INFORMATION TECHNOLOGY IN TEACHING FOREIGN LANGUAGES SESSION

K

SINTEZA 2025

ARTIFICIAL INTELLIGENCE IN MOBILE LANGUAGE LEARNING: DUOLINGO AND THE RISE OF A NEW EDUCATIONAL ERA

Tijana Gajić*, [0000-0002-5013-2867]

Jelena Nikolić, [0000-0002-7013-9513]

Neda Maenza, [0000-0002-4974-6052]

Aleksandra Gagić [0000-0002-6804-4662]

Singidunum University, Belgrade, Serbia

Correspondence:

Tijana Gajić

e-mail: tgajic@singidunum.ac.rs

Abstract:

This paper investigates the role of artificial intelligence (AI) in mobile applications for language learning, with a particular focus on Duolingo. It analyses how AI enhances personalized learning through adaptive technologies and features such as speech recognition and interactive exercises. Additionally, the paper explores AI's advantages, such as automated grading and reduced administrative tasks for teachers. Special emphasis is placed on how these technologies are transforming the educational process, considering their impact on both teachers and students. The discussion also addresses potential limitations, including concerns over data privacy and the over-reliance on technology in education. The conclusion acknowledges that while AI tools can significantly enhance the learning process, they cannot fully replace the human factor, especially in the domains of emotional intelligence and critical thinking. Ultimately, the paper argues that AI should be seen as a complementary tool rather than a substitute for traditional teaching methods, fostering a more balanced and effective approach to language learning.

Keywords:

Artificial Intelligence, Mobile Applications, Duolingo, Language Learning, Personalized Learning.

INTRODUCTION

We are witnessing the profound impact of artificial intelligence on foreign language learning [1]. In recent years, AI-based mobile language learning applications have become widely adopted tools in both formal and informal education. These applications leverage advanced algorithms, natural language processing, and adaptive technologies to provide personalized learning, customizing content to each user's needs, offering real-time feedback, and simulating interactive communication in the target language [2] [3]. This raises the question of whether traditional language learning approaches are facing challenges while, at the same time, a new era of education is emerging in which AI is redefining how we approach foreign language acquisition. However, concerns about data privacy and the ethical aspects of artificial intelligence continue to trouble many users. This paper investigates the role of artificial intelligence in mobile language learning applications and their potential impact on the future of education, focusing on new AI-based features of one of the world's most popular language-learning applications, Duolingo.

2. THE CHALLENGE OF ARTIFICIAL INTELLIGENCE IN FOREIGN LANGUAGE LEARNING FOR TEACHERS

With AI's profound influence on all spheres of education, including foreign language acquisition, the role of teachers in the classroom is inevitably changing. This raises the question of whether AI is a threat to language teachers or a valuable ally in the complex process of language acquisition. The authors of this paper, initially sceptical, have come to adopt a positive view of AI in education. We cannot ignore its presence or the fact that our students recognize its advantages as well as its disadvantages. AI is here to stay. Teachers must adapt to this new reality and help students use AI tools appropriately. Moreover, AI-based applications provide diverse resources that can enrich traditional curricula. AI is a valuable ally, particularly for teachers managing large student groups, as applications for automated grading accurately assess each student's progress and are often used for formative assessment. AI can also significantly reduce teachers' administrative burdens. In recent years, educators have increasingly used AI tools like Fetchy, a virtual assistant for teachers. Fetchy can be utilized in numerous ways to simplify and streamline teachers' professional responsibilities, offering inspiration and personalization for various teaching scenarios [4].

One of the authors' key recommendations is to use classrooms primarily for discussions, case studies, practical activities, and other tasks aimed at developing critical thinking, thus preserving them as spaces for social emancipation in line with key concepts of critical pedagogy [5]. On the other hand, AI applications designed to support autonomous learning can be used at home, aligning with the flipped classroom model. Research shows that AI tools yield the best results when they complement, rather than replace, traditional teaching methods and that a combination of both approaches leads to better academic performance and greater student engagement [6] [7] [8].

Using AI grants teachers complete autonomy in their teaching processes, enabling them to monitor students' progress and adjust teaching materials accordingly. AI allows teachers to create additional exercises for areas where students struggle or need to review. As a result, the language learning process is optimized, with more time spent on difficult and complex areas and less on those students have already mastered. Creating supplementary exercises is highly efficient since teachers can generate a variety of exercises targeting specific linguistic challenges quickly.

Notably, AI offers significant benefits in ESP (English for Specific Purposes), particularly in creating vocabulary exercises, given the difficulty of finding textbooks and materials that are comprehensive and aligned with the rapidly changing market demands, as well as the needs of professors and students adapting to these changes. By simply inputting the target vocabulary and the desired language level, teachers can generate a ready-made text with various vocabulary exercises in just a few minutes.

The modifications AI makes are particularly important for students with disabilities, as AI tools can help create accessible learning materials tailored to individual needs, such as text-to-speech features, adaptive exercises, and personalized learning paths.



Figure 1. Fetchy virtual assistant for educators

406

Given that AI is an inexhaustible source of information that can be consulted without the risk of being too demanding, anything undesirable can be modified and adapted to suit both teachers' and students' needs. Refreshing outdated materials is especially engaging, as it introduces greater dynamics into lessons and breaks the monotony that inevitably transfers from professor to students when the same materials are used year after year.

In addition to all the advantages of AI tools in education, we must also address the main drawbacks. These include, primarily, the issue of data privacy and the ethical aspects of artificial intelligence, as well as the time and effort teachers invest in their professional development to feel confident when using modern technologies in teaching. If an application shares user information with marketing firms, users might remain unaware that their data is being disclosed. Applications frequently use gamification to engage learners. However, excessive gamification can create dependency, causing users to feel pressured or anxious about daily app use.

For example, an article in El País highlights how Duolingo's mascot, Duo the Owl, employs persistent and emotionally manipulative tactics to keep users engaged, inducing guilt or stress in some learners [9].

In the context of the drawbacks of AI, the authors must also address the business policies of Duolingo's founder and CEO, Luis von Ahn. At the end of 2023, Duolingo decided not to renew contracts with around 10% of its freelance workers, replacing them with AI-generated translations and lessons in some cases. "Our stance as a company is that if we can automate something, we will," said founder and CEO Luis von Ahn regarding the layoffs [10]. In the long term, von Ahn optimistically adds, AI could open up new opportunities for gaining knowledge, providing quality education to the masses. He believes that languages, in particular, can help people overcome poverty.

3. DUOLINGO – AN AI-BASED LANGUAGE LEARNING APPLICATION

Duolingo is a pioneer in AI innovations for language learning. AI algorithms meticulously analyse user performance, continuously adjusting lesson difficulty to match individual progress. This personalized aspect ensures that Duolingo lessons are equally challenging and appropriate for learners at all levels.

Duolingo has recently introduced an interactive feature where users engage in video calls with Lily, one of Duolingo's beloved mascots. She is a slightly sarcastic girl with purple hair. Conversing with Lily allows users to practice speaking in other languages as if they were talking to an AI friend. These dialogues are generated using the OpenAI GPT-4 model. The feature is part of a subscription package called Duolingo Max, which costs \$30 per month and was launched in 2023 for its premium AI functionalities [11].

Premium AI features include the 'Explain My Answer' option, which provides detailed and personalized explanations for all incorrect answers. One of the biggest criticisms of the standard free Duolingo app is the lack of explanations when users make mistakes. The app would alert learners if they were incorrect and show the correct answer. Duolingo Max, powered by AI, strives to give all its users an insight into the principles governing a language's structure.

Another new AI addition is the "Roleplay" option, which places users in interactive real-life situations to practice language skills, such as ordering coffee, checking a passport, or asking for directions. Many studies have shown that speaking skills can be significantly improved through the regular use of AI applications [12] [13]. For many users, the novelty of practicing with AI characters could provide additional motivation to continue learning the language.



Figure 2. Duolingo mascot Lily

Table 1 clearly shows that the user dropout rate has decreased by as much as 25%, and in terms of results, users are 30% more successful compared to the period before AI implementation.

However, judging by the feedback from early users, while Roleplay is a remarkably helpful feature for practicing conversation, AI models have limitations. Their responses still cannot replace conversations with native speakers [14].

These features represent the latest wave of tools from the generative AI movement initiated by the company last year. "In my opinion, a personalized AI tutor is not a particular feature we are building," said Klinton Bicknell, head of the AI team at Duolingo, in an interview with Forbes. "It is more of a vision of what the entire app is becoming" [10].

The AI approach implemented in the Duolingo app has resulted in an increase in users and revenue after going public in 2022 [10]. Almost 104 million people use the app to learn languages, math, and music each month, representing a 40% increase compared to the previous year. This quarter, revenue has amounted to \$178.3 million, a 41% increase compared to last year [11]. In addition to efforts to develop an AI tutor, the company has made another significant investment in AI through its Duolingo English Test (DET). This is an application-based version of the TOEFL test used worldwide to certify English language proficiency for university or visa applications [11].

The DET, which costs \$59 and was first launched in 2016, became popular during the COVID-19 pandemic because it could be taken remotely. Duolingo now uses AI for every aspect of the DET exam (Forbes), from generating questions to ensuring test-takers do not cheat. One security feature, for example, uses facial recognition to ensure that the examinee is not looking at notes off-screen. Currently, this test accounts for 10% of Duolingo's revenue, and the founder and CEO, Luis von Ahn, aims to further increase revenue, as the company is increasingly targeting non-native English speakers.

Elizabeth Birr Moje, dean of the Marsal Family School of Education at the University of Michigan, said she was excited about the potential of Duolingo's new AI features. However, she does not believe that AI tools will ever be able to replace the intangible skills of real teachers. "AI can't see if a student is experiencing frustration. It cannot see body language," she said. "It can't see joy" [10].



Figure 3. The Future of Language Learning with AI

Table 1. Implementation Statistics and Cost Information

Implementation Statistics and Cost Information
Learning Outcomes - 30% improvement in proficiency levels.
Implementation Cost - \$8 million for adaptive learning AI integration.
ROI - Realized within 15 months with increased user satisfaction.
User Retention - 25% reduction in dropout rates.

AI tools like Duolingo are primarily designed for individual learning, allowing users to progress at their own pace and focus on their specific needs. However, there is significant potential for integrating collaborative learning into these platforms, where students could work together or in small groups with the support of artificial intelligence [15]. Through AI technologies, applications could enable interactive tasks that require collaboration, such as joint problem-solving, idea-sharing, or multi-participant conversation simulations [16] [17]. This would not only enrich the learning experience through social interaction but also foster the development of communication skills in a more realistic context.

To conclude, Duolingo's development reflects larger trends in technology-based language education, highlighting the crucial role of innovation in addressing the changing needs of learners in the digital era [18].

In addition to the Duolingo app, there are apps like Babbel, Pronounce, LanguaTalk, and TalkPal that also use artificial intelligence to enhance the educational experience in numerous ways. These technologies also support autonomous learning and inclusivity, allowing users to learn languages at their own pace.

4. CONCLUSION

The role of artificial intelligence in mobile language learning applications has become a crucial factor in modern education, given its potential to enhance personalized learning and interactive communication. These technologies provide tailored content and instant feedback and foster independent learning. Although artificial intelligence brings many advantages, such as facilitating the teaching process, optimizing formative assessment, and reducing teachers' administrative workload, the obstacles it introduces should not be overlooked. First and foremost, there are ethical concerns related to data privacy and the potential impact on employment opportunities in the education sector. Ethical responsibility is a key component in creating mobile applications based on artificial intelligence. The example of Duolingo, which uses AI to perform tasks that were once handled by humans, illustrates how this technology is transforming the job market and the educational landscape. Despite these challenges, research shows that combining traditional learning methods with AI tools is the most effective way to achieve better results and engage students. In this regard, AI can be a valuable ally to teachers. However, it cannot fully replace the human element in education, especially in areas that require emotional intelligence, critical thinking, and social interaction. Moving forward, ongoing collaboration between educators, developers, and policymakers will be essential to harness the full potential of AI while maintaining pedagogical integrity. In the long run, the successful integration of artificial intelligence in education will depend on a careful balance between technological innovations and the preservation of key pedagogical values, ensuring that AI serves as an enhancement rather than a substitute for meaningful human interaction in the learning process.

REFERENCES

- X. Huang, D. Zou, G. Cheng, X. Chen and H. Xie, "Trends, Research Issues and Applications of Artificial Intelligence in Language Education," *Educational Technology & Society*, vol. 26, no. 1, pp. 112-131, 2023.
- [2] B. Zou, X. Guan, Y. Shao and P. Chen, "Supporting Speaking Practice by Social Network-Based Interaction in Artificial Intelligence (AI)-Assisted Language Learning," *Sustainability*, vol. 15, no. 4, 2023.
- [3] N. Hockly, "Artificial Intelligence in English Language Teaching: The Good, the Bad and the Ugly," *RELC Journal*, vol. 54, no. 2, pp. 445-451, 2023.
- [4] "Fetchy," [Online]. Available: https://www.fetchy. com/. [Accessed 11 January 2025].
- [5] T. Gajić and A. Kuzmanović Jovanović, Foreign Language Teaching and the Development of Critical Thinking in the Era of Neoliberalism: A Critical Pedagogy Perspective, Belgrade: Čigoja Press, 2022.
- [6] O. Zawacki-Richter, V. I. Marín, M. Bond and F. Gouverneur, "Systematic review of research on artificial intelligence applications in higher education where are the educators?," *International Journal of Educational Technology in Higher Education*, vol. 16, no. 39, 2019.
- [7] W. Holmes, M. Bialik and C. Fadel, Artificial Intelligence In Education: Promises and Implications for Teaching and Learning, Boston: The Center for Curriculum Redesign, 2019.
- [8] E. Brynjolfsson and A. McAfee, "The Business of Artificial Intelligence," Harward Business Review, 2017.
- [9] M. Alonso, "Hace mucho que no te vemos": cómo Duolingo hizo de la pasivo-agresividad su secreto adictivo," El Pais, 2024.
- [10] R. Nieva, "Na jednoj od omiljenih aplikacija za jezike Duolingo uskoro će nas podučavati AI profesor," Forbes SRB, 2024.

- [11] "Duolingo The world's best way to learn a language," [Online]. Available: https://www.duolingo. com/. [Accessed 12 January 2025].
- [12] G. Dizon, "Evaluating Intelligent Personal Assistants for L2 Listening and Speaking Development," *Language Learning & Technology*, vol. 1, no. 16-26, p. 24, 2020.
- [13] K. W. K. Lai and H. J. H. Chen, "An exploratory study on the accuracy of three speech recognition software programs for young Taiwanese EFL learners," *Interactive Learning Environments*, vol. 32, no. 5, pp. 1582-1596, 2024.
- [14] E. Caldwell, "Duolingo Max: The Future of Language Learning with AI?," Duolingo Guides, 2024.
- [15] N. K. Tuong and T. C. Dan, "A Study on Duolingo Mobile Applications to Improve Efl Students' Listening Comprehension Performances," *European Journal of Alternative Education Studies*, vol. 9, no. 1, 2024.
- [16] Z. Ouyang, Y. Jiang and H. Liu, "The Effects of Duolingo, an AI-Integrated Technology, on EFL Learners' Willingness to Communicate and Engagement in Online Classes," *International Review of Research in Open and Distributed Learning* , vol. 25, no. 3, pp. 97-115, 2024.
- [17] R. K. Yekollu, T. B. Ghuge, S. S. Biradar, S. V. Haldikar, S. V. Haldikar and O. F. M. A. Kader, "AI-Driven Personalized Learning Paths: Enhancing Education Through Adaptive Systems," in *Smart Data Intelligence*, Singapore, 2024.
- [18] J. Vega, M. Rodriguez, Check, Erick, H. Moran, Loo and Luis, "Duolingo evolution: From automation to Artificial Intelligence," in 2024 IEEE Colombian Conference on Applications of Computational Intelligence (ColCACI), Pamplona, 2024.