



P-ISSN : 2074-9554 | E-ISSN: 2663-811

Journal of Al-Farahidi's Arts

available online at: fia.tu.edu.iq/index.php/fia



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"Employing Artificial Intelligence Tools to Enhance English Speaking Skills among University Students"

Keywords:

Artificial Intelligence, Duolingo, Socio-Interactionist Theory

Article history:

Received 20/8/2025

Received in revised form 17/9/2025

Accepted 19/10/2025

Available online 9/12/2025

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ABSTRACT

This pilot study aims to analyze the effectiveness of employing artificial intelligence tools, specifically the Duolingo app, in developing the English speaking skills of first-year students in the English Department at the College of Basic Education, University of Diyala.

160 male and female students were randomly selected and divided into two groups: an experimental group (80 students) who underwent training using Duolingo, and a control group (80 students) who received traditional instruction. Both groups were assessed using a speaking skills test designed according to IELTS Speaking Band Descriptors standards before and after the experiment.

The results showed a significant improvement in the performance of the experimental group compared to the control group, particularly in areas of fluency, accuracy, pronunciation, and linguistic richness.

These findings support Vygotsky's socio-interactionist theory, as the Duolingo app served as a cognitive mediator within the Zone of Proximal Development (ZPD), providing gradual support and immediate feedback to enhance learning. The study concluded that integrating AI applications such as Duolingo into university English language teaching can significantly improve speaking skills, and recommends using these tools to complement traditional methods in university curricula.

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"استخدام أدوات الذكاء الاصطناعي لتعزيز مهارات التحدث باللغة الإنجليزية لدى طلاب الجامعات"

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المستخلص:

تهدف هذه الدراسة التجريبية إلى تحليل فاعلية توظيف أدوات الذكاء الاصطناعي، وبشكل خاص تطبيق Duolingo، في تنمية مهارات التحدث باللغة الإنجليزية لدى طلبة المرحلة الأولى في قسم اللغة الإنجليزية بكلية التربية الأساسية - جامعة ديالى.

تم اختيار 160 طالباً وطالبة عشوائياً، وتم توزيعهم على مجموعتين: المجموعة التجريبية (80) طالباً خضعوا للتدريب باستخدام Duolingo، والمجموعة الضابطة (80) طالباً تلقوا التعليم التقليدي. وقُيِّمت المجموعتان باستخدام اختبار مهارات التحدث المصمم وفق معايير IELTS Speaking Band Descriptors قبل وبعد التجربة.

أظهرت النتائج تحسناً ملحوظاً في أداء المجموعة التجريبية مقارنة بالضابطة، خصوصاً في جوانب الطلاقة، الدقة، النطق، والثراء اللغوي. وتدعم هذه النتائج نظرية فيغوتسكي الاجتماعية-التفاعلية، حيث عمل تطبيق Duolingo كأداة معرفية وسيطة داخل منطقة النمو القريب (ZPD)، موفراً الدعم التدريجي والتغذية الراجعة الفورية لتعزيز التعلم.

خلصت الدراسة إلى أن دمج تطبيقات الذكاء الاصطناعي مثل Duolingo في تدريس اللغة الإنجليزية الجامعية يمكن أن يُحدث تحسناً كبيراً في مهارات التحدث، وتوصي الدراسة باستخدام هذه الأدوات المكملية للطرق التقليدية في المناهج الجامعية.

الكلمات المفتاحية: الذكاء الاصطناعي، Duolingo، النظرية الاجتماعية-التفاعلية

General Framework of the Research

1:1 The Research Problem

English speaking is one of the most complex language skills for undergraduate students, requiring an integration of linguistic knowledge (vocabulary and grammar), phonetics (pronunciation), and psychology (confidence and boldness in speaking). Although students in the English Department at the College of Basic Education at the University of Diyala take several language skills courses, field observations and academic reports reveal continued poor performance in speaking skills, particularly in the first grade.

This weakness prompts the search for innovative methods that go beyond the traditional approach of classroom conversation and written exercises. Among the most prominent modern alternatives are artificial intelligence applications such as Duolingo, which employs adaptive algorithms and machine learning to provide personalized coaching in speaking and listening, providing greater opportunities for ongoing individual training (Loewen et al., 2019).

Hence, the research problem is defined by the following main question:

What is the effect of employing the Duolingo application, as an artificial intelligence tool, on developing the English speaking skills of first-year students in the English Language Department, College of Basic Education, University of Diyala?

1:2 The Importance of the Research

The importance of this research stems from the following:

1. Theoretical Importance: This research supports Arab and foreign educational literature with scientific evidence of the effectiveness of artificial intelligence tools, such as Duolingo, in improving speaking skills.
2. Applied Importance: The research presents a practical program that can be adopted in teaching university English by integrating traditional training with smart applications.

3. Future Importance: It opens the door for subsequent studies examining the impact of other artificial intelligence tools on other language skills (listening, reading, writing).

1:3 Research Objectives

The research aims to:

1. Discover the effect of using Duolingo in improving students' English speaking skills.
2. Comparison of performance levels between the experimental group (which used Duolingo) and the control group (which received traditional training).

1:4 Research Hypotheses

1. First Null Hypothesis: There are no statistically significant differences at the 0.05 level between the mean scores of the experimental and control groups on the pre-test.
2. Alternative Hypothesis: There are statistically significant differences at the 0.05 level between the mean scores of the two groups on the post-test, in favor of the experimental group.

1:5 Research Limits

- Human Subjects: First-year students in the English Department, College of Basic Education, University of Diyala.
- Spatial: University of Diyala / College of Basic Education.
- Temporal: Academic year 2024-2025.
- Objective: Using the Duolingo app to improve English speaking skills (fluency, pronunciation, accuracy).

1:6 Terminology

1. Artificial Intelligence (AI): A branch of computer science that seeks to design systems that mimic human mental abilities, such as learning and reasoning (Russell & Norvig, 2021).
2. Duolingo: A free language learning app that employs artificial intelligence to provide interactive exercises in vocabulary, pronunciation, and listening. It is used globally for educational purposes (Vesselinov & Grego, 2012).

3. Speaking Skills: This refers to a student's ability to express themselves orally in English with accuracy, fluency, and correct pronunciation, according to the standards of the IELTS Speaking Descriptors.

Theoretical Framework and Previous Studies

2.1 Theoretical Framework

2.1.1 Artificial Intelligence in Language Education

Artificial intelligence (AI) is defined as the ability of computer systems to simulate human capabilities such as learning, thinking, and communication (Russell & Norvig, 2021). In the field of language education, AI technologies are used to provide:

- Personalized learning tailored to each learner's level.
- Real-time error correction using speech and text recognition technologies.
- Interactive activities that encourage continuous practice.

Recent studies have confirmed that the use of AI tools in second language education leads to tangible results in developing communicative competence (Li, 2022).

2.1.2 Duolingo as an AI-based tool

Duolingo is one of the most popular tools for language education via smartphone. It features the following:

- Adaptive Learning: Activities are adjusted based on the student's performance. "Speech Recognition": Provides pronunciation training and immediate error correction.
- "Gamification": Enhances learner motivation through points, levels, and rewards.

A study by Vesselinov & Grego (2012) showed that using Duolingo is equivalent to a semester-long university course in foreign language learning in terms of vocabulary and grammar.

2.1.3 English Speaking Skills

Speaking is one of the most important skills in learning a foreign language, as it reflects the learner's ability to use the language in real-life communication situations. It includes three basic components:

1. Fluency: Speaking smoothly without excessive pauses.
2. Accuracy: Adherence to grammar and correct vocabulary.
3. Pronunciation: Producing sounds and syllables correctly and intelligibly.

Brown (2007) asserts that mastering speaking requires continuous practice in a supportive environment and is often the greatest challenge facing second language learners.

2.1.4 Theoretical Foundation of the Research

The current research is based on Vygotsky's (1978) sociocultural theory, which assumes that learning occurs through social interaction and the use of "mediational tools" that help the learner reach higher levels of performance.

Vygotsky believes that students learn within the Zone of Proximal Development (ZPD), i.e., the distance between what they can perform independently and what they can perform with the help of mediators or experts.

In this research, Duolingo, an AI-based cognitive tool, acts as a mediator, providing audio exercises, immediate feedback, and a progression of activities tailored to the student's abilities. * Thus, the application helps students move from a weak level of speaking to a higher level in terms of fluency, accuracy, and pronunciation, making the socio-interactional theory the most appropriate framework for explaining the tool's impact on developing speaking skills.

2.2 Previous Studies

2.2.1 Foreign Studies

1. Vesselinov & Grego (2012): A study on Spanish language learners showed that 34 hours of Duolingo use was equivalent to an entire university semester.

2. Loewen et al. (2019): A case study on Duolingo demonstrated its clear impact on developing vocabulary and listening skills, with a moderate effect on speaking.
3. Li (2022): A research review on artificial intelligence in English language teaching, confirming that it enhances learners' confidence and increases their engagement in conversation.

2.2.2 Arabic Studies

1. Al-Obaidi (2021): A study on Iraqi university students, demonstrating that smartphone applications improve speaking fluency.
2. Ahmed (2022): A study on artificial intelligence in language teaching concluded that smart tools can be effective alternatives to traditional methods.

2.3 Benefits from Previous Studies

1. All studies confirmed the effectiveness of smart tools in second language teaching.
2. Most of them focused on vocabulary and listening, while less specifically on "speaking".
3. No previous experimental study has been conducted, to the best of our knowledge, on first-year students at Iraqi universities using Duolingo.

Therefore, the current study seeks to fill this gap through a rigorous experimental design (two groups, pretest and posttest) to measure the effect of Duolingo on developing speaking skills specifically.

Research Methodology and Procedures

3.1 Research Methodology

The research relied on the experimental approach, as it is the most appropriate method for studying the effect of the independent variable (use of the Duolingo app) on the dependent variable (English speaking skill). A two-group equivalent design (experimental and control) was used, with pre-test and post-test.

3.2 Research Design

The following design was followed:

3.3 Research Population and Sample

1. Original Population: All first-year students in the English Department, College of Basic Education, University of Diyala.
2. Sample : (160) male and female students were selected using a simple random method, then distributed into two equal groups:
 - Experimental Group (80).
 - Control Group (80).

Equivalence between the two groups was verified on the following variables: age, previous academic level, and pre-speaking test scores.

3.4 Research Tool

The researcher used a criterion-referenced test to measure English speaking skills. It was prepared according to the IELTS Speaking Band Descriptors, which measures:

1. Fluency.
 2. Accuracy.
 3. Pronunciation.
 4. Lexical Resource.
- Validity: Face and content validity were achieved by presenting the test to a panel of experts in English language teaching methods.
 - Reliability: The test was administered to a pilot sample (30 students), and the reliability coefficient was calculated using Cronbach's Alpha, reaching (0.84), which is an acceptable coefficient.

3.5 Experimental Treatment

- Students in the experimental group were given an (8)-week training program via the Duolingo application.
- The training included conversational, pronunciation, and listening activities, with student usage monitored through application reports.

- The control group continued with traditional lessons that relied on dialogue between the student and the teacher and classroom exercises.

3.6 Implementation Procedures

1. Conduct a pre-test for both groups to measure their speaking level before treatment.
2. Implement the training program using Duolingo for the experimental group only.
3. The control group continued with traditional instruction.
4. Conduct a post-test for both groups after the experiment ended.

3.7 Statistical Method

1. An independent-samples t-test was used to determine the significance of the differences between the mean scores of the two groups (experimental and control) in the post-test.
2. A related-samples t-test was also used to measure the differences between the results of the pre- and post-tests within each group.
3. A statistical significance level of $\alpha \leq 0.05$ was adopted.

3.8 Variables

- Independent variable: Use of the Duolingo app.
- Dependent variable: Developing English speaking skills (Fluency, Accuracy, Pronunciation, Vocabulary).

Results and Analysis

4.1 Descriptive Results

4.1.1 Pretest

The pretest was administered to both groups to measure their speaking skills before the experimental treatment was implemented.

Table (4-1) shows the means and standard deviations for the two research groups:

Table (4-1): Means and standard deviations of pretest scores

Group	N	Mean	Std. Deviation
Experimental	80	42.5	5.8
Control	80	42.0	6.1

Analysis: The table shows that the two groups' scores on the pretest were close, confirming their equivalence before the treatment.

4.1.2 Post- test

After the treatment was implemented (using Duolingo for the experimental group) and eight weeks had passed, the posttest was administered.

Table (4-2) shows the results:

Table (4-2): Means and standard deviations of posttest scores

Group	N	Mean	Std. Deviation
Experimental	80	68.7	5.2
Control	80	53.4	6.0

Analysis: The experimental group's mean scores were significantly higher than the control groups, indicating a positive effect of using Duolingo on speaking skills.

4.2 Testing the Differences Between the Two Groups

A two-independent-samples t-test was used to verify the significance of the differences in the post-test.

Table 4-3: Two-independent-samples t-test for the post-test

Group	Mean	Std. Deviation	t-value	df	Sig. (2-tailed)
Experimental	68.7	5.2	13.72	158	0.000
Control	53.4	6.0			

Analysis:

- Calculated $t = 13.72$, significance level = $0.000 < 0.05$, meaning that the differences are statistically significant in favor of the experimental group.
- This confirms the success of the experimental treatment (Duolingo) in improving speaking skills.

4.3 Testing the Differences Within Each Group

4.3.1 Experimental Group

Table 4-4: Two-linked-samples t-test for the experimental group

Test	Mean	Std. Deviation	t-value	df	Sig. (2-tailed)
Pre-test	42.5	5.8	35.21	79	0.000
Post-test	68.7	5.2			

4.3.2 Control Group

Table 4-5: Two-linked-samples t-test for the control group

Test	Mean	Std. Deviation	t-value	df	Sig. (2-tailed)
Pre-test	42.0	6.1	8.57	79	0.000
Post-test	53.4	6.0			

Analysis:

- Both groups showed improvement after the post-test, but the experimental group achieved a significantly greater increase.
- This indicates that training via Duolingo is more effective than traditional training in developing speaking skills.

4.4 Discussion of the results and their connection to theory

1. The positive effect of the experimental treatment:

- Explained through Social-Interactional Theory: Duolingo acts as a mediational tool that supports the learner in ZPD, allowing for grading of activities and immediate error correction.
- This grading helped students significantly improve fluency, accuracy, and pronunciation compared to the control group.

2. Limited improvement in the control group:

- Demonstrates that traditional teaching has a positive effect, but is less effective in developing speaking skills compared to AI-based smart tools.

3. Consistency with previous studies:

- The research results are consistent with Vesselinov & Grego (2012) and Loewen et al. (2019), where smart tools demonstrated a clear improvement in language skills.
- The current study is unique in its application to speaking skills specifically and to first-year students at Iraqi universities.

Conclusions and Recommendations

5.1 Conclusions

Based on the results of the research after implementing the experimental treatment using the Duolingo app on first-year students in the English Department, the following conclusions can be drawn:

1. Effectiveness of Using Duolingo:

- The data showed that the experimental group using the app achieved significant improvement in speaking skills compared to the control group.
- The improvement included all dimensions of speaking skills: fluency, grammatical accuracy, pronunciation, and linguistic richness.

2. Confirmation of the Socio-Interactional Theory:

- The Duolingo app served as a mediational tool within the Zone of Proximal Development (ZPD), helping students develop their skills gradually while providing continuous feedback.
- The results support the theory's premise that learning occurs through interaction and the use of appropriate cognitive tools.

3. The Importance of Ongoing Individual Training:

- Repeated training via the app enhanced motivation and engagement, which traditional methods did not provide to the same degree.

4. Research Uniqueness:

- This research is distinguished by its experimental application on speaking skills specifically and on first-year students at the University of Diyala, a field not covered by previous studies in the local context.

5.2 Recommendations

Based on the results and conclusions, the researcher proposes the following:

1. Applied Recommendations:

- Integrate the Duolingo app into university English language courses, particularly in developing speaking skills.
- Provide initial training for teachers on how to use smart applications to support language learning.
- Allocate weekly times for students to engage in interactive activities inside and outside the classroom.

2. Future Research Recommendations:

- Conduct long-term studies to measure the impact of smart applications on other language skills (listening, reading, writing).
- Compare the impact of different artificial intelligence tools on multiple skills to determine the most appropriate for each skill.
- Study the impact of integrating smart applications with traditional teaching methods on overall student performance.

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Appendix (1)

Lists the names of the expert evaluators and reviewers