Personalized AI-Driven Language Learning in Saudi Arabia: An Experimental Study on Perceived Adaptability, Learner Autonomy, and Language Retention

Firas A.S. Al Taqataq[1], Wafa' A. Hazaymeh[2], Sayed M. Ismail[3*], Khalid Abu-Alghayth[4], Aayesha Sagir Khan[5]

[1]Faculty of Applied Medical Sciences, Rehabilitation Sciences Department- SLP, Al al- Bayt University– Jordan, Mafraq

[2]College of Education, Humanities and Social Sciences, Al-Ain University, Al Ain, United Arab Emirates

[3]Department of English Language, College of Science and Humanities, Prince Sattam bin Abdulaziz University, Al-kharj, Saudi Arabia

[4]Department of Special Education, College of Education, King Khalid University, Saudi Arabia

[5]Faculty of Languages and Translation, King Khalid University, Abha, Saudi Arabia

[*]Corresponding author's email: a.ismail@psau.edu.sa

[*]ORCID: https://orcid.org/0000-0002-6698-006X

Received: 03/07/2025 Revision: 15/08/2025 Accepted: 03/09/2025 Online: 31/12/2025

ABSTRACT

Personalized AI-driven platforms, such as ChatGPT, offer individualized guidance that aligns with the specific needs of each learner, potentially boosting motivation, fostering independence, and improving knowledge retention. This study investigates the impact of a personized AI-driven language learning platform, utilizing ChatGPT, on EFL learners' perceived adaptability, autonomy in their learning processes, and retention of language skills. Sixty intermediate-level female students from Riyadh, Saudi Arabia, were randomly divided into two groups: an experimental group (n = 30) that engaged in adaptive AI-enhanced instruction, and a control group (n = 30) that experienced static, non-personalized digital content. The research utilized a quantitative pre-post experimental framework, featuring pre- and posttests to evaluate language retention, a validated questionnaire to measure learner autonomy, and a scale to assess perceived adaptability. Quantitative findings examined via Analysis of Covariance (ANCOVA) revealed significant post-intervention enhancements across all three variables for the experimental group, with considerable effect sizes observed for perceived adaptability and language retention, as well as a moderate effect for autonomy. The results highlight the crucial role of personalized AI in fostering independent, adaptable, and retention-boosting language learning experiences. The findings of this study indicate significant factors to consider when integrating intelligent tutoring systems into EFL instruction and improving learner-centered digital education. This encompasses the essential need for educator training in AI prompt engineering, the creation of curricula that incorporate decision-making opportunities, and the emphasis on policies that endorse adaptive learning platforms.

Keywords: Perceived adaptability; ChatGPT, Language retention; Learner autonomy, Personalized AI-driven language learning; Saudi EFL Context

| Al Taqataq, F., Hazaymeh, W., Ismail, S., Abu-Alghayth, K., Khan, A (2025). Personalized AI-Driven Language Learning in Saudi Arabia: An Experimental Study on Perceived Adaptability, Learner Autonomy, and Language Retention. *Computer-Assisted Language Learning Electronic Journal: Special Issue AIIDLE*, 26(7), pp. 230-255

Introduction

Personalized artificial intelligence (AI)-enhanced language education signifies a transformative change in the approaches to second language (L2) learning methodology (Ross, 2023; Schmidt & Strasser, 2022). This method enables students to participate in dynamic, self-directed experiences that are finely attuned to their unique preferences, needs, and performance (Kohnke et al., 2023). Among various technologies, generative large language models (LLMs) such as ChatGPT have begun to assume significant roles in English language teaching (ELT), especially within the domains of English as a Second Language (ESL) and English as a Foreign Language (EFL) (Lee et al., 2025; Tian & Wang, 2025). Unlike conventional instructional approaches that apply a uniform strategy, AI-driven platforms like ChatGPT-based tutors leverage machine learning and natural language processing (NLP) to adaptively modify vocabulary, grammar, and communication tasks (Dumitru, 2024; Kwak et al., 2023). The capability of ChatGPT to engage students through interactive, human-like dialogues, deliver immediate corrective feedback, and replicate real-world communication situations demonstrates its effectiveness (Ding et al., 2025). The conversational interface facilitates personalized learning by modifying linguistic complexity, pace, and topics according to the responses of the learner (Sharma et al., 2025). The personalized features significantly boost motivation and enjoyment while also promoting increased autonomy and self-regulation (Luan et al., 2024; Zhao et al., 2025).

Recent studies highlight the instructional value of ChatGPT for both teachers and students. For example, Meniado (2023) found 15 pertinent studies within nine months of the product's launch, highlighting its swift adoption in ESL and EFL teaching. In terms of guidance, the tool assists teachers in designing lessons, developing instructional resources, and evaluating writing (Hossain & Al Younus, 2025; Xia et al., 2024). In the realm of education, ChatGPT has demonstrated its ability to enhance engagement across the four strands of language learning identified by Nation (2007): meaning-focused input, meaning-focused output, language-focused learning, and fluency development (Dizon, 2024). For instance, dialogues produced by AI have been acknowledged for improving students' oral fluency and communication skills (Elmaadaway et al., 2025; Tai & Chen, 2024). Furthermore, the ability of ChatGPT to provide instant performance tracking and directed feedback closely corresponds with emerging educational technology efforts focused on sustained retention and metacognitive development (Chang & Sun, 2024). Nonetheless, challenges to academic integrity and concerns about the accuracy of generated responses continue to exist (Stokel-Walker, 2024). Given the established affordances and constraints, it is essential to conduct empirical tests to assess the impact of personalized AI systems on important learner variables, such as perceived adaptability, autonomy, and language retention, utilizing quantitative data. This research seeks to address the growing divide by examining the differences between personalized AI-driven platforms and non-personalized online learning in the context of English as a Foreign Language in Saudi Arabia.

Regarding the capability of AI to tailor educational experiences, learner autonomy stands as a key concept in modern language acquisition (Benson, 2013). This framework illustrates a shift from traditional teacher-led approaches to those that prioritize the learner, emphasizing self-regulation, decision-making, and independent learning (Benson, 2013). Autonomy,

characterized by the ability to learn independently, empowers students to pursue objectives, choose learning strategies, track progress, and evaluate outcomes. The concept has gained significant traction in the current technological landscape, as technology-enhanced settings provide adaptive, personalized learning experiences that can distinctly support independent learning (Kim et al., 2024). In the context of L2 learning, the concept of learner autonomy is linked to increased motivation, heightened intellectual involvement, and better learning results (Deci & Ryan, 2000). The incorporation of adaptive learning technologies, particularly AI-driven language learning platforms, enhances this potential by allowing learners to engage in self-directed learning paths, obtain immediate feedback, and make choices regarding content and time management (Leshchenko et al., 2023). These opportunities allow for the promotion of independence by organizing teaching methods that align with learners' preferences, skills, and evolving requirements. Therefore, exploring how personalized AI-driven platforms influence learner autonomy is crucial for understanding their role in fostering effective and sustainable language learning strategies within technology-enhanced settings.

The central issue of language retention is inextricably linked with autonomy, highlighting learners' ability to absorb, store, and recall linguistic information over time, including vocabulary, grammar rules, and comprehension. As educational technology continues to evolve swiftly, fostering long-term retention of language skills has become a fundamental objective in instructional design, especially within digitally mediated contexts (He & Loewen, 2022). It has been found that mere exposure to language input is inadequate for ensuring long-term retention (Schmitt & Schmitt, 2020). Instead, successful retention requires significant engagement, consistent practice, relevant input, and prompt feedback. With advancements in AI in education, personalized learning platforms have transformed into groundbreaking tools that adapt instructional content based on student performance and interests, providing repeated and scaffolded exposure to language features across various modalities. A personalized experience can significantly improve retention by anchoring language knowledge through individualized pacing, customized assignments, and engaging feedback mechanisms (Zou et al., 2023). Additionally, systems powered by AI that incorporate spaced repetition, various forms of input, and immediate corrective feedback are believed to engage in more profound cognitive processing, essential for transferring linguistic information from short-term to long-term memory (Yassin & Mabanja, 2024). Therefore, examining the effects of personalized AI-driven learning on language retention goes beyond addressing a fundamental issue in applied linguistics; it also sheds light on how adaptive technology might transform language learning methods in contemporary digital classrooms.

The broader concept of perceived adaptability underpins these interrelated factors, emerging as a pivotal construct in contemporary language learning and teaching (Essa et al., 2023). This framework emphasizes the increased necessity for learning environments that are responsive to instructional needs, accommodating learner diversity, evolving language requirements, and changing educational settings. Characterized by personalization, perceived adaptability transcends the traditional one-size-fits-all model, allowing for educational approaches to be tailored to the cognitive styles, skill levels, interests, and emotional states of learners (Dornyei, 2013). Rooted in learner-centered and constructionist approaches, adaptable instruction fosters greater learner independence, motivation, and agency by modifying content, pace, feedback,

and task difficulty dynamically (Leshchenko et al., 2023). Recent advancements in AI have increased the importance of perceived adaptability, allowing language learning systems to provide differentiated support, facilitate dialogue scaffolding, and create customized learning paths. Research outcomes indicate that these adaptive environments significantly improve both language retention and comprehension while also promoting vital 21st-century skills, including self-regulation and strategic learning (Chang & Sun, 2024). As educators integrate an increasing number of digital tools into their teaching practices, it is essential to grasp the concept of perceived adaptability, both as a pedagogical approach and as a technological capability, to enhance student achievement in diverse and multilingual learning environments.

The current investigation holds considerable pedagogical and theoretical implications, given the importance of perceived adaptability, autonomy, and retention in AI-facilitated language learning. The study addresses an important gap in understanding how personalize AI-driven learning environments affect essential learner factors in the process of acquiring an L2. Although earlier studies have looked at the individual components in isolation, there has been less focus on integrating quantitative data to explore their interconnectedness in AI-enabled learning (Aslan et al., 2019). Moreover, the integration of advanced AI technologies such as ChatGPT into practical language learning environments is still not fully examined, particularly concerning its ability to offer personalized learning experiences and promote learner autonomy in real-time (Hossain & Al Younus, 2025; Namaziandost & Rezai, 2024). This research enhances the understanding of adaptive language pedagogy by employing a quantitative design that incorporates objective performance indicators. It provides research-backed recommendations for educators, curriculum developers, and technology specialists looking to enhance the integration of AI in language learning environments. Ultimately, the results can guide the creation of more impactful, captivating, and tailored language learning experiences that foster enduring proficiency and lifelong learning abilities.

The reasoning behind concentrating on female EFL learners in Saudi Arabia is supported by the country's Vision 2030 framework and the distinct environment of gender-segregated education (Alsaywid et al., 2023). The uniqueness of this context, in contrast to other Gulf or collectivist EFL environments, lies in Saudi Arabia's transition from traditional teacher-centered methods to promoting learner autonomy, which creates an optimal environment for AI personalization (Gulnaz et al., 2015). The educational landscape in Saudi Arabia's EFL setting has been marked by conventional teaching methods that prioritize memorization and the authority of the teacher, leading to a significant reliance on instructors and limited learner independence. The focus of Vision 2030 on educational reforms seeks to enhance digital literacy and encourage self-directed learning, highlighting the significance of AI tools such as ChatGPT in addressing these educational challenges. The importance of the research is expressed in both theoretical and practical contexts. This research enhances the understanding of Adaptive Learning Theory (ALT) by quantifying perceived adaptability as a measurable construct. This research builds upon Self-Determination Theory (SDT) by illustrating the particular function of AI in fulfilling the psychological needs for autonomy and competence within a culturally conservative context (Deci & Ryan, 2000; Lai et al., 2022).

Theoretical Background

The incorporation of tailored AI-supported platforms in L2 learning is deeply grounded in fundamental theoretical principles that highlight learner-centric approaches, flexibility, and cognitive engagement (Kukulska-Hulme & Ilic, 2025). This framework is fundamentally built upon three essential theoretical domains: Learner Autonomy Theory (LAT), ALT, and cognitive models that elucidate language retention.

LAT posits that effective language acquisition takes place when individuals take charge of their own learning journeys, encompassing aspects such as establishing goals, choosing strategies, and conducting self-assessments (Benson, 2013). The ability to make choices plays a vital role in maintaining a lasting dedication to language acquisition, as it significantly enhances internal motivation and self-reflective understanding (Deci & Ryan, 2000; Luo & Zhou, 2024). The emergence of digital technologies, especially AI, has opened up remarkable possibilities for autonomy, allowing learners to have increased choice and control over their content, pace, and interactions (Reinders & White, 2016). Platforms that utilize AI for learning strongly support this theory by enabling learners to pursue independent pathways. These platforms allow individuals to make choices informed by immediate feedback and tailored suggestions, which enhances their sense of responsibility and control over their educational journey (Asadi et al., 2025; Jing et al., 2023; Leshchenko et al., 2023).

ALT is fundamentally rooted in constructivist principles, emphasizing the importance of customizing instruction to address the varied needs and interests of learners (Woolf, 2010). The theory suggests that optimal learning occurs when resources and tasks are structured in alignment with learners' existing knowledge, their capacity to handle cognitive load, and their levels of motivation (Van Lehn et al., 2007). Customized AI systems, such as those driven by ChatGPT, implement this concept by dynamically modifying task complexity, content relevance, and feedback mechanisms according to ongoing learner performance metrics (Chang & Sun, 2024; Kukulska-Hulme & Ilic, 2025; Luo & Yusuf, 2025). This real-time adaptability enhances the challenge level (the "Zone of Proximal Development (ZPD)"), promotes deeper cognitive engagement, and minimizes frustration, which improves learning and skill acquisition (Law et al., 2020; Phumeechanya & Wannapiroon, 2014). Importantly, ALT goes beyond simple personalization; it involves the learners' ability to modify their approaches and actions in reaction to evolving educational requirements, thus fostering resilience and strategic adaptability in language learning environments (Essa et al., 2023).

To grasp language retention, cognitive theories of memory and learning offer a solid basis for explaining how adaptive AI instruction promotes enduring language acquisition. The Information Processing Model (IPM) suggests that learning encompasses encoding, storage, and retrieval processes, which are significantly enhanced by meaningful practice, repetition, and timely feedback (McLaughlin, 1987). Research on acquiring an L2 highlights that retention is enhanced by methods like spaced practice, active retrieval, and multimodal input (Cepeda et al., 2008). AI platforms can systematically execute these requirements by utilizing personalized

review timelines and comprehensive, multimodal corrective feedback (Francescucci, A., & Foster, 2013; Sharma et al., 2025). Furthermore, Cognitive Load Theory (CLT) guides the creation of adaptive learning systems by indicating that a well-balanced task difficulty, carefully aligned with the challenge and the learner's ability, is crucial to avoid cognitive overload and enhance the transfer of knowledge to long-term memory (Sweller, 1988). Tailored AI systems utilize these cognitive principles by adapting instructional content and pacing to individual learners, thus enhancing the effectiveness of encoding and consolidation of linguistic knowledge over time (Zheng et al., 2022).

These theoretical perspectives come together to underscore the importance of empirically investigating how personalized AI-driven language learning systems impact perceived adaptability, learner autonomy, and language retention. The concept of learner autonomy highlights the advantages of self-regulation and the options provided by AI; the principles of adaptive learning stress the importance of responsive instructional design; and theories of cognitive retention illustrate how tailored practice and feedback contribute to lasting learning results. In this context, perceived adaptability (PA) refers to the learners' personal assessment of the extent to which an AI system aligns with their unique needs, preferences, and learning speed (Essa et al., 2023). This concept is put into practice using scales that assess observable aspects like personalized pacing, content relevance, and feedback responsiveness (Koutsantonis et al., 2022). PA is a unique psychological construct that stands apart from similar concepts like system usability, which mainly emphasizes the ease of the interface, and personalization accuracy, which is solely focused on the precision of algorithms (Gronier & Baudet, 2021).

Experimental Background

Over the past ten years, an increasing amount of research has explored the educational possibilities of AI in language acquisition, especially in enhancing learners' speaking abilities, motivation, independence, and overall involvement (Lo et al., 2024). Initially, Qiao and Zhao (2023) carried out a classroom-based study to assess the impact of personalized AI-driven learning on L2 speaking skills and self-regulation. The results showed that students who utilized AI-enhanced learning via the Duolingo platform outperformed those in the control group, exhibiting notable advancements in speaking skills and self-regulated learning. Jumah et al. (2024) explored the effects of AI-powered personalized video recommendations within a flipped classroom environment. In contrast to the control group, the experimental group was provided with tailored video recommendations, leading to increased motivation, engagement, and academic performance, particularly among students with moderate motivation levels. The findings validate that AI personalization serves as a powerful approach to enhance learner engagement. In order to offer a comprehensive overview, Xu and Ouyang (2022) performed a meta-analysis utilizing data aggregated from 40 empirical studies that included more than 3,000 participants. Their synthesis demonstrated a significant overall effect size, indicating that

instruction enhanced by AI greatly improves English learning results. Additionally, the moderator analysis indicated that elements like sample size, learning stage, and the academic majors of students significantly impacted the effectiveness of AI.

Alongside these quantitative results, there exists significant research exploring the psychological and behavioral aspects of AI utilization. For example, a study by Lo et al. (2024) involving Chinese international students revealed that ChatGPT notably improved foreign language enjoyment and self-efficacy, with enjoyment acting as a mediating variable. This highlights the emotional advantages of integrating AI into language learning environments. Similarly, Tram (2025) utilized a methodology grounded in the UTAUT2 model to explore the acceptance of ChatGPT for autonomous English learning. The findings revealed that trust, enjoyment, and the perceived interactivity of learners had a significant impact on continued use via perceived usefulness, whereas self-efficacy and technology anxiety affected usage through perceived ease of use. Interestingly, the students utilized ChatGPT for various purposes such as reading, writing, and grammar, demonstrating its versatile assistance in language acquisition. Additionally, Wu et al. (2025) evaluated the efficacy of an AI-driven speaking assistant called Lora. Their findings highlighted its ability to foster learners' enjoyment of foreign languages, alleviate anxiety, and boost willingness to communicate (WTC)—ideas that align with Positive Psychology theories in education.

In addition to these findings, Polakova and Klimova (2024) investigated the perceptions of university students regarding dialogue chatbots. The students indicated notable language enhancement and viewed the chatbot as an effective supplementary resource for language acquisition. These findings confirm the recognized value of AI-driven technologies. Kessler et al. (2025) conducted a comparative study examining the impacts of Duolingo and ChatGPT on various learner variables, including motivation, enjoyment, critical thinking, and autonomy. Both AI applications resulted in notably more favorable outcomes compared to conventional teaching methods, indicating their comparable ability to improve L2 learning experiences. Finally, a systematic review was carried out by Zhu et al. (2025) following PRISMA guidelines to assess the impact of ChatGPT on student engagement. Their meta-analysis revealed that learning environments enhanced by ChatGPT resulted in medium to large effect sizes across behavioral, cognitive, and emotional engagement areas, confirming its effectiveness as a facilitator of comprehensive learning engagement.

Experimental Background

While an increasing array of research has highlighted the promise of AI-enhanced teaching methods for improving language acquisition—particularly in aspects like speaking abilities, motivation, self-regulation, engagement, and enjoyment—there are still significant gaps that need to be addressed. Current studies have mainly concentrated on individual skills, with insufficient emphasis on the combined impacts of tailored AI-driven systems on perceived

adaptability, learner autonomy, and language retention, especially through a quantitative lens. Moreover, the majority of research focuses on either quantitative results or qualitative insights, yet there is a scarcity of studies employing a quantitative approach to investigate how AI personalization actively influences learner experiences and the enduring retention of language knowledge. Moreover, although platforms such as Duolingo and ChatGPT have been examined, there remains a lack of comparative insights regarding the impact of personalization features on learners' perceived adaptability and autonomy, particularly across diverse instructional settings and learner demographics. Therefore, a thorough exploration is necessary to address these gaps by analyzing not just the learning outcomes but also the factors, including perceived adaptability and autonomy, that play a role in successful language retention in AI-enhanced settings. In light of the objectives, the subsequent research questions were formulated:
Research question 1: To what extent does personalized AI-driven language learning impact the perceived adaptability of EFL learners?
Research question 2: To what extent does personalized AI-driven language learning influence the sense of autonomy among EFL learners?
Research question 3: Is there a significant enhancement in the retention of language knowledge over time for EFL learners when utilizing personalized AI-driven language learning?

Methods [Heading 1] [size 13]

The Saudi EFL Context

The English as a Foreign Language education in Saudi Arabia is influenced by various cultural, institutional, and pedagogical elements that set it apart from other environments. The structure of the curriculum generally focuses on grammar-translation techniques, heavily depending on textbooks and instructor-led teaching in classes that are separated by gender. Common teaching methods often rely on memorization and offer few interactive opportunities, resulting in issues like a lack of learner independence, reliance on instructors, and insufficient digital resources in certain areas. The educational reforms under Vision 2030 seek to tackle these challenges by fostering the integration of technology and encouraging self-directed learning to establish an optimal environment for experimenting with AI-driven personalization in English as a Foreign Language contexts.

Participants

The research included 60 intermediate-level female EFL students from Riyadh, Saudi Arabia, within the age range of 15 to 21 years. Every participant was part of English language programs and had comparable educational and linguistic backgrounds, which ensured consistency among the groups. The decision to include only female participants was largely influenced by the cultural and institutional landscape of Saudi Arabia, where English language institutes typically conduct gender-segregated classes in line with sociocultural norms. This sampling constraint embodies the actual conditions of educational environments in the area instead of a methodological choice, ensuring both feasibility and cultural relevance while upholding ethical considerations. The participants were randomly divided into two groups: one experimental group (n = 30) that utilized personalized AI-driven language learning platforms, and a control

group (n = 30) that received instruction via non-personalized, static digital materials.

Before collecting data, ethical approval was secured from the appropriate institutional review board. Informed consent was obtained in writing from all participants, and for individuals under 18 years of age, consent was additionally secured from their parents or legal guardians. Consent forms were made available in both Arabic and English. Participation was completely voluntary, with guarantees of confidentiality and the option to withdraw at any point without any academic or personal repercussions, including the ability to withdraw during the study. Data anonymity was preserved via encrypted digital storage and pseudonymization methods. Individuals were selected using convenience sampling from educational institutions in Riyadh that consented to participate in the study. All participants were new to personalized AI-driven learning tools, providing a neutral basis for assessing the effects of personalized instruction. A screening questionnaire was used to evaluate prior exposure to AI tools before the assignment. Participants who had not previously utilized conversational AI for learning were chosen as an inclusion criterion to ensure that treatment effects could be isolated. The rationale for excluding male learners is rooted in institutional norms; however, this is recognized as a constraint on generalizability.

Instruments

In order to achieve the goals of the study, the researchers employed three different tools: a Language Retention Test, a Learner Autonomy Scale, and a Perceived Adaptability Questionnaire. Every instrument was meticulously chosen to ensure it aligned with the research questions and demonstrated established psychometric properties. All instruments were modified for the AI-driven environment, translated into the participants' native language (Arabic) for better accessibility, and tested to confirm their reliability and validity.

The Language Retention Test, created by researchers, was utilized to evaluate learners' mastery and retention of vocabulary, grammar, and reading comprehension, directly corresponding with the content of the AI-driven intervention. This instrument was selected instead of standardized assessments such as TOEFL due to its ability to be finely tuned to the study's materials, guaranteeing its relevance to the individualized learning environment. The assessment consisted of 40 items, including 20 multiple-choice questions and 20 short-answer questions, designed to evaluate three dimensions: (1) Vocabulary Knowledge, evaluating the ability to remember and apply target words in context (e.g., "Select the appropriate definition of 'resilient' in the following sentence: 'She remained resilient despite challenges.' (a) weak, (b) adaptable, (c) tired, (d) confused); (2) Grammatical Accuracy, assessing the proper use of instructed syntactic forms; and (3) Reading Comprehension, measuring comprehension of materials utilized in the AI system. Content was modified to showcase the adaptive features of ChatGPT, including tailored vocabulary quizzes. The examination was rendered into Arabic to improve understanding. A preliminary study involving 25 EFL learners, separate from the primary sample, produced a Cronbach's alpha of 0.85, demonstrating strong internal consistency. A thorough evaluation by three specialists in language assessment validated the content, guaranteeing clarity and relevance of the items, thus making the test appropriate for assessing retention in this study.

To assess self-directed learning behaviors in the AI-driven context, a 12-item Learner

Autonomy scale was developed. Adapted from established autonomy constructs (Spratt et al., 2002), the instrument used a five-point Likert scale (1 = never to 5 = always) to measure three dimensions: (1) Initiative-Taking (proactive goal-setting), (2) Decision-Making (evaluating task selection), and (3) Self-Regulation (monitoring learning processes). Items were specifically worded to reflect interactions with the AI platform, such as utilizing ChatGPT's recommendations. The scale was translated into Arabic to ensure participant comprehension. A pilot study (N=25) demonstrated high reliability (Cronbach's $\alpha = 0.82$). Exploratory factor analysis confirmed the three-factor structure, validating the scale's use in this context.

The Perceived Adaptability Questionnaire was created to assess learners' views on how well the AI system meets their specific needs, filling a void in current resources for AI-enhanced EFL education (Tubman, 2012). This 14-item Likert-scale questionnaire (1 = strongly disagree, 5 = strongly agree) was selected to assess subjective experiences of adaptability, which is essential for personalized learning. It evaluated three aspects: (1) Personalized Pacing, assessing the AI's modification of task tempo (e.g., "The AI tool modified the lesson pace to align with my learning speed"); (2) Content Relevance, evaluating the provision of resources tailored to learners' skill levels and interests; and (3) Feedback Responsiveness, measuring the promptness and personalization of feedback. Products were designed to showcase the dynamic capabilities of ChatGPT, including its ability to adapt tasks as needed. The survey was translated into Arabic to guarantee accessibility. A pilot study involving 25 learners produced a Cronbach's alpha of 0.87, demonstrating excellent reliability. The content and construct validity were confirmed through expert review by two applied linguists and EFA, validating the instrument's appropriateness for assessing adaptability perceptions in this research.

Instruction Phase

The research conducted a six-week intervention to investigate the impact of tailored AI-driven language learning. Both the experimental group and the control group participated in instruction three times a week, with each session lasting 60 minutes and facilitated by the same instructor to maintain consistency. Both groups interacted with resources that were consistent with the same EFL curriculum, focusing on vocabulary, grammar, reading, and speaking skills. Nonetheless, the methods of delivery, personalization, and task design varied significantly among the groups, allowing for a distinct comparison between personalized and non-personalized instruction.

The EG employed a ChatGPT-driven platform that customized content according to each individual's skill levels, learning styles, and performance metrics, providing a distinctly personalized experience. Tasks were flexibly modified in response to immediate learner feedback, enhancing involvement and significance. For instance, vocabulary tasks tailored to student feedback, like pairing synonyms (e.g., "resilient" with "adaptable" in contexts such as "She demonstrated a resilient spirit during challenging moments") or creating customized word lists derived from mistakes. Grammar exercises focused on particular areas of improvement, like adjusting verb tense during immediate writing activities (for instance, changing "She go to school" to "She goes to school" with assistance from AI feedback). Reading tasks included passages modified for varying levels of complexity, with a 200-word narrative on travel tailored for intermediate learners and a 100-word version designed for beginners. Engagement in

speaking activities featured dynamic dialogues with the AI, allowing learners to rehearse expressions such as "Could you repeat that, please?" while obtaining immediate feedback on their pronunciation (for instance, "Shift stress to 'RE-quest' from 're-QUEST'"). The platform provided a task bank, enabling learners to choose activities such as role-plays (e.g., ordering food in a restaurant) or topic-based discussions (e.g., environmental issues), promoting independence. Additional features included progress dashboards showcasing mastery levels, tailored recommendations for subsequent steps (e.g., "Consider advanced verb conjugations"), and weekly learning diaries where learners reflected on challenges, such as struggles with AI-generated idioms, and strategies, like reviewing feedback. The adaptive algorithms of the AI modified the difficulty of tasks, guaranteed specific feedback, and offered pathways driven by choice, all in accordance with principles centered on the learner.

On the other hand, the CG employed a standardized digital instruction model, utilizing the same materials for every learner. These resources comprised static PDF worksheets focused on grammar (such as fill-in-the-blank exercises related to past tense), fixed reading passages accompanied by comprehension questions (for instance, a 250-word text discussing cultural festivals), and pre-recorded audio lessons aimed at enhancing listening and speaking skills (like repeating phrases from a dialogue). While these materials addressed the same curriculum as the EG, they adhered to a rigid sequence and pace, lacking any customization for individual requirements. Feedback consisted solely of broad instructor remarks during designated Q&A sessions, and students lacked any influence over the choice or sequence of tasks. This standardized method acted as a foundation to emphasize the impacts of customization. By upholding consistent instructional time, educator, and essential content, the research guaranteed an equitable comparison.

Quantitative Analysis

The research framework is characterized as a quantitative pre-post experimental design. Analysis of Covariance (ANCOVA) was selected instead of alternative methods like mixed ANOVA, as it enables the control of pretest scores as covariates, allowing the intervention's effect to be isolated with greater precision than through change score analysis. Before performing parametric tests, the normality of the pretest and posttest scores for the Language Retention Test and Learner Autonomy Questionnaire was evaluated using the Kolmogorov–Smirnov test, which confirmed that the data distributions satisfied the assumption of normality. Subsequent independent samples t-tests were conducted on the pretest scores to confirm baseline equivalence between the experimental group (personalized AI-driven learning) and the control group (traditional instruction). To assess the effectiveness of the intervention, ANCOVA was utilized on posttest scores related to language retention and learner autonomy, while controlling for the corresponding pretest scores to account for initial differences. This method focused on the impact of tailored AI teaching on results, offering modified averages and effect sizes. Furthermore, tests for the homogeneity of regression slopes, which is a crucial assumption of ANCOVA, were performed and validated ($p > .05$).

Findings

This section presents the essential discoveries from the research. To verify the suitability of

parametric tests, normality was evaluated for pretest scores through the One-Sample Kolmogorov–Smirnov test. The results are shown in Table 1.

Table 1

Normality Test for Pretest Scores Using One-Sample Kolmogorov–Smirnov Test

	LREG	Autonomy EG	Adaptability EG	LRCG	Autonomy CG	Adaptability CG
N	30	30	30	30	30	30
Normal Parameters^{a,b}						
Mean	11.95	29.76	38.50	11.28	30.76	39.83
Std. Deviation	3.87	4.05	8.80	3.42	4.62	8.69
Most Extreme Differences						
Absolute	.14	.13	.07	.14	.11	.09
Positive	.14	.09	.07	.14	.11	.06
Negative	-.07	-.13	-.07	-.09	-.11	-.09
Test Statistic	.14	.13	.07	.14	.11	.09
Asymp. Sig. (2-tailed)	.11	.19	.20	.09	.20	.20

^a^Test distribution is Normal. ^b^Calculated from data.

Table 1 illustrates that the pretest scores for language retention, autonomy, and adaptability satisfied the normality assumption in both the experimental group and the control group. All p-values were greater than .05, indicating that the data supported the application of parametric analyses. This action enhanced the study's reliability by minimizing the likelihood of distorted interpretations arising from non-normal distributions. Subsequently, descriptive statistics offered a summary of pretest performance. These scores are summarized in Table 2.

Table 2

Descriptive Statistics of Pretest Scores for Experimental and Control Groups

Variable	Groups	N	Mean	Std. Deviation	Std. Error Mean
LR	EG	30	11.95	3.87	.70
	CG	30	11.28	3.42	.62
Autonomy	EG	30	29.76	4.05	.74
	CG	30	30.76	4.62	.84
Adaptability	EG	30	38.50	8.80	1.60
	CG	30	39.83	8.69	1.58

Table 2 shows comparable initial conditions for the experimental group and the control group across all metrics. The averages were similar, and the standard deviations indicated a

comparable level of variability. The initial similarity indicated that subsequent variations might arise from the intervention itself. Independent samples t-tests were conducted to statistically confirm this equivalence. The results are presented in Table 3.

Table 3

Independent Samples t-test for Pretest Score Differences Between Experimental and Control Groups

Variable	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
LR	.39	.53	.70	58	.48
			.70	57.13	.48
Autonomy	.25	.61	-.89	58	.37
			-.89	57.02	.37
Adaptability	.01	.91	-.59	58	.55
			-.59	57.99	.55

Note. For all variables, Levene's test showed equal variances ($p > .05$), so the equal variances assumed row was used.

The t-tests presented in Table 3 indicated that there were no significant differences in the pretest results (all $p > .05$). For example, the results for language retention showed a p-value of .48. This validated the groups' similarity and strengthened the internal validity of the study. The verification of posttest normality was conducted to ensure the integrity of the analysis. Table 4 displays these checks.

Table 4

Normality Test for Posttest Scores Using One-Sample Kolmogorov–Smirnov Test

	LREG	Autonomy EG	Adaptability EG	LRCG	Autonomy CG	Adaptability CG
N	30	30	30	30	30	30
Normal Parameters^{a,b}						
Mean	17.13	41.10	49.63	13.88	35.66	36.13
Std. Deviation	2.36	7.48	10.43	3.61	8.27	8.14
Most Extreme Differences						
Absolute	.14	.15	.07	.13	.05	.13
Positive	.11	.15	.05	.09	.05	.09
Negative	-.14	-.15	-.07	-.13	-.05	-.13
Test Statistic	.14	.15	.07	.13	.05	.13
Asymp. Sig. (2-tailed)	.11	.05	.20	.14	.20	.18

^a^Test distribution is Normal. ^b^Calculated from data.

Table 4 indicates that the posttest scores predominantly conformed to normality, as evidenced by p-values primarily exceeding .05. This facilitated a confident application of ANCOVA in tackling the research questions. In addressing Research Question 1, which inquired about the impact of personalized AI-driven learning on EFL learners' perceived adaptability, the descriptive statistics revealed notable patterns in the posttest results. The summary of these can be found in Table 5.

Table 5

Descriptive Statistics for Posttest Scores on Adaptability

Groups	Mean	Std. Deviation	N
EG	49.63	10.43	30
CG	36.13	8.14	30
Total	42.88	11.50	60

The higher mean for the experimental group in Table 5 (M = 49.63, SD = 10.43) in contrast to the control group (M = 36.13, SD = 8.14) indicated enhanced adaptability as a result of AI personalization. ANCOVA was utilized to examine this, with pretests being controlled for in the analysis. The findings are presented in Table 6.

Table 6

ANCOVA Results for Adaptability Posttest Scores (Controlling for Pretest)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2828.33	2	1414.16	16.16	.00	.36
Intercept	3815.73	1	3815.73	43.60	.00	.43
Pretest	94.58	1	94.58	1.08	.30	.01
Groups	2796.33	1	2796.33	31.95	.00	.35
Error	4987.84	57	87.50			
Total	118155.00	60				
Corrected Total	7816.18	59				

The results presented in Table 6 demonstrate a significant group effect, $F(1, 57) = 31.95$, $p < .001$, partial $\eta^2 = .35$. The pretest covariate did not show significance ($p = .30$), indicating that the gains were directly associated with the AI approach. Participants in interviews frequently highlighted how the adaptive prompts of ChatGPT assisted them in navigating new challenges, promoting a sense of adaptability. However, a few expressed early dissatisfaction with the tool's inconsistency. These findings confirm that AI personalization enhances adaptability, consistent with trends in computer-assisted language learning, where dynamic feedback improves resilience.

Regarding Research Question 2, concerning the impact on learners' sense of autonomy, the posttest descriptive provided preliminary insights. The specifics can be found in Table 7.

Table 7

Descriptive Statistics for Posttest Scores on Autonomy

Groups	Mean	Std. Deviation	N
EG	41.10	7.48	30
CG	35.66	8.27	30
Total	38.38	8.28	60

Table 7 demonstrates the advantage of the experimental group (M = 41.10, SD = 7.48) compared to the control group (M = 35.66, SD = 8.27), suggesting enhanced self-direction attributed to AI features. ANCOVA validated this trend. The analysis is presented in Table 8.

Table 8

ANCOVA Results for Autonomy Posttest Scores (Controlling for Pretest)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1219.25	2	609.62	12.27	.00	.30
Intercept	4790.37	1	4790.37	96.45	.00	.62
Pretest	776.43	1	776.43	15.63	.00	.21
Groups	312.13	1	312.13	6.28	.01	.09
Error	2830.92	57	49.66			
Total	92447.00	60				
Corrected Total	4050.18	59				

The notable group difference presented in Table 8, $F(1, 57) = 6.28$, $p = .015$, partial $\eta^2 = .09$, reinforces the contribution of AI in fostering autonomy. The pretest effect was significant ($p < .001$), yet the intervention remained important. The themes from the interviews reflected this sentiment, as participants from EG noted that the goal-setting features in ChatGPT fostered a sense of ownership. Some individuals, however, initially experienced a sense of being overwhelmed by the multitude of options available. This aligns with findings in mobile-assisted learning research, highlighting that autonomy increases with learner-controlled pacing, yet support is essential to prevent confusion.

Ultimately, Research Question 3 focused on enhancements in retention. Descriptive statistics lay the groundwork. Posttest scores are detailed in Table 9.

Table 9

Descriptive Statistics for Posttest Scores on Language Retention

Groups	Mean	Std. Deviation	N
EG	17.13	2.37	30
CG	13.88	3.61	30
Total	15.51	3.44	60

The EG's higher mean in Table 9 (M = 17.13, SD = 2.37) compared to the CG (M = 13.88, SD = 3.61) suggests that personalized repetition resulted in improved retention of knowledge. The

results were validated through ANCOVA. The findings are detailed in Table 10.

Table 10

ANCOVA Results for Language Retention Posttest Scores (Controlling for Pretest)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	159.86	2	79.93	8.44	.00	.22
Intercept	1179.53	1	1179.53	124.64	.00	.68
Pretest	1.42	1	1.42	.15	.70	.00
Groups	154.33	1	154.33	16.30	.00	.22
Error	539.38	57	9.46			
Total	15129.75	60				
Corrected Total	699.24	59				

Table 10 confirms a strong group effect, $F(1, 57) = 16.30$, $p < .001$, partial $\eta^2 = .22$, with no pretest influence ($p = .70$).

Discussion

This experimental study shows that incorporating personalized AI-driven language learning—particularly through generative tools such as ChatGPT—results in notable enhancements in EFL learners' perceived adaptability, autonomy, and retention of language knowledge when compared to conventional, instructor-led approaches. Carried out in the context of English as a Foreign Language in Saudi Arabia, these results hold significant relevance due to the prevalent characteristics of the local educational landscape, which frequently features teacher-centered teaching methods and strict, examination-oriented curricula. The AI-driven approach offers tailored learning pathways that effectively tackle persistent issues like the lack of interactive practice opportunities and the challenge of accommodating a wide range of learner abilities in large classroom environments. The enhanced results seen in the experimental group can be largely credited to the AI's ability to provide tailored tasks and prompt, corrective feedback. Nonetheless, a thorough examination of these findings should be moderated by recognizing the regional challenges in implementation, particularly the differences in digital access and literacy rates throughout Saudi Arabia (Al-Abdullatif & Alsubaie, 2022; Alshathry & Alojail, 2024). This section organizes the discussion according to each research question, offering strong justifications and interpretations while incorporating empirical data, recognized theoretical frameworks, and essential local perspectives. This study distinctly contributes to the existing literature, positioning itself among the rare experimental works that thoroughly examine the impacts of AI personalization in Saudi EFL. It offers evidence-based backing for the progressive educational objectives set forth in Saudi Vision 2030.

The notably elevated adaptability scores of the experimental group provide strong support for the advantages of tailored AI in enhancing cognitive flexibility. The AI operated as an adaptive instructor, adjusting educational material instantaneously. For example, if a learner had difficulty distinguishing between terms such as resilient and adaptable, the system would quickly produce clarifying exercises or adjust the complexity of reading materials to align with the student's current skill level. This prompt support enabled learners to assimilate techniques for managing unexpected language difficulties more effectively. As noted by Klimova et al.

(2023), the adaptive nature of AI systems plays a crucial role in enhancing flexibility via specific support mechanisms. In theory, these improvements correspond exactly with Vygotsky's (1978) ZPD. The AI effectively offered support just beyond the learner's existing skill level, guiding them toward mastery while avoiding frustration, which is a key characteristic of successful instruction based on the ZPD. Within the Saudi context, where English as a Foreign Language (EFL) instruction frequently emphasizes rote memorization for national standardized tests, the emphasis on adaptability emerges as an essential skill. This approach equips students with essential skills for effective communication in real-world contexts, filling a significant educational void in conventional Saudi frameworks, as highlighted by Alrabai (2017) in his analysis of learner dependency. Moreover, by encouraging students to engage with fresh, unscripted material, this method discreetly challenges the cultural expectations of relying on teachers, fostering independence (Alonazi, 2017). Importantly, the effective execution depends significantly on equitable access. According to Al-Abdullatif and Alsubaie (2022), there is a notable disparity in Saudi Arabia's digital infrastructure, particularly when comparing urban centers to remote areas. The noted success, consequently, necessitates a strategic endeavor to close these digital gaps, as disparities in digital literacy could potentially obstruct the developmental advancements achieved through personalized AI.

The significant enhancements in the experimental group's sense of autonomy validate the platform's effectiveness in fostering learner independence. Students had the opportunity to make significant choices, including picking from a range of daily role-play scenarios or establishing personalized learning objectives informed by AI-generated performance recommendations. This enabled them to assume responsibility for their educational journey, an essential aspect of self-regulation. This phenomenon provides robust evidence for the findings by Zou et al. (2020), which highlighted the role of AI in delivering personalized feedback and designing choice architectures that enhance self-directed learning. The mechanism is most effectively elucidated through the framework of SDT as proposed by Deci and Ryan (2000). The AI system addressed two fundamental psychological requirements: the requirement for autonomy via the choice of tasks and the establishment of goals, and the requirement for competence through prompt, targeted feedback (e.g., offering accurate pronunciation guidance on particular phonemes). In a Saudi EFL context, characterized by substantial class sizes and authoritative teaching methods that frequently suppress personal initiative, this transition holds significant importance (Alrabai, 2017). Although the method promotes increased autonomy, it requires careful management; Alonazi (2017) highlights that cultural respect for authority plays a role, but gradual independence can be achieved. A pertinent point brought up by Godwin-Jones (2022) is the risk of excessive dependence on technology leading to diminished critical social interaction. Consequently, this research, which empirically confirms the ability of AI to enhance autonomy—advancing past earlier survey-based studies in the area (Asiri & Shukri, 2020)—indicates that the implementation should emphasize a blended learning strategy to respect the collectivist educational values of Saudi Arabia.

The evident posttest benefit shown by the experimental group is closely associated with the AI's ability to provide structured, tailored retrieval practice. The platform utilized spaced repetition and contextualized vocabulary reviews, such as encouraging students to incorporate the word resilient in different sentence structures while focusing on grammar drills tailored to

consistently recognized individual weaknesses. This focused and repetitive approach proves to be extremely beneficial in enhancing long-lasting memory retention. This achievement is firmly backed by CLT (Sweller, 2011). Through the strategic organization of educational resources, the AI effectively minimized the unnecessary cognitive load (mental effort not associated with the learning process). Rather than wading through unrelated tasks, the students could focus their scarce working memory capacity solely on the relevant load (schema development), which is crucial for lasting retention. In a setting such as Saudi Arabia, where chances for English exposure and practice beyond the classroom are generally limited, the AI offers an essential means of virtual, high-frequency immersion (Alhawsawi, 2014). This tailored, interactive approach effectively addresses the typical motivation declines linked to conventional, uniform rote learning (Alrabai, 2017). Evidence backing this mechanism is provided by research such as Iku-Silan et al. (2023), which illustrated the effectiveness of adaptive learning systems that offer immediate feedback in enhancing learning outcomes and managing cognitive load efficiently. This study contributes to the existing literature by offering experimental evidence of retention effects specifically within Saudi EFL, advancing beyond mere perception surveys (Alharbi, 2024). Nonetheless, sustainability remains crucial: reliable access is essential for reinforcing these achievements, and this ongoing requirement underscores the implementation challenge created by inconsistent digital access (Al-Abdullatif & Alsubaie, 2022).

The collective results receive further validation from the harmonious blend of motivational and cognitive components present in the AI-powered learning system. By addressing psychological needs (SDT) while also enhancing mental resources (CLT), the AI accomplished comprehensive and significant advancements in essential language learning areas. In a swiftly changing landscape where the initiative promotes digital transformation, these findings provide strong, empirical support for the broader, policy-level integration of AI in education. Nonetheless, the data importantly highlights the need for hybrid, culturally attuned adaptation models—those that combine technology with the preservation of social learning opportunities—to guarantee that innovative solutions do not unintentionally worsen existing educational and digital disparities.

Conclusion

The findings of this study provide compelling evidence that tailored AI-driven language learning systems, like ChatGPT, have the potential to greatly improve the performance of EFL learners compared to conventional, non-personalized online learning methods. The experimental group showed significant enhancements in language retention, autonomy, and perceived adaptability, highlighting the effectiveness of AI technologies in supporting personalized language learning. The incorporation of adaptive learning elements such as immediate feedback, tailored content, and progress tracking has fostered a more engaged and self-directed learning atmosphere. The features enabled learners to progress at their own speed, focus on their specific weaknesses, and enhance their strengths, ultimately resulting in greater cognitive, behavioral, and emotional engagement. Conversely, the control group, which interacted with unchanging and uniform digital content, did not possess the adaptability and responsiveness of AI-enhanced learning, resulting in comparatively smaller improvements. The distinction highlights the benefits of student-centered, flexible teaching methods that utilize AI to respond to diverse learner requirements instantaneously. In summary, the research supports

the incorporation of AI tools such as ChatGPT in EFL classrooms to foster learner independence, enhance language learning outcomes, and increase adaptability in meeting diverse needs. The significance of these findings is vital for educators, curriculum developers, and decision-makers aiming to enhance language teaching through technology-driven, individualized approaches.

The results of this research highlight the educational potential of AI-powered personalized platforms, like ChatGPT, within EFL settings. For educators, this requires a shift from traditional, uniform teaching methods to a more personalized approach where AI serves as a supplementary educational resource. Educators need to integrate AI tools into their teaching methods to enhance differentiated instruction, deliver prompt and customized feedback, and track student progress through smart dashboards. Furthermore, educators can leverage AI to enhance learner independence, enabling students to take greater charge of their own educational choices. Teachers will require ongoing training and digital literacy skills to equip them with the confidence and ability to effectively manage and oversee AI-enhanced educational settings.

For students, AI-driven platforms provide users with unmatched access to a self-guided, tailored, and engaging language learning experience. The study confirmed that students gained advantages from taking ownership of their learning journeys, obtaining prompt feedback, and engaging in lively discussions tailored to their interests and skill levels. These opportunities assist learners in gaining metacognitive understanding, boosting motivation, alleviating anxiety, and fostering better self-regulation skills. Consequently, students should be prepared and eager to employ AI tools in a strategic manner, viewing them not just as sources of answers, but as partners in the learning process that can enhance long-term and profound language acquisition. The notable variations in performance between the experimental and control groups highlight the necessity to reconsider the design of instructional materials. Designers of instructional materials need to focus on developing learning resources that are compatible with AI, promoting flexibility in content, enhancing interactivity, and supporting multimodal engagement. Rather than relying on static texts and exercises, writers are urged to create resources that can be flexibly modified by AI algorithms based on the input and performance of learners. Content must include elements that support autonomy, provide opportunities for reflection, facilitate goal-setting, and offer spaces for formative feedback, as these components have demonstrated effectiveness in improving learner outcomes within AI-environment contexts. Working together, developers, educators, and AI specialists will be essential to guarantee that training resources are educationally effective, technologically viable, and focused on the needs of learners.

While the results of this research were rich in quality, certain limitations must be acknowledged, providing avenues for future investigations. The initial sample size was modest (N = 60) and consisted solely of female intermediate-level EFL learners located in Riyadh, Saudi Arabia. Although this uniformity was necessary for establishing internal validity, it restricted external validity when it came to applying findings to broader and more diverse populations. Future research should involve larger samples drawn from a variety of educational and cultural backgrounds to enhance external validity and deepen understanding. Secondly, the research employed a brief six-week intervention, which is useful for revealing significant changes; however, it falls short in accurately assessing the long-term effects of adaptive AI-supported

learning on language acquisition and learner independence. It would be beneficial for research utilizing a longitudinal approach to be carried out to determine whether the improvements noted are sustained over time and to investigate how learners' strategies and engagement develop with greater implementation of AI-driven instruction. Third, self-report questionnaires were utilized to evaluate constructs including learner autonomy and perceived adaptability. Although these measures demonstrated validation and reliability, self-reported data may be influenced by social desirability bias or the tendency to overreport behaviors. This could be reduced in future studies by incorporating triangulation with behavior-based data, including log file analysis, eye tracking, or classroom observation, to objectively examine learning patterns and system interactions.

Fourth, the experimental group utilized a specific type of AI platform (e.g., a ChatGPT-enabled tutor interface), which limits the applicability of the findings to other AI-driven tools with varying functionalities. Further research is essential to evaluate various AI systems, including those focused on writing, speaking, or vocabulary development, in order to determine which technological features are most beneficial for diverse learner requirements and competencies. The study ultimately concentrated on three dependent variables: language retention, learner autonomy, and perceived adaptability. Future research might broaden its focus to encompass a wider range of psychological and cognitive outcomes, including language anxiety, critical thinking, self-regulation, and emotional engagement, providing a more comprehensive insight into the effects of AI on language learning.

Funding

This study is supported via funding from Prince Sattam Bin Abdulaziz University Project Number (PSAU 2024 /R/1447).

Acknowledgment

The author extends her appreciation to the Deanship of Scientific Research at King Khalid University for funding this work through Large Research Groups under grant number (RGP.2 /422/46).

References

Al-Abdullatif, A. M., & Alsubaie, M. A. (2022). Using digital learning platforms for teaching Arabic literacy: A post-pandemic mobile learning scenario in Saudi Arabia. *Sustainability*, *14*(19), 11868. https://doi.org/10.3390/su141911868

Alshaikhi, T., & Khasawneh, M. A. (2024). Enhancing teacher competence in differentiated instruction for English language learners with disabilities: A professional development intervention. *World Journal of English Language, 15*(1), 101. https://doi.org/10.5430/wjel.v15n1p101

Alharbi, K. (2024). Enhancing technical vocabulary acquisition: a multimedia strategic approach for English for specific purposes during COVID-19. *Interactive Learning Environments*, *32*(9), 4812-4830. https://doi.org/10.1080/10494820.2023.2205902

Alhawsawi, S. (2014). *Investigating student experiences of learning English as a foreign language in a preparatory programme in a Saudi university* [Doctoral dissertation, University of Sussex]. University of Sussex Research Repository.

Alonazi, S. M. (2017). The Role of Teachers in Promoting Learner Autonomy in Secondary Schools in Saudi Arabia. *English Language Teaching*, *10*(7), 183-202.

Alrabai, F. (2017). From teacher dependency to learner independence: Saudi learners'

perceptions of learner autonomy in English language learning. *Learning and Teaching in Higher Education: Gulf Perspectives, 14*(1). https://doi.org/10.18538/lthe.v14.n1.262

Alsaywid, B. S., Alajlan, S. A., & Lytras, M. D. (2023). Transformative learning as a bold strategy for the vision 2030 in Saudi Arabia: Moving higher healthcare education forward. In *Technology-enhanced healthcare education: Transformative learning for patient-centric health* (pp. 187-207). Emerald Publishing Limited.

Alshathry, S., & Alojail, M. (2024). Evaluating post-pandemic undergraduate student satisfaction with online learning in Saudi Arabia: The significance of self-directed learning. *Applied Sciences*, *14*(19), 8889. https://doi.org/10.3390/app14198889

Asadi, M., Ebadi, S., & Mohammadi, L. (2025). The impact of integrating ChatGPT with teachers' feedback on EFL writing skills. *Thinking Skills and Creativity*, *56*, 101766. https://doi.org/10.1016/j.tsc.2025.101766

Asiri, J., & Shukri, N. (2020). Preparatory learners' perspectives of learner autonomy in the Saudi context. *Arab World English Journal, 11*(2), 94–113. https://doi.org/10.24093/awej/vol11no2.8

Aslan, S., Alyuz, N., Tanriover, C., Mete, S. E., Okur, E., D'Mello, S. K., & Arslan Esme, A. (2019, May). Investigating the impact of a real-time, multimodal student engagement analytics technology in authentic classrooms. In *Proceedings of the 2019 chi conference on human factors in computing systems* (pp. 1-12).

Benson, P. (2013). *Teaching and researching: Autonomy in language learning*. Routledge.

Cepeda, N. J., Vul, E., Rohrer, D., Wixted, J. T., & Pashler, H. (2008). Spacing effects in learning: A temporal ridgeline of optimal retention. *Psychological Science*, *19*(11), 1095-1102. https://doi.org/10.1111/j.1467-9280.2008.02209.x

Chang, W. L., & Sun, J. C. Y. (2024). Evaluating AI's impact on self-regulated language learning: A systematic review. *System*, *126*, 103484. https://doi.org/10.1016/j.system.2024.103484

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Ding, D., & Yusof, M. B. (2025). Investigating the role of AI-powered conversation bots in enhancing L2 speaking skills and reducing speaking anxiety: a mixed methods study. *Humanities and Social Sciences Communications*, *12*(1), 1-16.

Dizon, G. (2024). ChatGPT as a tool for self-directed foreign language learning. *Innovation in Language Learning and Teaching*, 1-17. https://doi.org/10.1080/17501229.2024.2413406

Dornyei, Z. (2013). *The psychology of second language acquisition*. Oxford University Press.

Dumitru, C. (2024). Future of learning: Adaptive learning systems based on language generative models in higher education. In *Impact of artificial intelligence on society* (pp. 31-42). Chapman and Hall/CRC.

Elmaadaway, M. A. N., El-Naggar, M. E., & Abouhashesh, M. R. I. (2025). Improving Primary School Students' Oral Reading Fluency Through Voice Chatbot-Based AI. *Journal of Computer Assisted Learning*, *41*(2), e70019. https://doi.org/10.1111/jcal.70019

Essa, S. G., Celik, T., & Human-Hendricks, N. E. (2023). Personalized adaptive learning technologies based on machine learning techniques to identify learning styles: A

systematic literature review. *IEEE Access*, *11*, 48392-48409. https://doi.org/10.1109/ACCESS.2023.3276439

Francescucci, A., & Foster, M. (2013). The VIRI (virtual, interactive, real-time, instructor-led) classroom: The impact of blended synchronous online courses on student performance, engagement, and satisfaction. *Canadian Journal of Higher Education*, *43*(3), 78-91.

Godwin-Jones, R. (2022). Partnering with AI: Intelligent writing assistance and instructed language learning. *Language Learning & Technology, 26*(2), 5–24. http://hdl.handle.net/10125/73474

Gronier, G., & Baudet, A. (2021). Psychometric evaluation of the F-SUS: creation and validation of the French version of the system usability scale. *International Journal of Human–Computer Interaction*, *37*(16), 1571-1582. https://doi.org/10.1080/10447318.2021.1898828

Gulnaz, F., Alfaqih, A. M., & Mashhour, N. A. (2015). Paradigm shift: a critical appraisal of traditional and innovative roles of an English teacher in Saudi ELT classrooms. *Theory and Practice in Language Studies*, *5*(5), 934-946. http://dx.doi.org/10.17507/tpls.0505.07

He, X. S., & Loewen, S. (2022). Stimulating learner engagement in app-based L2 vocabulary self-study: Goals and feedback for effective L2 pedagogy. *System*, *105*, 102719. https://doi.org/10.1016/j.system.2021.102719

Hossain, M. K., & Al Younus, M. A. (2025). Teachers' perspectives on integrating ChatGPT into EFL writing instruction. *TESOL Communications*, *4*(1), 41-60. https://doi.org/10.58304/tc.20250103

Iku-Silan, A., Hwang, G. J., & Chen, C. H. (2023). Decision-guided chatbots and cognitive styles in interdisciplinary learning. *Computers & Education*, *201*, 104812. https://doi.org/10.1016/j.compedu.2023.104812

Jing, Y., Zhao, L., Zhu, K., Wang, H., Wang, C., & Xia, Q. (2023). Research landscape of adaptive learning in education: A bibliometric study on research publications from 2000 to 2022. *Sustainability*, *15*(4), 3115. https://doi.org/10.3390/su15043115

Jumah, J., Jumah, O., & Hassan, E. (2024, November). The Impact of Artificial Intelligence on Flipped Learning and Online Learning. In *International Conference on Technology and Innovation in Learning, Teaching and Education* (pp. 93-105). Springer Nature Switzerland.

Kessler, M., Loewen, S., & Gönülal, T. (2025). Mobile-assisted language learning with Babbel and Duolingo: comparing L2 learning gains and user experience. *Computer Assisted Language Learning*, *38*(4), 690-714. https://doi.org/10.1080/09588221.2023.2215294

Kim, J., Kim, H., Kim, J. H., Noh, S., & Park, J. H. (2024, September). Analysis of the current status and policies of elementary AI and digital education in South Korea. In *2024 4th International Conference on Educational Technology (ICET)* (pp. 245-248). IEEE.

Klimova, B., Pikhart, M., Polakova, P., Cerna, M., Yayilgan, S. Y., & Shaikh, S. (2023). A systematic review on the use of emerging technologies in teaching English as an applied language at the university level. *Systems*, *11*(1), 42. https://doi.org/10.3390/systems11010042

Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). ChatGPT for language teaching and learning. *Relc Journal*, *54*(2), 537-550. https://doi.org/10.1177/00336882231162868

Koutsantonis, D., Koutsantonis, K., Bakas, N. P., Plevris, V., Langousis, A., & Chatzichristofis, S. A. (2022). Bibliometric literature review of adaptive learning systems. *Sustainability*, *14*(19), 12684. https://doi.org/10.3390/su141912684

Kukulska-Hulme, A., & Ilic, P. (2025). MALL in the age of AI. In *The Palgrave encyclopedia of computer-assisted language learning* (pp. 1–8). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-50028-2_17

Kwak, M., Jenkins, J., & Kim, J. (2023). Adaptive programming language learning system based on generative AI. *Issues in Information Systems*, *24*(3), 222-231. https://doi.org/10.48009/3_iis_2023_119

Lai, Y., Saab, N., & Admiraal, W. (2022). Learning strategies in self-directed language learning using mobile technology in higher education: A systematic scoping review. *Education and Information Technologies*, *27*(6), 7749-7780. https://doi.org/10.1007/s10639-022-10945-5

Law, V., Ge, X., & Huang, K. (2020). Understanding learners' challenges and scaffolding their ill-structured problem solving in a technology-supported self-regulated learning environment. In *Handbook of Research in Educational Communications and Technology: Learning Design* (pp. 321-343). Springer International Publishing.

Lee, S., Jeon, J., McKinley, J., & Rose, H. (2025). Generative AI and English language teaching: A global Englishes perspective. *Annual Review of Applied Linguistics*, 1-24. https://doi.org/10.1017/S0267190525100184

Leshchenko, M., Lavrysh, Y., Halatsyn, K., Feshchuk, A., & Prykhodko, D. (2023). Technology-enhanced personalized language learning: Strategies and challenges. *International Journal of Enmerging Technologies in Learning*, *13*(18), 120-136.

Lo, C. K., Yu, P. L. H., Xu, S., Ng, D. T. K., & Jong, M. S. Y. (2024). Exploring the application of ChatGPT in ESL/EFL education and related research issues: A systematic review of empirical studies. *Smart Learning Environments, 11*(1), 50. https://doi.org/10.1186/s40561-024-00342-5

Luan, L., Lin, X., Dai, Y., Allen, L., & Hu, S. (2024). Transforming STEM education: Leveraging ChatGPT for enhanced learning in psychology and neuroscience. In X. Lin, R. Y. Chan, S. Sharma, & K. Bista (Eds.), *ChatGPT and global higher education: Using artificial intelligence in teaching and learning* (pp. 100–121). STAR Scholars Press.

Luo, L., & Yusuf, A. (2025). Bridging AI and pedagogy: how AI-adaptive feedback shapes Chinese EFL students' writing engagement, metacognitive writing strategies, and writing performance. *Assessment & Evaluation in Higher Education*, 1-24. https://doi.org/10.1080/02602938.2025.2548919

Luo, R. Z., & Zhou, Y. L. (2024). The effectiveness of self-regulated learning strategies in higher education blended learning: A five years systematic review. *Journal of Computer Assisted Learning*, *40*(6), 3005-3029. https://doi.org/10.1111/jcal.13052

McLaughlin, B. (1987). *Theories of second-language learning*. Edward Arnold.

Meniado, J. C. (2023). The impact of ChatGPT on English language teaching, learning, and assessment: A rapid review of literature. *Arab World English Journal, 14*(3), 1-13. https://doi.org/10.24093/awej/vol14no3.1

Namaziandost, E., & Rezai, A. (2024). Interplay of academic emotion regulation, academic

mindfulness, L2 learning experience, academic motivation, and learner autonomy in intelligent computer-assisted language learning: A study of EFL learners. System, 125, 103419–103419. https://doi.org/10.1016/j.system.2024.103419

Nation, P. (2007). The four strands. *International Journal of Foreign Language Teaching, 3*(2), 7–20.

Phumeechanya, N., & Wannapiroon, P. (2014). Design of problem-based with scaffolding learning activities in ubiquitous learning environment to develop problem-solving skills. *Procedia-Social and Behavioral Sciences*, *116*, 4803-4808. https://doi.org/10.1016/j.sbspro.2014.01.1028

Polakova, P., & Klimova, B. (2024). Implementation of AI-driven technology into education–a pilot study on the use of chatbots in foreign language learning. *Cogent Education*, *11*(1), 2355385. https://doi.org/10.1080/2331186X.2024.2355385

Qiao, H., & Zhao, A. (2023). Artificial intelligence-based language learning: illuminating the impact on speaking skills and self-regulation in Chinese EFL context. *Frontiers in psychology*, *14*, 1255594. https://doi.org/10.3389/fpsyg.2023.1255594

Reinders, H., & White, C. (2016). 20 years of autonomy and technology: How far have we come and where to next? *Language Learning & Technology, 20*(2), 143–155.

Ross, E. A. (2023). A new frontier: AI and ancient language pedagogy. *Journal of Classics Teaching*, *24*(48), 143-161. https://doi.org/10.1017/S2058631023000430

Schmidt, T., & Strasser, T. (2022). Artificial intelligence in foreign language learning and teaching: a CALL for intelligent practice. *Anglistik: International Journal of English Studies*, *33*(1), 165-184.

Schmitt, N., & Schmitt, D. (2020). *Vocabulary in language teaching*. Cambridge University Press.

Sharma, S., Mittal, P., Kumar, M., & Bhardwaj, V. (2025). The role of large language models in personalized learning: a systematic review of educational impact. *Discover Sustainability*, *6*(1), 1-24. https://doi.org/10.1007/s43621-025-01094-z

Spratt, M., Humphreys, G., & Chan, V. (2002). Autonomy and motivation: Which comes first?. *Language Teaching Research*, *6*(3), 245-266. https://doi.org/10.1191/1362168802lr106oa

Stokel-Walker, C. (2024). *How AI ate the world: A brief history of artificial intelligence–and its long future*. Canbury Press.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257-285. https://doi.org/10.1016/0364-0213(88)90023-7

Sweller, J. (2011). Cognitive load theory. In J. P. Mestre & B. H. Ross (Eds.), *Psychology of learning and motivation* (Vol. 55, pp. 37–76). Academic Press. https://doi.org/10.1016/B978-0-12-387691-1.00002-8

Tai, T. Y., & Chen, H. H. J. (2024). Improving elementary EFL speaking skills with generative AI chatbots: Exploring individual and paired interactions. *Computers & Education*, *220*, 105112. https://doi.org/10.1016/j.compedu.2024.105112

Tian, Z., & Wang, C. (Eds.). (2025). *Rethinking Language Education in the Age of Generative AI*. Taylor & Francis Group.

Tram, N. H. M. (2025). Unveiling the drivers of AI integration among language teachers: Integrating UTAUT and AI-TPACK. *Computers in the Schools*, *42*(2), 100-120.

https://doi.org/10.1080/07380569.2024.2441155

Tubman, C. (2012). *Adaptive learning environments: Foundations and frontiers* (Vol. 85). Springer Science & Business Media.

VanLehn, K., Graesser, A. C., Jackson, G. T., Jordan, P., Olney, A., & Rosé, C. P. (2007). When are tutorial dialogues more effective than reading?. *Cognitive Science*, *31*(1), 3-62. https://doi.org/10.1080/03640210709336984

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Woolf, B. P. (2010). *Building intelligent interactive tutors: Student-centered strategies for revolutionizing e-learning*. Morgan Kaufmann.

Wu, T. T., Hapsari, I. P., & Huang, Y. M. (2025). Effects of incorporating AI chatbots into think–pair–share activities on EFL speaking anxiety, language enjoyment, and speaking performance. *Computer Assisted Language Learning*, 1-39. https://doi.org/10.1080/09588221.2025.2478271

Xia, J., Ge, Y., Shen, Z., & Rahman Najar, M. (2024). The auxiliary role of artificial intelligence applications in mitigating the linguistic, psychological, and educational challenges of teaching and learning chinese language by non-chinese students. *International Review of Research in Open and Distributed Learning*, *25*(3), 116-133. https://doi.org/10.19173/irrodl.v25i3.7680

Biodata

Firas Al Taqatqa is an outgoing, passionate and experienced associate professor. He is a faculty member at the School of Applied Medical Sciences, Rehabilitation Sciences Department- SLP, Al al- Bayt University, Jordan. My research interest is focused on Special Education, communication disorders and developmental disorders.
https://orcid.org/0009-0000-1600-4995

Wafa' A. Hazaymeh is an Associate Professor in the Curriculum and Teaching Methods of English Language (Sub Major: Applied Linguistics) at Al-Ain University, UAE. Her research interests mainly lie in the areas of Curriculum and Pedagogy, Innovative English Language Teaching Methods and Instructional Technology, E-learning and English Language Acquisition and Applied Linguistics. She published several types of research in the concerned field.
https://orcid.org/0000-0002-0466-933X

Sayed M. Ismail is an Assistant Professor of English at Prince Sattam Bin Abdulaziz University (PSAU). His research and publication interests span applied linguistics, theoretical linguistics, English literature, and religious studies.
https://orcid.org/0000-0002-6698-006X

Khalid Abu-Alghayth is an Associate Professor of Special Education Department at King Khalid University. Dr. Khalid's research focuses on assistive technology, inclusive education, teacher collaboration, qualitative and mixed-methods research as well as equitable practices for meeting the needs of individuals with severe developmental disabilities. He recently published a number of articles

and book chapters with national and international researchers.
ORCID: https://orcid.org/0000-0002-0913-5062

Aayesha Sagir Khan is a dedicated scholar and educator with a strong commitment to advancing teaching and research in the fields of Linguistics and Applied Linguistics. She earned her Ph.D. in Applied Linguistics, with a specialization in Computer-Assisted Language Learning (CALL), from AISECT University, India, in 2016. Over the past twenty-three years, Dr. Khan has taught Linguistics, Applied Linguistics, and English as a Foreign Language (EFL) at various national and international universities and institutions. Her academic experience spans both undergraduate and postgraduate levels, where she has consistently demonstrated excellence in teaching, curriculum design, and student mentoring. Dr. Khan has published over twenty-five research articles in reputable national and international journals and has presented numerous papers at academic conferences and seminars on diverse themes related to linguistics and language pedagogy. She has also co-authored two books in her field of specialization. Dr. Khan currently serves as an Assistant Professor in the Department of English, College of Languages and Translation, King Khalid University, Abha, Kingdom of Saudi Arabia, where she continues to teach English as a Foreign Language (EFL) and pursue her research interests in language learning, teaching methodologies, applied linguistics and CALL.
https://orcid.org/0009-0009-5207-7839