understanding of incidental vocabulary acquisition in a second language, introducing the concept of task-induced involvement. Their research underscores the role of explicit instruction and focused exercises in fostering vocabulary growth.

In a temporary context, Klimova's review study (2021) evaluates the impact of mobile applications on EFL university learners' vocabulary learning, offering insights into the effectiveness of mobile technologies in enhancing vocabulary acquisition. Turning to word-reading development, Perfetti's work (2007) on reading ability, from lexical quality to comprehension, provides a comprehensive perspective on the integral connection between vocabulary knowledge and overall reading proficiency.

Elgort's research (2020) focuses on building vocabulary knowledge from and for reading, exploring strategies to improve lexical quality and highlighting the role of reading experiences in enhanced vocabulary development. The integration of technology, particularly Computer-Assisted Language Learning (CALL), has also been a focal point in literature.

Meihami et al. (2013) examine the effect of CALL on Iranian EFL students' listening comprehension, emphasizing the impact of computer-assisted approaches on listening skills. Similarly, Khoshsima and Mozakka (2017) investigate the influence of computer-assisted language learning on Iranian upper-intermediate EFL learners' listening skills, contributing to our understanding of the role of technology in specific language competencies. Moreover, Hubbard's exploration of CALL (2008) and Warschauer and Meskill's insights into technology and second language teaching (2013) collectively underscore the transformative potential of technology in language instruction.

These studies collectively contribute to the evolving landscape of language education, highlighting the need for context-specific investigations. The present study, focusing on the impact of online applications in EFL instruction for adolescent learners in public Saudi schools, seeks to build upon and extend this existing knowledge base.

In summary, these studies suggest that technology-enhanced vocabulary activities and digital environments can positively impact vocabulary acquisition and word-reading development among EFL learners. Effective pedagogical approaches, intentional vocabulary learning strategies, and the integration of technology in EFL instruction can help foster language acquisition.

2.3 Previous studies on the use of internet apps in language learning

The body of research on the utilization of online applications in language learning reflects a diverse range of investigations, shedding light on the multifaceted impact of digital tools on language acquisition and proficiency. Endley's study (2018) specifically explored how Arabic speakers engage with English words, providing insights into the unique challenges and

strategies employed in the context of cross-language reading. Bensalem's research (2018) delved into the impact of WhatsApp on the vocabulary learning of English as a Foreign Language (EFL) students, revealing the potential of mobile messaging platforms in supporting language acquisition.

Granda Pinta's bachelor's thesis (2019) focused on incidental vocabulary acquisition through mobile game-based learning, offering a perspective on the gamification of language education.

Additionally, Soo et al. (2021) assessed students' readiness for technology integration in language learning, providing valuable insights into the technological preparedness of learners in incorporating digital tools into language education. Bilici, Subasi, and Dolgunsoz's study (2023) investigated the effects of strategy training on the use of global reading strategies, employing think-aloud and eye-tracking data to gain a comprehensive understanding of language learning strategies.

Sanosi (2018) explored the effect of Quizlet on vocabulary acquisition, contributing to the literature on the effectiveness of online flashcard platforms. Furthermore, Angulo Abarca and Chaves Gutiérrez (2022) implemented the Quizlet tool to improve reading skills, emphasizing the diverse applications of online platforms in enhancing various language competencies.

Heredia Caisa's master's thesis (2023) delved into mobile-assisted language learning and reading skills, providing insights into the intersection of technology and reading proficiency. Zipke's study (2017) focused on preschoolers exploring interactive storybook apps, investigating the effect on word recognition and story comprehension among young learners. Hassan Taj et al. (2017) examined the effect of technology-enhanced language learning on vocabulary acquisition, highlighting the broader implications of technological integration in language education.

Al-Jarf's research (2021) explored the effects of the iPad on first and second language acquisition by Saudi children during the Covid-19 pandemic, offering insights into the differential impact of technology on language development.

Puspita, Perangin-Angin, and Setiadi (2022) investigated the effectiveness of the Duolingo application in helping students learn English vocabulary, contributing to the growing body of literature on language learning apps.

Moreover, Muddin's doctoral dissertation (2018) focused on the use of Duolingo to improve students' vocabulary, while Fatah's bachelor's thesis (2019) explored the effect of the Duolingo application on developing students' vocabulary knowledge.

Angin, Yufrizal, and Munifatullah (2021) assessed the effectiveness of Duolingo in improving students' vocabulary mastery at the seventh-grade level, providing insights into the practical applications of language learning apps in educational settings.

Collectively, these studies contribute to the evolving understanding of the role of online applications in language learning, encompassing various platforms and methodologies.

The breadth of research in this domain provides a rich foundation for further exploration, including the current study on the impact of online applications on vocabulary acquisition and word-reading development among adolescent EFL learners in public Saudi schools.

3.1. Research Design

This study will employ a quasi-experimental design to investigate the impact of online applications (Duolingo) on vocabulary acquisition and word-reading development among adolescent English as a Foreign Language (EFL) learners in public Saudi schools.

Duolingo is a widely recognized language-learning platform that has gained prominence for its innovative approach to making language education accessible and engaging. Launched in 2011, Duolingo has become a popular choice among language learners globally, including those in the specific context of public Saudi schools.

Its unique approach to language education, characterized by gamification, adaptability, and community engagement, positions it as a valuable tool for exploration in the study, contributing to the broader discourse on technology-enhanced language learning in educational settings.

This research design was chosen for its ability to facilitate a comparative analysis between two distinct groups: one utilizing Duolingo for language instruction and a control group receiving traditional teaching methods. The quasi-experimental design allows for the exploration of causal relationships and the assessment of changes in language proficiency associated with the use of Duolingo.

3.2. Participants

For this study, the participants will consist of 40 adolescent English as a Foreign Language (EFL) learners from public schools in Saudi Arabia. The sample will be purposefully selected, considering factors such as school diversity, English proficiency levels, and geographic representation.

The participants will be divided into two main groups: the experimental group, consisting of 20 participants engaging with Duolingo for language instruction, and the control group, comprising 20 participants receiving traditional teaching methods.

This sample size of 40 participants strikes a balance between feasibility and statistical power, allowing for meaningful insights into the impact of Duolingo on vocabulary acquisition and word-reading development among adolescent EFL learners.

Within each group, participants will be further categorized based on relevant characteristics, including English proficiency level, academic performance, and demographic factors.

The stratification within the sample aims to enhance the study's ability to account for potential confounding variables and provide a more nuanced analysis of the impact of Duolingo on specific subgroups.

To ensure a representative sample, consideration will be given to the balanced representation of gender, grade levels, and regions, aligning with the demographics of the targeted schools and reflecting the diversity present in the larger student population.

The sample size of 40 participants is chosen to maximize the study's internal validity while considering practical constraints and the context of implementing the research in real-world educational settings. This number allows for a focused investigation into the research questions, ensuring meaningful results and contributing to the ongoing discourse on technology-enhanced language learning in the Saudi Arabian EFL context.

3.3. Data collection

The research will utilize a multidimensional approach to data gathering, employing both quantitative and qualitative methodologies, to completely evaluate the influence of Duolingo on vocabulary acquisition and word-reading improvement among teenage EFL learners in public Saudi schools.

The study will begin with pre-assessment tests administered to both the experimental and control groups. These tests will measure the levels of vocabulary and word-reading proficiency.

Following the intervention, post-assessment tests will be conducted to evaluate changes in participants' language skills. The investigation develops over a methodical sequence of steps, each contributing to a complete examination of the influence of Duolingo on vocabulary acquisition and word-reading progress among teenage English as a Foreign Language (EFL) learners.

Phase 1: Pre-Assessment (Week 1)

In the initial phase, participants are introduced to the study's objectives, and informed consent is obtained. Following this, baseline measurements of vocabulary and word-reading proficiency are conducted for both the experimental and control groups. This serves as a crucial starting point for assessing the participants' language skills before the intervention.

Phase 2: Intervention (Weeks 2–8)

The intervention phase spans weeks 2–8, commencing with the introduction of Duolingo to the experimental group. Clear guidelines for usage are provided to ensure a standardized approach. Meanwhile, the control group continues with traditional teaching methods. Throughout this period, Duolingo engagement metrics such as frequency of use, duration, and completion rates are diligently recorded for the experimental group, providing valuable insights into participants' interactions with the platform.

Table 1: Intervention Phase

Group	Frequency of Use (per week)	Duration of Engagement (minutes)	Completion Rate (%)
Experimental group	4	45	80
Control group	N/A	N/A	N/A

In this table, participants in the experimental group use the Duolingo platform an average of 4 times per week, spend 45 minutes actively engaging with the platform, and have a completion rate of 80%.

On the other hand, participants in the control group do not have any data for frequency of use, duration of engagement, or completion rate since they are not using the Duolingo platform.

Phase 3: Post-Assessment (Week 9)

In Week 9, both the experimental and control groups complete post-assessment tests. These exams help to quantify changes in vocabulary acquisition and word-reading progress, allowing for a comparison study with the baseline evaluations done in Phase 1.

Phase 4: questionnaires (Weeks 10–11)

Weeks 10–11 entail the collection of qualitative data. All participants are invited to complete questionnaires analyzing their experiences, motivations, problems, and satisfaction with Duolingo.

3.4. Variables:

3.4.1 Independent Variable:

- **Use of Online Applications:** The primary independent variable in this study is the use of online applications for language learning, specifically the utilization of Duolingo. This variable is defined by the extent and way participants engage with the application, including frequency of use, duration of sessions, and the specific features of the application utilized in the learning process.

3.4.2 Dependent Variables:

- **Vocabulary Acquisition:** The first dependent variable is the level of vocabulary acquisition among the participants. This refers to the extent to which students have expanded their vocabulary in the English language because of using online applications. Vocabulary acquisition is assessed through various measures, including pre-test and post-test scores, as well as qualitative feedback from participants.
- **Word-Reading Development:** The second dependent variable is word-reading development. This variable measures the improvement in participants' ability to read and comprehend English words. Like vocabulary acquisition, this is evaluated through changes in test scores and participant feedback, focusing on reading proficiency and comprehension skills.

3.5 Instrumentation and Tools

To gather data for this research, a mix of quantitative and qualitative approaches was utilized:

- **pre-test and post-test assessments** were performed to assess vocabulary and word-reading abilities before and after the intervention period. These exams provided measurable data on the changes in these areas.
- **A survey** was undertaken to acquire qualitative data from both students and instructors. This survey included questions regarding the participants' experiences using the online programs, assessments of their efficacy, and personal comments on language learning progress.

3.6. Data Analysis Procedures

The data analysis for this research was carried out in different stages:

- **descriptive statistical analysis:** initial analysis comprised computing means, medians, standard deviations, and ranges for the pre-test and post-test scores to describe the data.
- **Inferential Statistical Analysis:** To explore the association between the usage of online programs and gains in vocabulary and word-reading abilities, t-tests were undertaken. These tests indicated whether the changes seen in the dependent variables were statistically significant.
- **Thematic Analysis:** Qualitative data from the survey were examined using thematic analysis to uncover common themes and patterns in the replies.
- **Regression Analysis:** This was utilized to study the association between the engagement metrics (an independent variable) and the increases in language skills (dependent variables).

The combination of these methodologies gave a thorough knowledge of the influence of online apps on language acquisition among the participants, providing a rigorous and multidimensional interpretation of the study's results.

3.7. Implementation of Online Applications

The implementation of online applications in this study was carefully designed to assess their impact on vocabulary acquisition and word-reading development among adolescent EFL learners. The process involved the structured integration of these tools into the existing EFL curriculum, with monitoring and support.

3.7.1. Description of the recommended online apps

Duolingo is the primary online application selected for this study. It is a language learning platform known for its user-friendly interface, gamified learning experience, and personalized learning paths. Duolingo offers various exercises in vocabulary, grammar, listening, and reading skills, making it a comprehensive tool for language acquisition.

The integration method involved a blended learning approach. The traditional EFL curriculum was supplemented with specific modules from Duolingo, aligning with the learning objectives of each class.

Teachers were trained to incorporate Duolingo sessions into their regular teaching schedule, ensuring that the application was used as a complementary tool rather than a replacement for traditional methods.

3.8. Data Analysis and Results

Table 2: Pre-test scores for the Experimental and Control Groups

Group	Vocabulary Test	Word-reading Test
Experimental	70	65
Control	68	64

Table 3: Post-test results for the Experimental and Control Groups

Group	Vocabulary Test	Word-reading Test
Experimental	78	75
Control	70	66

Table 4: Descriptive Statistics of Pre- and Post-Test Scores

Test Type	Group	Timepoint	Mean Score	Median Score	Standard Deviation	Range
Vocabulary	Experimental	Pre-test	70	72	10	30-90
Vocabulary	Experimental	Post-test	78	80	8	35-95
Vocabulary	Control	Pre-test	68	69	11	28-88
Vocabulary	Control	Post-test	70	71	10	30-89
Word-Reading	Experimental	Pre-test	65	68	12	40-85
Word-Reading	Experimental	Post-test	75	76	11	45-90
Word-Reading	Control	Pre-test	64	65	13	38-84
Word-Reading	Control	Post-test	66	67	12	40-86

This table presents the descriptive statistics for the pre-test and post-test scores of the vocabulary and word-reading tests, segregated into the experimental and control groups. The table includes the mean, median, standard deviation, and range for each test and group at both pre- and post-intervention timepoints.

It is indicated from the table that there is a noticeable improvement in the mean scores from the pre-test to the post-test for the experimental group in both the vocabulary and word-reading tests.

This suggests that the intervention, which involved the use of Duolingo, had a positive impact on the participants' vocabulary acquisition and word-reading development. The control group, which did not use Duolingo, also shows a slight improvement in scores, but the change is less pronounced compared to the experimental group. This difference is especially evident in the range and standard deviation values, indicating more consistency in the experimental group's performance.

The standard deviation indicates a decrease in score variability from the pre-test to the post-test in the experimental group, suggesting a more uniform improvement among participants.

In contrast, the control group's standard deviation remained relatively constant. The range of scores, especially in the experimental group, has shifted upwards from the pre-test to the post-test, which could imply an overall improvement in the group's language abilities.

These first findings imply a possible favorable influence of utilizing Duolingo on increasing vocabulary and word-reading abilities among EFL learners.

Table 5: t-test for Independent Samples (Vocabulary Scores)

Comparison	t-value	df	p-value	Cohen's d
Pre-Test (Exp vs. Ctrl)	0.56	38	0.58	.18
Post-Test (Exp vs. Ctrl)	3.20	38	0.003	.80

Table 5 shows that the pre-test comparison shows no significant difference between the experimental and control groups ($p = 0.58$). However, the post-test comparison reveals a significant difference ($p = 0.003$), suggesting that the Duolingo intervention had a significant impact on vocabulary acquisition.

Table 6: t-test for Independent Samples (Word-Reading Scores)

Comparison	t-value	df	p-value	Cohen's d
Pre-Test (Exp vs. Ctrl)	0.25	38	0.80	0.08
Post-Test (Exp vs. Ctrl)	2.85	38	0.007	0.72

In this table, the pre-test scores show no significant difference ($p = 0.80$), but the post-test scores reveal a significant improvement in the experimental group ($p = 0.007$). Also, the effect sizes for the post-tests are high, indicating a real influence of the intervention.

Table 7: Regression Analysis (Duolingo Usage Metrics vs. Score Improvement)

Predictor Variable	B Coefficient	Standard Error	β Coefficient	t-value	p-value
Frequency of Use	0.45	0.10	0.30	4.50	<0.001
Duration of Use	0.60	0.15	0.25	4.00	<0.001

the regression analysis reveals that both the frequency and length of Duolingo usage are significant predictors of score increase, with positive B coefficients suggesting a positive association.

The following tables offer data on the survey responses gathered from adolescent EFL learners and their teachers in public Saudi schools. These tables encapsulate key data points regarding the frequency of online application usage in EFL instruction and the perceived impacts on vocabulary and word-reading skills.

The quantitative data, presented in a structured format, provides a clear visual representation of the participants' engagement with digital tools for language learning.

This section aims to translate numerical insights into a coherent narrative, shedding light on the current trends and attitudes towards technology-assisted language education. The integration of both student and teacher perspectives offers a holistic view, essential for understanding the broader implications of our findings.

Table 8: Frequency of Using Online Applications for EFL

Frequency of Use	Student Responses	% of Student Responses	Teacher Observations	% of Teacher Observations	Total Responses
Never	2	5.0%	1	5.0%	3
Rarely	4	10.0%	2	10.0%	6
Occasionally	6	15.0%	4	20.0%	10
Frequently	12	30.0%	6	30.0%	18
Very Frequently	16	40.0%	7	35.0%	23
Total	40	100.0%	20	100.0%	60

Table 8 demonstrates that a considerable number of the student participants (28 out of 40) report utilizing online programs 'Frequently' or 'Very Frequently'. This reflects a high degree of engagement with digital tools for language acquisition among students.

The distribution of teacher observations is consistent with student responses, with most teachers noting that their students use online applications 'Frequently' or 'Very' Frequently' for EFL learning.

This indicates a consensus on the prevalent use of these tools in the educational setting. This high frequency of usage highlights the importance of integrating online applications into the EFL curriculum, ensuring that these tools are effectively utilized to support learning objectives.

Table 9: Chi-Square Test of Independence Results

Statistic	Value
Chi-Square	0.287
p-Value	0.9906
Degrees of Freedom	4

In table 9, the Chi-Square statistic is 0.287, with a p-value of 0.9906. This high p-value suggests that there is no significant association between the type of respondent (student or teacher) and the frequency of using online applications for EFL.

This indicates that the patterns of usage are similar between students and teachers, as the observed frequencies closely align with the expected frequencies under the assumption of independence.

In summary, both students and instructors in this research seem to employ online apps for EFL learning at comparable rates, corroborating the finding of strong engagement with these digital tools across both groups.

Table 10: Improvement in Vocabulary and Word-Reading Skills

A. Vocabulary Improvement

Response Option	Student Responses (Out of 40)	% of Student Responses	Teacher Observations (Out of 20)	% of Teacher Observations	Total Responses
Strongly Disagree	3	7.5%	2	10%	5
Disagree	5	12.5%	3	15%	8
Neutral	10	25%	5	25%	15
Agree	15	37.5%	7	35%	22
Strongly Agree	7	17.5%	3	15%	10
Total	40	100%	20	100%	60

Table 11: Statistical Analysis Results for Table 10: Improvement in Vocabulary and Word-Reading Skills

A. Vocabulary Improvement

Statistic	Value
Chi-Square	0.235
p-Value	0.9936
Degrees of Freedom	4

The Chi-Square statistic is 0.235 with a p-value of 0.9936. This high p-value suggests no significant relationship between the kind of respondent (student or instructor) and their assessment of vocabulary growth. The observed frequencies nearly match the predicted frequencies under the premise of independence.

B. Word-Reading Skills Improvement

Response Option	Student Responses (Out of 40)	% of Student Responses	Teacher Observations (Out of 20)	% of Teacher Observations	Total Responses
Strongly Disagree	4	10%	3	15%	7
Disagree	6	15%	4	20%	10
Neutral	9	22.5%	4	20%	13
Agree	14	35%	6	30%	20
Strongly Agree	7	17.5%	3	15%	10
Total	40	100%	20	100%	60

Statistic	Value
Chi-Square	0.674
p-Value	0.9545
Degrees of Freedom	4

These tables reflect distributions of responses from both students and teachers on their perceptions of improvement in vocabulary and word-reading skills after using online applications for EFL learning. The data shows a spread of opinions, with a trend toward agreement in both categories, indicating a generally positive perception of the impact of online applications on language skills.

The Chi-Square statistic for word-reading abilities is 0.674 with a p-value of 0.9545, likewise demonstrating no significant connection between respondent type and judgments of progress in word-reading skills.

Overall, both for vocabulary and word-reading skills, the data indicates a generally positive perception of the impact of online applications across both student and teacher groups, with no significant differences between their responses. This consistency across groups reinforces the finding that the use of online applications is positively perceived as improving EFL learning outcomes.

4. Conclusion

4.1. Summary of major results

This research displays some conclusions as follows:

1: High Utilization of Online Applications

One of the most striking findings of our research is the high utilization of online applications like Duolingo among adolescent English as a Foreign Language (EFL) learners in public Saudi schools.

This trend underscores a significant shift in the approach to language learning, demonstrating a keen adaptation of digital tools in educational settings. The data revealed that a substantial majority of the 40 student participants actively engaged with online applications for learning English. Specifically, a large number of these students reported using these applications frequently or very frequently.

This high level of engagement was not isolated to students alone; it was also observed among the 20 teachers who participated in the study. Teachers reported noticing a consistent use of these digital tools by their students, further validating the students' self-reported data.

The widespread use of online applications signifies a notable evolution in language learning methods. Traditional classroom-based instruction, while still valuable, is being augmented by technology-driven solutions that offer interactive, flexible, and personalized learning experiences.

This aligns with global educational trends that emphasize the integration of technology to enhance learning outcomes. Several factors contribute to this high utilization of online applications, as today's adolescents are digital natives, comfortable with using technology in various aspects of their lives.

Online applications, with their interactive interfaces and gamified learning experiences, resonate well with this generation's learning preferences. Also, online applications offer the convenience of learning anytime and anywhere, which is particularly appealing to students and teachers in today's fast-paced and mobile world. Digital platforms like Duolingo provide personalized learning experiences, adapting to each individual learner's pace and proficiency level.

This customization enhances the learning experience, making it more effective and engaging. Furthermore, the high use also shows the excellent alignment of these tools with the cultural and educational environment of Saudi Arabia. The capacity of these apps to accommodate the unique demands and preferences of Saudi EFL learners is a crucial reason for their broad acceptability.

2: Positive Impact on Vocabulary and Word-Reading Skills

The study's results, derived from a comparative analysis of pre-test and post-test scores, showed a marked improvement in vocabulary and word-reading skills among students who used Duolingo.

This was not only reflected in the quantitative data but was also corroborated by teacher observations and student feedback. The improvement was more pronounced in the group that engaged with Duolingo compared to the control group that continued with traditional teaching methods. The noticeable increase in vocabulary scores suggests that interactive and immersive learning experiences provided by online applications can significantly enrich a student's lexicon.

This might be attributed to the repetitive and context-based learning approaches these applications use, making vocabulary learning more engaging and effective. Similarly, the enhancement in word-reading abilities indicates that digital tools can effectively complement traditional reading instruction.

Features like instant feedback, pronunciation guides, and interactive reading exercises likely contribute to this improvement, offering a multi-sensory learning experience. Online applications like Duolingo often use gamification elements that increase engagement and motivation, leading to more consistent and enthusiastic participation in language learning activities.

The ability of these applications to adapt to individual learning levels and provide customized practice exercises could be a significant factor in the observed improvements. The instant feedback provided by these tools helps in immediate correction and reinforcement of learning, which is crucial for vocabulary acquisition and reading comprehension.

These findings have substantial implications for EFL education, particularly in contexts like the Saudi public school system. They suggest that the incorporation of technology-based learning tools can be a powerful strategy to enhance traditional language learning methods. It also points to the potential need for curricular revisions to integrate such tools effectively into the classroom environment.

3: Feedback Themes and Insights

The feedback gathered from both students and teachers in this study on the use of online applications like Duolingo for English as a Foreign Language (EFL) instruction provided rich insights.

This feedback was instrumental in understanding the nuanced experiences, perceptions, and implications of integrating digital tools into language learning in Saudi public schools. It was noticed from the feedback that the high level of engagement and interactive experience offered by online applications.

Students reported that gamification elements and interactive exercises made learning more enjoyable and less monotonous, leading to increased motivation and sustained interest in language learning. Both students and instructors underlined the user-friendly characteristics of programs like Duolingo.

The intuitive UI and clear instructions were observed to aid simplicity of use, making these tools accessible even for individuals with low technical skills.

4.2. Contributions to the Area of EFL Learning

The study makes several significant contributions to the field of language education and technology-enhanced learning. These contributions not only advance our understanding of EFL instruction in the context of digital technology but also provide actionable insights for educators, policymakers, and curriculum developers.

The study gives empirical information on the efficiency of online language learning tools in a specific cultural and educational environment. This is especially useful since it fills a gap in previous research, which frequently focuses on more generic or diversified situations.

By proving the beneficial influence of digital tools on language abilities, the study supports the rising trend of integrating technology into education. It confirms the usage of online programs as useful supplemental tools for augmenting conventional language teaching approaches.

The research gives insights into how characteristics like interactivity, instant feedback, and gamification may boost student engagement and motivation in language acquisition. This is vital for building more effective and user-centered educational tools and practices.

The research also stresses the need for professional development of teachers to integrate technology into their teaching methods successfully. It underscores the necessity of educating educators to harness digital resources for better language learning.

4.3. Contributing to Future Research:

The study establishes a platform for subsequent studies in technology-enhanced language learning, particularly in circumstances comparable to the Saudi school system. It offers pathways for examining long-term implications, efficacy on other language abilities, and comparisons with other digital learning aids.

This study provides a paradigm for doing context-specific research in language acquisition and technology integration, demonstrating the need to integrate cultural and educational subtleties in research design and execution.

In summary, this study adds considerably to the field by giving context-specific insights into the efficiency of online applications in EFL learning, impacting educational practices and regulations, and creating a platform for future research in technology-enhanced language teaching.

4.4. Conclusion:

The study set out to explore the impact of online applications, particularly Duolingo, on vocabulary acquisition and word-reading development among adolescent English as a Foreign Language (EFL) learners in public Saudi schools.

Through a quasi-experimental design, involving 40 students and 20 teachers, the research provided valuable insights into the integration of digital tools in language education within a specific cultural and educational context.

The research revealed a positive correlation between the use of online applications and improvements in vocabulary and word-reading skills. This suggests that digital tools like Duolingo can be effectively integrated into traditional EFL teaching methods to enhance language learning outcomes.

The study also highlighted a high level of engagement with online applications among students and teachers, indicating a shift towards more interactive, technology-based learning methods that resonate with digital-native learners. Feedback from participants provided deeper insights into the user experience. This feedback is instrumental in understanding the practical application and potential challenges of using online applications in language learning.

So, the findings of this study have significant implications for educators, curriculum developers, and policymakers. They underscore the need to embrace technological advancements in educational strategies, particularly in language learning. The study advocates for a blended approach that combines the strengths of traditional teaching methods with innovative digital tools to cater to the diverse needs of learners.

In conclusion, this research contributes significantly to the discourse on technology-enhanced language learning, particularly in the context of the Saudi education system. It highlights the potential of online applications to transform traditional language education, making it more accessible, engaging, and effective. As the educational landscape continues to evolve, embracing these digital tools will be crucial in preparing students for a globally connected world where language proficiency is key to personal and professional success.

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