THE ROLES OF AI IN SECOND LANGUAGE LEARNING AND ACQUISITION IN THE 21ST CENTURY

By

Gloria Wilson Inyang, Ph.D.
Department of French
Akwa Ibom State College of Education
Afaha Nsit

Nchedo Alice UKWUEZE, Ph.D.
Department of foreign languages & literatures,
University of Port-Harcourt,
Rivers State, Nigeria

And

OFFIONG, Glory Richard
Department of French School of Language
College of Education,
Afaha Nsit

ABSTRACT

This study examined the roles of artificial intelligence in second language learning and acquisition in the 21st century. Artificial intelligence (AI) has dramatically reshaped the landscape of second language learning (L2) and acquisition (L3+). In the context of carrying out this research, numerous subheads were taken into account, some of which included: concept of artificial intelligence, concept of language and concept of second language. Furthermore, the study mentioned numerous roles of artificial intelligence in second language learning and acquisition. It also highlighted the steps in using artificial intelligence in learning and acquiring second language to include: needs assessment/ goal setting, selecting artificial intelligence-powered language learning tools and artificial intelligence-powered personalization/adaptive learning. The challenges of adopting artificial intelligence in learning/acquisition of second language as stated in the study included: limited contextual understanding, bias in artificial intelligence training data and lack of human-like interaction. Furthermore, the study provided mitigations to the challenges to include: improving contextual understanding, addressing bias in artificial intelligence training and enhancing artificial intelligence emotional intelligence. The study concluded that artificial intelligence (AI) plays a transformative role in second language learning and acquisition in the 21st century. One of the recommendations made was that artificial intelligence systems should be designed to tailor learning experiences based on individual progress, strengths, and weaknesses.

KEYWORDS: Artificial Intelligence, Second Language, Learning, Acquisition and 21st Century

INTRODUCTION

In the 21st century, artificial intelligence (AI) has dramatically reshaped the landscape of second language learning (L2) and acquisition (L3+). As globalization and cross-cultural communication continue to expand, the demand for multilingualism has surged, necessitating the development of innovative tools to facilitate language learning. AI plays a pivotal role in addressing these needs, offering personalized, efficient, and interactive methods for learners worldwide. The integration of AI technologies into language education is transforming how individuals acquire new languages, enhancing traditional methods and providing new opportunities for learners of all ages and backgrounds. AI-powered applications, such as speech recognition, natural language processing (NLP), and machine translation, have emerged as key components in modern language learning platforms, making the process more accessible, engaging, and effective (Baker, 2019; Goh, 2020).

AI's impact extends beyond merely supplementing language education; it is revolutionizing how learners interact with language. Personalized learning systems powered by AI algorithms can adapt to individual needs, tracking progress and offering targeted feedback, allowing learners to focus on specific areas of difficulty (Vesselinov&Grego, 2012). Speech recognition tools, for instance, help learners improve their pronunciation by providing real-time corrections, making it easier to master challenging sounds and intonations (Baker, 2019). Furthermore, the advent of machine translation technologies, such as Google Translate, has broken down language barriers, offering real-time translations that enhance comprehension and vocabulary acquisition (Wu et al., 2016). Additionally, AI facilitates immersive learning experiences by simulating realistic interactions, which encourage learners to practice in authentic contexts without the need for a human conversational partner (Godwin-Jones, 2018).

Despite its immense potential, AI in language learning does not come without challenges. Issues such as cultural sensitivity, data privacy concerns, and the need for human interaction in language acquisition highlight the importance of balancing technology with traditional pedagogical methods (Chik, 2014). Nevertheless, AI continues to evolve, offering an exciting frontier for the future of language education. In this context, AI is not just a tool but an essential partner in fostering linguistic and cultural proficiency in the 21st century.

CONCEPT OF AI

Artificial Intelligence (AI) is a branch of computer science focused on creating machines capable of performing tasks that typically require human intelligence. These tasks include learning, reasoning, problem-solving, perception, and language understanding. AI systems work by processing large volumes of data and using algorithms to identify patterns, make decisions, and improve over time through experience. Artificial Intelligence can be understood as the collection of technologies that enable machines to sense, comprehend, act, and perform several functions matching those of humans (Bassey and Owushi, 2023).

The most common forms of AI today are Narrow AI, which is designed to perform specific tasks, and Machine Learning (ML), a subset of AI focused on enabling machines to learn from data without explicit programming. Narrow AI applications are prevalent in everyday life, such as virtual assistants (e.g., Siri, Alexa), recommendation systems, and self-driving cars. Machine learning, in particular, has transformed various industries by automating complex tasks like image recognition, fraud detection, and natural language processing (Jordan & Mitchell, 2015). Deep learning, a subset of ML, uses multi-layered neural networks to process vast amounts of data and has achieved impressive results in areas such as speech and image recognition (LeCun, Bengio, & Hinton, 2015).

AI, also referred to as Strong AI, remains a theoretical concept and refers to machines that possess the ability to perform any intellectual task that a human can do. Unlike Narrow AI, which excels in specific domains, General AI would have the capacity to understand and learn a broad range of tasks, apply common sense reasoning, and adapt to new situations. However, the development of such systems presents significant challenges in terms of creating machines that exhibit human-like consciousness, reasoning, and emotional intelligence (Bostrom, 2014). As of now, AI research is far from achieving true General AI, and it remains an area of ongoing speculation and exploration.

Natural Language Processing (NLP) is a subfield of AI that enables machines to understand, interpret, and respond to human language. NLP applications are widespread, including in chatbots, language translation services, and sentiment analysis. By processing and analyzing text or speech data, NLP allows computers to interact more seamlessly with humans. One of the most notable advances in NLP is the development of large language models like OpenAI's GPT, which can generate human-like text and hold conversations with users (Vaswani, 2017). These advances have revolutionized areas such as customer service, content generation, and language translation.

CONCEPT OF LANGUAGE

Language is a structured system of communication that consists of grammar and vocabulary. It is the primary means by which humans convey meaning, both in spoken and signed forms, and may also be conveyed through writing. Human language is characterized by its cultural and historical diversity, with significant variations observed between cultures and across time. According to Evans & Levinson (2024). Human languages possess the properties of productivity and displacement, which enable the creation of an infinite number of sentences, and the ability to refer to objects, events, and ideas that are not immediately present in the discourse.

The primary function of language, the creation of meanings, must not be confused with language use. Language is used for specific external purposes, the most important of which is communication. Castillo, (2024). Because of this language is instrumental. But language cannot be identified with the use made of it. Language is to be defined by its primary function, its internal determination. The use of language constitutes the external determination of language. Language cannot be defined by its external determinations but its internal determination. Language defines itself because of meaning and thus both.

Language, a system of conventional spoken, manual (signed), or written symbols by means of which human beings, as members of a social group and participants in its culture, express themselves. The functions of language include communication, the expression of identity, play, imaginative expression, and emotional release. Language is primarily human and non- instinctive method of communicating ideas, emotions and desires by means of a system of voluntarily produced symbols. Chakma, (2022) Language is a purely human and non-instinctive method of communicating ideas, emotions and desires by means of a system of voluntarily produced symbols.

Language is the expression of ideas by means of speech-sounds combined into words. Words are combined into sentences, this combination answering to that of ideas into thoughts. Language is a complex phenomenon. Linguists, psychologists and philosophers have attempted to define and describe it in their own words. Basically, it is means of communicating ideas, feelings and emotions through spoken and written words.

CONCEPT OF SECOND LANGUAGE

A second language is any language learned in addition to a person's native language. It plays a crucial role in communication, education, and globalization, enabling individuals to interact across linguistic and cultural boundaries. The process of acquiring a second language varies based on age, learning environment, cognitive abilities, and exposure to the target language (Ellis, 2019). Second language acquisition is influenced by numerous factors, including motivation, learning strategies, and linguistic similarities between the first and second languages (Dörnyei & Ryan, 2020). Learners may acquire a second language through formal instruction, immersion, or interaction with native speakers.

Research indicates that younger learners often attain better pronunciation and fluency due to greater neural plasticity, whereas older learners excel in explicit grammar learning (Hakuta, Bialystok, & Wiley, 2021). Technological advancements, including artificial intelligence (AI), have revolutionized second language learning by offering personalized tutoring, speech recognition, and adaptive learning techniques. However, challenges such as cultural nuances, idiomatic expressions, and emotional engagement remain significant in AI-assisted language learning (Zhang & Yu, 2020).

However, second language plays an importance role by extending beyond individual benefits and influences global economies, international relations, and multicultural interactions. In many professional sectors, proficiency in a second language enhances career opportunities, allowing individuals to work in diverse environments and communicate effectively across cultural barriers. Additionally, learning a second language fosters cognitive development, improving problem-solving skills, memory retention, and critical thinking abilities. Social integration is another key aspect of second language learning. For immigrants and expatriates, acquiring the local language is essential for building social connections, accessing essential services, and feeling a sense of belonging within their new communities.

Educational institutions worldwide emphasize bilingual or multilingual education to equip students with language skills that will benefit them in their personal and professional lives. Despite its many advantages, learning a second language presents challenges such as language interference, where structures from the first language influence the second, leading to errors in pronunciation, grammar, or word usage. Additionally, achieving fluency requires consistent practice and exposure, which can be difficult without access to native speakers or immersive language environments. Nevertheless, with the right learning methods, dedication, and technological support, second language acquisition remains an attainable and valuable skill.

THE ROLES OF AI SECOND LANGUAGE LEARNING AND ACQUISITION IN THE 21ST CENTURY

In the 21st century, artificial intelligence (AI) has dramatically reshaped the landscape of second language learning (L2) and acquisition (L3+). As globalization and cross-cultural communication continue to expand, the demand for multilingualism has surged, necessitating the development of innovative tools to facilitate language learning. AI plays a pivotal role in addressing these needs, offering personalized, efficient, and interactive methods for learners worldwide. The integration of AI technologies into language education is transforming how individuals acquire new languages, enhancing traditional methods and providing new opportunities for learners of all ages and backgrounds. AI-powered applications, such as speech recognition, natural language processing (NLP), and machine translation, have emerged as key components in modern language learning platforms, making the process more accessible, engaging, and effective (Baker, 2019; Goh, 2020).

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STEPS IN USING AI IN LEARNING AND ACQUISITION OF SECOND LANGUAGE

AI has revolutionized second language acquisition (SLA) by offering personalized instruction, adaptive learning, and real-time feedback. The following sections provide an in-depth exploration of how AI is effectively utilized in SLA.

□ Needs Assessment and Goal Setting

Before integrating AI into second language learning, learners and educators must assess individual needs and set specific learning goals. AI systems rely on these initial inputs to customize language instruction. Common goals include enhancing fluency, expanding vocabulary, improving pronunciation, and refining writing skills. AI-driven platforms such as Duolingo and Busuu use user analytics to design personalized learning pathways (Tajik, 2025). Furthermore, AI-powered diagnostics assess learners' initial proficiency through speech and writing analysis. For example, speech recognition tools like Google Speech-to-Text provide pronunciation scores and highlight phonetic errors. Adaptive AI models adjust lesson plans based on real-time learner progress, ensuring a tailored learning experience. Needs assessment also includes understanding learners' cognitive styles, allowing AI to offer auditory, visual, or kinesthetic learning options.By defining clear learning objectives, AI applications optimize engagement and efficiency, making second language acquisition more structured and goal-oriented.

□ Selecting AI-Powered Language Learning Tools

The integration of AI in second language learning requires selecting appropriate tools that align with learners' needs. AI-powered chatbots, virtual tutors, adaptive learning platforms, and speech recognition software provide different functionalities.

• **Chatbots and Virtual Tutors:** AI assistants such as ChatGPT and Replika offer real-time conversational practice, improving fluency. They adapt to users' responses, mimicking natural conversations.

• Adaptive Learning Platforms: Platforms like Duolingo use AI to tailor lesson difficulty based on learners' progress.

• **Speech Recognition and Pronunciation Analysis:** AI-powered speech recognition tools like Google Speech-to-Text assess pronunciation accuracy and suggest corrections.
• **Automated Writing Assistant:** Grammarly and ProWritingAid use AI to analyze grammar, coherence, and style, providing instant feedback.
Selecting the right AI tool enhances engagement and ensures a structured learning experience, reducing cognitive overload while promoting consistent language acquisition.

** AI-Powered Personalization and Adaptive Learning**

AI personalizes second language acquisition by analyzing learners' progress and tailoring content accordingly. AI-powered adaptive learning models track users' mistakes and adjust lesson difficulty in real time. For example, Duolingo's AI algorithm identifies weak areas and revisits challenging topics. AI-powered tutors offer vocabulary suggestions based on learners' interests and past performance. Additionally, personalized pronunciation assessments in AI-driven apps like Elsa Speak refine speaking skills through phonetic correction. Gamification elements, such as point-based rewards and progress badges, further enhance motivation. AI also customizes exercises for different learning styles, whether visual, auditory, or kinesthetic. Research shows that personalized AI learning improves retention rates and engagement compared to traditional methods (Harshitha, 2025). By continuously adapting to learners' needs, AI ensures that second language acquisition remains dynamic, engaging, and highly effective.

** AI-Enhanced Language Practice and Interaction**

AI facilitates language practice through interactive exercises and simulations. Chatbots like ChatGPT and Replika engage learners in real-time conversations, replicating human-like interactions. AI-generated role-playing scenarios immerse learners in contextual dialogues, improving conversational fluency. Speech recognition tools evaluate pronunciation and intonation, offering corrective feedback. For instance, Elsa Speak provides phonetic breakdowns, helping learners refine their pronunciation. AI-driven writing assistants assess grammar, sentence structure, and coherence, allowing learners to enhance their writing skills. Furthermore, AI-powered virtual reality (VR) applications create immersive language environments. VR simulations enable learners to practice language skills in realistic settings, such as ordering food in a restaurant or navigating an airport. This hands-on approach accelerates fluency development.

** AI-Driven Automated Assessments and Feedback**

AI automates assessments by evaluating learners' proficiency through quizzes, writing evaluations, and pronunciation tests. AI-driven platforms provide instant feedback, helping learners understand mistakes and improve language accuracy. For instance, Grammar and Pro Writing Aid analyze essays, offering grammatical corrections, structural suggestions, and style enhancements. AI-powered oral assessment tools evaluate pronunciation and fluency, providing phonetic feedback. AI-generated multiple-choice tests assess reading and listening comprehension, adapting questions based on user performance (Yan, 2025). Adaptive AI technology ensures that assessments align with learners' proficiency levels, reinforcing knowledge retention. Additionally, AI-powered learning dashboards track progress, offering personalized insights into strengths and weaknesses. Automated assessment reduces grading time for educators while enhancing self-paced learning for students.

THE CHALLENGES OF ADOPTION OF AI TO LEARN AND ACQUIRE SECOND LANGUAGE

Artificial Intelligence (AI) has significantly transformed second language learning by offering personalized learning experiences, adaptive feedback, and speech recognition capabilities. However, despite its potential, AI faces several challenges in effectively facilitating second language acquisition. These challenges include limitations in contextual understanding, biases in AI models, lack of human-like interaction, accessibility issues, ethical concerns, and technological constraints. Addressing these challenges is essential for optimizing AI-driven language learning systems.

Limited Contextual Understanding

AI models, particularly those based on Natural Language Processing (NLP), struggle with understanding the deeper contextual, cultural, and idiomatic nuances of language (Zhang & Yu, 2020). Language is dynamic, and meaning often depends on situational context, tone, and non-verbal cues, which AI systems are yet to fully comprehend. This limitation leads to inaccuracies in translation and comprehension, hindering effective language learning.

Bias in AI Training Data

AI models learn from vast datasets, but these datasets often contain biases. If AI is trained on predominantly Western or standardized language data, it may fail to accommodate linguistic diversity, dialects, and accents (Sun et al., 2019). This can lead to an uneven learning experience, where learners are exposed to a limited or even distorted version of the target language (Bender et al., 2021).

Lack of Human-Like Interaction

One of the most critical aspects of language acquisition is social interaction. AI lacks the emotional intelligence and adaptability of human instructors, making it difficult for learners to engage in meaningful conversations and receive nuanced corrections (Schroeder & Schmidt, 2022). The inability of AI to fully simulate real-life conversations may limit its effectiveness as a standalone learning tool.

Accessibility and Digital Divide

Many AI-driven language learning tools require stable internet connections, advanced computational resources, and costly subscriptions. This creates a digital divide, as learners from lower-income backgrounds or regions with poor technological infrastructure may struggle to access these resources (Kohnke, 2021). Bridging this gap is crucial to ensuring AI-based language learning is inclusive and widely available.

Ethical and Privacy Concerns

AI-powered language learning platforms collect vast amounts of user data to enhance personalization. However, concerns about data privacy, security, and ethical AI use arise when this data is not adequately protected or is exploited for commercial purposes (Branwen, 2023). Ensuring compliance with data protection laws and maintaining transparency in AI operations is essential to building user trust.

Over-Reliance on AI and Reduced Critical Thinking

Excessive reliance on AI-generated translations, grammar corrections, and speech recognition tools may reduce learners' active engagement with language structures and problem-solving skills (Chen, 2020). Language learning requires practice, creativity, and cognitive effort,

which AI may not always encourage if users passively accept AI-generated outputs without critical thinking.

Technological Limitations and Errors

AI is not infallible; it can produce errors, incorrect translations, and flawed sentence structures, especially when dealing with complex language rules. Learners relying solely on AI tools risk internalizing these errors, potentially affecting their language proficiency (Xie, 2022). Regular updates, human oversight, and hybrid learning approaches that integrate AI with human instruction can help mitigate this issue.

HOW TO MITIGATE THE CHALLENGES OF AI TO LEARN AND ACQUIRE SECOND LANGUAGE

Artificial Intelligence (AI) has transformed second language learning by providing personalized learning experiences, real-time feedback, and automated language assessment. However, challenges such as contextual limitations, bias in AI models, and lack of emotional intelligence, accessibility issues, and ethical concerns hinder its full potential. Addressing these challenges requires strategic interventions to optimize AI's effectiveness in language acquisition.

Improving Contextual Understanding

Improving contextual understanding by using multimodal AI training, such as incorporating audio, video, and real-world conversational data, can help AI understand context better (Zhang & Yu, 2020). Additionally, hybrid AI-human interaction can combine AI-based instruction with human educators to clarify contextual misunderstandings and provide cultural insights (Schroeder & Schmidt, 2022).

Addressing Bias in AI Training

Addressing bias in AI training data requires diverse and representative datasets that include different dialects, linguistic variations, and cultural contexts (Bender et al., 2021). Bias detection and correction mechanisms should be implemented in AI algorithms to identify and correct biased language patterns (Chen, 2020).

Enhancing AI Emotional Intelligence

Enhancing emotional intelligence and human-like interaction can be achieved through affective computing integration, where AI is trained to recognize emotions in voice and text, improving engagement (Schroeder & Schmidt, 2022). Blended learning approaches that combine AI tools with human interactions ensure a more emotionally supportive learning environment (Kohnke, 2021).

Increasing Accessibility and Personalization

Bridging the digital divide and enhancing accessibility can be done by developing low-cost AI solutions, such as AI-powered mobile applications that function offline to reach underprivileged learners (Branwen, 2023). Government and institutional support through funding and subsidies for AI-based language learning tools can improve accessibility.

Ensuring Ethical AI Deployment

Strengthening data privacy and ethical considerations involves strict data encryption and security protocols to protect user data (Branwen, 2023). Compliance with global privacy

regulations, such as GDPR and CCPA, ensures ethical AI deployment in second language teaching (Chen, 2020).

CONCLUSION

Artificial Intelligence (AI) plays a transformative role in second language learning and acquisition in the 21st century. AI-powered tools offer personalized learning experiences, adapting to individual learners' needs and proficiency levels. Virtual tutors and chatbots provide real-time feedback, enhancing pronunciation, grammar, and fluency. AI-driven language apps facilitate immersive learning through speech recognition, gamification, and adaptive assessments. Machine translation and natural language processing bridge communication gaps, supporting multilingual interactions. AI fosters autonomous learning, enabling students to practice anytime and anywhere. However, ethical concerns, data privacy, and the lack of human cultural nuance remain challenges. Overall, AI is revolutionizing language learning, making it more accessible, efficient, and engaging.

RECOMMENDATIONS

- AI systems should be designed to tailor learning experiences based on individual progress, strengths, and weaknesses. Adaptive learning algorithms can optimize content delivery.
- Developers should improve AI-driven speech recognition to provide more accurate pronunciation feedback, helping learners develop fluency and proper articulation.
- AI tools should incorporate cultural nuances and contextual understanding to ensure learners grasp not only language mechanics but also cultural appropriateness in communication.

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