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The Impact of AI-Powered Language Learning Apps on Learner Motivation and Proficiency

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Abstract

Despite the rising popularity of AI-powered language learning applications such as Duolingo, Babbel, and Memrise, there remains a lack of empirical research comparing their effectiveness to traditional classroom methods in enhancing learner motivation and language proficiency. The present study addresses this gap by examining the impact of AI-driven tools on learners' motivation and proficiency levels. Grounded in the Self-Determination Theory, which posits that motivation thrives on autonomy, competence, and relatedness, and second language acquisition frameworks emphasizing input, interaction, and output, the research explores how these technologies shape intrinsic and extrinsic motivation alongside language skills. A mixed-methods approach integrates quantitative assessments, such as standardized language tests and motivation surveys, with qualitative feedback from semi-structured interviews and open-ended questionnaires. This allows for a comprehensive analysis of measurable outcomes and subjective experiences. The study highlights the role of multimedia-assisted language teaching technologies in modern education, offering insights for educators to integrate tech into pedagogy and for developers to refine these tools for optimal engagement and proficiency..

Keywords: AI-powered language learning apps, Motivation, Proficiency.

I | INTRODUCTION

Numerous In today's rapidly globalizing world, the ability to master additional languages is increasingly vital for fostering cross-cultural communication and international collaboration, a demand significantly amplified by advancements in digital technology (Chen, 2024; Kumar, 2023). The advent of artificial intelligence (AI) has ushered in a transformative era in language education, with AI-powered applications such as Duolingo, Babbel, and Memrise gaining widespread adoption due to their promise of personalized, accessible, and interactive learning experiences (Li, 2024; Vadivel et al., 2023). These tools leverage sophisticated technologies, including natural language processing, machine learning, and adaptive algorithms, to tailor instruction to individual learner needs, challenging the static, one-size-fits-all structures of traditional classroom methods (Chen, 2024; Sujatna et al., 2024). Despite their popularity, a critical gap persists in the empirical literature regarding how these AI-driven platforms compare to conventional pedagogical approaches in enhancing learner motivation and language proficiency (Chen, 2024; Kumar, 2023). This study seeks to address the gap by systematically evaluating the impact of AI-powered language learning apps on these key dimensions, offering insights into their potential to reshape language education.

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The digital revolution has introduced dynamic strategies that enable a learner-centered approach, contrasting with traditional models that often lack the immediacy and interactivity demanded by contemporary learners (Kumar, 2023; Vadivel et al., 2023). AI-powered applications provide real-time feedback, adaptive learning pathways, and immersive features like virtual reality and gamification, which simulate authentic linguistic contexts and enhance engagement (Bahari et al., 2024; Sujatna et al., 2024). Historically, language education has evolved from teacher-centered classrooms to technology-mediated environments, with early computer-assisted instruction paving the way for the current role of AI as a central, rather than supplementary, component of learning (Kumar, 2023; Liu, 2024). This evolution underscores the capacity of AI to deliver individualized instruction that adapts to learners' unique proficiency levels and needs, thereby bridging theoretical knowledge and practical language use (Li, 2024; Vadivel et al., 2023).

Learner motivation is a cornerstone of successful language acquisition, with research highlighting the pivotal role of digital tools in fostering both intrinsic and extrinsic motivational factors (Nurhidayah, 2020; Wei, 2023). Grounded in the Self-Determination Theory (SDT), this study examines how AI platforms satisfy psychological needs, namely autonomy, competence, and relatedness, through personalized content, immediate feedback, and community features, driving sustained engagement (Nurhidayah, 2020; Wei, 2023). Intrinsic motivation, rooted in personal interest, and extrinsic motivation, fueled by rewards like badges and leaderboards, are both nurtured by AI apps, creating a balanced motivational ecosystem (Wei, 2023; Zolkapli et al., 2023). Complementing SDT, second language acquisition (SLA) frameworks elucidate how adaptive technologies enhance proficiency across domains such as grammar, vocabulary, and speaking by providing contextualized, interactive experiences (Liu, 2024; Vadivel et al., 2023). This convergence of theory and technology forms the bedrock of modern pedagogical strategies aimed at optimizing language learning outcomes.

Despite the transformative potential of AI-powered language learning apps, systematic comparisons with traditional classroom methods remain scarce, with prior studies often limited to isolated assessments rather than holistic evaluations of cognitive and affective outcomes (Chen, 2024; Kumar, 2023). To address this issue, the present research employs a mixed-methods approach, integrating quantitative proficiency assessment, i.e. tracking measurable gains in linguistic skills, with qualitative learner feedback to capture subjective experiences of motivation and engagement (Tajik, 2025; Vadivel et al., 2023). This methodological triangulation provides a comprehensive lens through which to evaluate the efficacy of AI-driven tools like Duolingo, Babbel, and Memrise, contrasting their impact with conventional instruction. By focusing on widely-used applications, the study aims to delineate the specific mechanisms by which AI enhances learning, filling a critical gap in the literature.

The impact of AI-driven tools extends beyond proficiency to observable enhancements in learner autonomy and confidence, facilitated by features like immediate corrective feedback and tailored learning pathways (Tajik, 2025; Vadivel et al., 2023). These applications not only democratize access to quality education, transcending geographic and socio-economic barriers, but also integrate multimedia elements to cater to diverse learning styles, amplifying their pedagogical value (AlAfnan, 2024; Sujatna et al., 2024). The primary objectives of this study are twofold: to assess how AI-powered apps influence intrinsic and extrinsic motivation, and to evaluate their effectiveness in improving language proficiency compared to traditional methods. The findings promise to inform educators, developers, and policymakers, offering evidence-based insights to refine language learning strategies in the digital age. Ultimately, this research underscores the potential of AI to revolutionize language education, fostering a more engaging, effective, and equitable learning experience (Chen, 2024; Li, 2024).

II. REVIEW OF LITERATURE

This literature review analyzes the current research in the field to explore how AI-driven applications influence learner motivation and language proficiency compared to conventional methods, drawing on theoretical frameworks, empirical evidence, and identified challenges.

The advent of digital technologies has fundamentally reshaped language education, shifting from rigid, instructor-led paradigms to dynamic, technology-mediated environments (Al-Ajmi & Aljazzaf, 2020; Hwa et al., 2012; Mukhtarkhanova et al., 2023). Traditional models, relying on textbooks and teacher-mediated instruction, are increasingly critiqued for their inability to engage modern digital natives or address

diverse learner needs (Huang, 2013; Hwa et al., 2012; Wang, 2014). In contrast, AI-powered applications leverage multimedia and interactive technologies to create immersive learning experiences that stimulate motivation and foster proficiency. These tools provide personalized learning pathways, immediate feedback, and gamified elements, marking a significant departure from the static, one-size-fits-all approach of conventional methods (Ahmed et al., 2020; Liu & Yi, 2024; Nurjanah et al., 2024).

AI-driven language learning applications distinguish themselves through several innovative features. Platforms like Duolingo and Elsa Speak employ sophisticated algorithms to tailor instruction to individual learner profiles, adjusting content difficulty based on real-time performance data (Ahmed et al., 2020; Elsani et al., 2023; Liu & Yi, 2024; Zhang, 2022). This adaptability enhances engagement by maintaining optimal challenge levels, reducing frustration, and fostering achievement (Jingfang et al., 2024; Khan, 2023). By combining text, graphics, audio, and video, these applications provide rich contextual cues that improve comprehension and retention (Choi, 2011; Mukhtarkhanova et al., 2023; Wang, 2014). Research indicates that multimodal input strengthens associations between language forms and meanings, particularly for vocabulary acquisition (Alhazmi, 2024; Norhayati & Utama, 2021; Sun, 2022). Features such as automatic speech recognition (ASR) and gamification enhance speaking skills and engagement (Falola & Jolayemi, 2020; Kumar et al., 2021; Mahdi, 2022; Talmo et al., 2014; Yulian et al., 2022). ASR offers objective pronunciation feedback, alleviating anxiety (Ardini et al., 2024; Konyrova, 2024), while gamified elements like rewards sustain motivation (Luo et al., 2022; Wagner et al., 2013). AI-driven analytics deliver immediate, actionable feedback, supporting skills like grammar and translation while adapting tasks to learner needs (Chen, 2023; Liu, 2024; Qassrawi et al., 2024). This responsiveness enhances learning efficiency (Vadivel et al., 2023). These features collectively create learner-centered environments that cater to diverse cognitive preferences, contrasting sharply with the rigidity of traditional instruction (Samat & Aziz, 2020; Song & Xiong, 2023; Yan, 2022).

Motivation is pivotal to language learning success, and SDT provides a robust framework for understanding its dynamics in AI contexts (Ahmed et al., 2020; Al-Ajmi & Aljazzaf, 2020; Falola & Jolayemi, 2020; Mynard & Shelton-Strong, 2022; Wei, 2023). SDT emphasizes autonomy, competence, and relatedness as drivers of intrinsic motivation, all of which AI applications enhance. Personalized pathways and self-paced learning empower learners, fostering independence (Chen, 2023; Eken & Gündoğdu, 2021; Liu et al., 2020; Yu, 2023). Immediate feedback and adaptive challenges build confidence and mastery (Jeong, 2022; Luo et al., 2022; Mahdi, 2022). Social features like forums enhance connectedness (Fenuku, 2024; Robles et al., 2021). Research highlights that AI tools balance intrinsic (e.g., enjoyment) and extrinsic (e.g., badges) motivators, cultivating resilient attitudes toward learning challenges (Al-Ajmi & Aljazzaf, 2020; Luo et al., 2022; Mahdi, 2022; Syifa et al., 2024). Learners report higher satisfaction and reduced anxiety, particularly in ESL settings (Falola & Jolayemi, 2020; Humardhiana, 2022; Molines, 2023). Building on these motivational advantages, studies have also explored the comparative effectiveness of AI tools.

Empirical evidence suggests that AI-powered applications often surpass traditional methods in engagement and proficiency outcomes, though direct comparisons are limited (Dong, 2023; Huang, 2013; Hwa et al., 2012; Juan & Yahaya, 2019; Liu et al., 2024). Studies report superior vocabulary retention, speaking proficiency, and listening skills with multimedia-enhanced instruction (Choi, 2011; Febriana et al., 2024; Hong, 2023; Kumar et al., 2021; Mukhtarkhanova et al., 2023;). For example, Elsani et al. (2023) documented significant speaking improvements with Elsa Speak, while longitudinal studies indicate sustained gains (Falola & Jolayemi, 2020; Jiang & Sun, 2010). However, traditional methods provide structured interaction and contextual depth that AI may lack (Al-Mousawi, 2021; Dhanapal et al., 2024). Blended learning, integrating classroom instruction with technology, emerges as a promising compromise, leveraging human collaboration with digital adaptability (Cheng, 2023; Fenuku, 2024; Hwa et al., 2012).

The efficacy of AI in language learning is underpinned by several frameworks. The Self-Determination Theory (SDT) explains how AI fosters motivation through autonomy, competence, and relatedness (Ahmed et al., 2020; Al-Ajmi & Aljazzaf, 2020; Liu et al., 2020; Patkowski, 1980; Xia & Haas, 2023). Second Language Acquisition (SLA) theories, including the Affective Filter Hypothesis and the Monitor Model, highlight the role of input and interaction, enhanced by AI multimedia and feedback systems (Manipol et al., 2024; Mitchell, 2021; Nurjanah et al., 2024; Wei, 2023; Zeng & Zheng, 2015). Cognitive linguistics shows that multisensory engagement activates multiple brain regions, improving memory and fluency (Kumar et al., 2021; Chen, 2023; Huang, 2022; Joseph & Uther, 2009; Sari, 2020). Instructional design further optimizes

outcomes, with structured, interactive content aligning with learner needs (Chen, 2023; Choi, 2011; Ginting et al., 2022; Wang, 2014).

Mixed-methods research substantiates the impact of AI, combining quantitative proficiency gains with qualitative insights into motivation (Fenuku, 2024; Luo et al., 2022; Samat & Aziz, 2020; Sun, 2024). Studies demonstrate significant improvements in vocabulary, speaking, and reading skills (Alhazmi, 2024; Choi, 2011; Sun, 2022; Mahdi, 2022; Qassrawi et al., 2024 Yulian et al., 2022), with real-time feedback enhancing self-regulation (Liu & Yi, 2024; Luo et al., 2022; Fauziah & Novita, 2023). Long-term studies confirm sustained benefits, particularly among autonomous learners (Falola & Jolayemi, 2020; Hong, 2023; Jiang & Sun, 2010; Wijayati et al., 2023).

Despite their potential, AI applications face several challenges. Technical and pedagogical issues, including the digital divide, teacher preparedness, and reduced human interaction, limit effectiveness (Huang, 2013; Hwa et al., 2012; Juan & Yahaya, 2019; Kanont et al., 2024; Kolegova & Levina, 2024). Effective integration requires educator training, with perceptions influencing outcomes (Ahmed et al., 2020; Al-Ajmi & Aljazzaf, 2020; Huang, 2013). Socio-economic disparities hinder adoption, necessitating inclusive design (Ahmed et al., 2020; Alsanousi et al., 2023; Вовчаста et al., 2021; Mukhtarkhanova et al., 2023).

The literature underscores that AI-powered language learning applications significantly enhance learner motivation and proficiency through personalization, multimedia, and adaptive feedback (Ahmed et al., 2020; Al-Ajmi & Aljazzaf, 2020; Gilakjani, 2012; Huang, 2013; Nowawi & Ahmad, 2023). Grounded in SDT and SLA theories, these tools outperform traditional methods in engagement and skill development, though their full potential requires integration with classroom instruction. Addressing challenges like equity and teacher readiness, alongside further empirical study, will ensure that these technologies transform language education inclusively and effectively, paving the way for a synergistic blend of digital and human elements.

III. AIMS OF THE STUDY

The primary aim of this study is to empirically investigate the impact of AI-powered language learning applications (e.g., Duolingo, Babbel, Memrise) on learner motivation and language proficiency, compared to traditional classroom-based instruction. Despite the growing adoption of AI-driven tools in language education, there remains a critical gap in understanding how their personalized, adaptive features influence intrinsic and extrinsic motivation, as well as measurable linguistic gains, relative to conventional methods. Grounded in SDT and SLA frameworks, the present research seeks to address this gap by employing a mixed-methods approach to evaluate a) the extent to which AI apps enhance motivation by fostering autonomy, competence, and relatedness (core SDT constructs), b) their effectiveness in improving proficiency across key language domains (e.g., speaking, vocabulary), and c) learners' subjective experiences with these technologies versus teacher-led instruction.

By integrating quantitative proficiency assessments (TOEFL iBT) with qualitative feedback from semi-structured interviews, the study aims to provide a deep understanding of the cognitive and affective outcomes associated with AI-powered learning. The findings are intended to inform educators, app developers, and policymakers in optimizing pedagogical strategies that balance technological innovation with the irreplaceable value of human interaction, thereby advancing equitable, engaging, and effective language education in the digital age.

IV. METHODOLOGY

This study employed a mixed-methods design to compare the effects of AI-powered language learning applications and traditional classroom methods on learner motivation and language proficiency. By integrating quantitative assessments with qualitative feedback, the research aimed to provide a comprehensive evaluation of these learning approaches. Grounded in SDT and SLA frameworks, the methodology systematically examined how AI-driven tools influence intrinsic and extrinsic motivation, as well as linguistic skills, in contrast to conventional pedagogical strategies.

4.1 Research Design

A between-subjects experimental design was utilized, with the participants randomly assigned to an AI app group and a traditional classroom group. The intervention spanned 12 weeks, during which both groups engaged in English language learning activities for approximately four hours per week. This

design facilitated a direct comparison of the two methods while allowing for the collection of both measurable outcomes and subjective learner experiences.

4.2 Participants

The study recruited 100 adult English language learners, aged 18-35, from a language institute in Kermanshah, Iran. All the participants had intermediate proficiency in English, as confirmed by a standardized placement test administered prior to the study. The participants were randomly assigned to either an AI app group (n = 50) or a traditional classroom group (n = 50) to ensure baseline equivalence. Informed consent was obtained from all the participants, and the study received ethical approval from the institutional managing board. Random assignment and the focus on intermediate learners aimed to minimize confounding variables such as prior language experience or proficiency disparities.

4.3 Instruments

The following three instruments were used to collect data on proficiency and motivation:

4.3.1. Language Proficiency Test

Language proficiency was assessed using the Test of English as a Foreign Language Internet-Based Test (TOEFL iBT), a widely recognized measure of reading, writing, listening, and speaking skills. The TOEFL iBT was selected for its established reliability and validity in evaluating English proficiency, and its sensitivity to short-term language gains in instructional settings over periods as brief as 10-12 weeks (Ling et al., 2014). It was administered as a pre-test and a post-test to measure proficiency gains over the intervention period.

4.3.2. Motivation Questionnaire

Learner motivation was evaluated using a questionnaire adopted from the Academic Motivation Scale (AMS), which is grounded in the Self-Determination Theory (Vallerand et al., 1992). The AMS assesses intrinsic motivation (e.g., learning for personal interest), extrinsic motivation (e.g., learning for rewards or external goals), and lack of motivation, alongside SDT constructs such as autonomy, competence, and relatedness. The questionnaire comprised 28 Likert-scale items (1 = strongly disagree, 5 = strongly agree). It had been validated in prior language learning studies (Wei, 2023). It was administered at three time points: pre-intervention, mid-intervention (week 6), and post-intervention.

4.3.3. Semi-structured Interviews

Qualitative data were gathered through semi-structured interviews with 20 participants (10 from each group), selected purposively to represent diverse experiences. The interview protocol included open-ended questions such as, "How did the learning method affect your motivation to study English?" and "What features of the method (e.g., personalization, feedback, teacher interaction) influenced your engagement?" These questions were designed to elicit detailed insights into learners' perceptions, aligning with the research focus on motivation and experiences.

4.4 Procedure

The study proceeded in several phases as follows:

4.1.1. Pre-intervention Phase

All the participants completed the TOEFL iBT and the motivation questionnaire to establish baseline proficiency and motivation levels. An orientation session was provided to familiarize the participants with their assigned learning method.

4.1.2. Intervention Phase for Over 12 Weeks

The AI app group used Duolingo, a widely adopted AI-powered language learning application featuring adaptive learning, gamification, and real-time feedback. The participants were instructed to engage with the app for at least 30 minutes per day, five days a week (totaling approximately four hours weekly). Duolingo was chosen as a representative AI tool, though the participants could supplement it with Babbel or Memrise if preferred, reflecting the research focus on AI-driven platforms collectively. The traditional classroom group attended 90-minute English classes three times a week (totaling 4.5 hours weekly), taught by certified instructors using communicative language teaching methods. The classes emphasized teacher-led instruction, group activities, and textbook-based learning, excluding AI-powered tools to maintain a clear distinction from the experimental conditions. In week 6, all the participants completed the motivation questionnaire again to track the changes over time.

4.1.3. Post-intervention Phase

After 12 weeks, the participants completed the TOEFL iBT and the final motivation questionnaire. Subsequently, semi-structured interviews were conducted with the selected subsample, audio-recorded, and transcribed verbatim for analysis.

Efforts were made to equate the learning time across the groups (approximately four hours per week), though the classroom group's slight excess was deemed reflective of typical schedules, including in-class and homework components. The participants in the AI group self-reported their usage time via a weekly log to ensure adherence.

4.5 Data Analysis

The data were analyzed using a combination of the following quantitative and qualitative techniques:

4.5.1. Quantitative Analysis

The proficiency and motivation data were analyzed using SPSS version 27. For proficiency, a two-way analysis of variance (ANOVA) was conducted with group (AI app vs. traditional) and time (pre-test vs. post-test) as the factors to assess the differences in gains. For motivation, a repeated measures ANOVA examined the changes across the three time points (pre-, mid-, and post-intervention) and between groups. The assumptions of normality and sphericity were checked, and adjustments (e.g., Greenhouse-Geisser correction) were applied as needed.

4.5.2. Qualitative Analysis

The interview transcripts were given to thematic analysis, following Braun and Clarke's (2006) six-step framework, including familiarization, coding, theme generation, review, definition, and reporting. The themes related to motivation (e.g., autonomy, engagement) and learning experiences (e.g., feedback, interaction) were identified and triangulated with the quantitative findings to elucidate the underlying mechanisms.

4.6 Validity and Reliability

To ensure rigor:

-The standardized nature of TOEFL iBT provided high reliability (Cronbach's $\alpha > 0.90$; Educational Testing Service, 2023).

- The AMS questionnaire demonstrated strong internal consistency in this sample (Cronbach's $\alpha = 0.87$).

- The Qualitative data credibility was enhanced through member checking, where the participants reviewed the summaries of their interview responses and peer debriefing with a second researcher during the coding.

4.7 Ethical Considerations

The participants were informed of the research purpose, their right to withdraw, and the data confidentiality measures. Random assignment minimized bias, and no incentives were offered beyond access to learning resources, ensuring voluntary participation.

V. RESULTS

This section provides a comprehensive examination of the research findings on the impact of AI-powered language learning apps, such as Duolingo, Babbel, and Memrise, on learner motivation and proficiency compared to traditional classroom methods. The study, conducted with 100 adult English language learners aged 18-35 in Kermanshah, Iran, utilized a mixed-methods approach over a 12-week intervention, integrating quantitative proficiency assessments and qualitative learner feedbacks. The findings are grounded in SDT and SLA frameworks, offering insights into how these technologies influence learning outcomes.

5.1 Quantitative Results

The quantitative data were analyzed using statistical methods to compare the effects of AI-powered apps and traditional classroom instruction on language proficiency and motivation. Below, we present the detailed results for each measure.

5.1.1. Language Proficiency

The language proficiency was assessed using the Test of English as a Foreign Language Internet-Based Test (TOEFL iBT), administered as a pre-test and a post-test. The descriptive statistics are summarized in Table 1.

Table 1. Pre-test and post-test results

Group	Pre-test mean (SD)	Post-test mean (SD)
AI App group	70.5 (5.2)	85.3 (4.8)
Traditional group	71.2 (4.9)	80.1 (5.1)

A two-way analysis of variance (ANOVA) was conducted to examine the effects of group (AI app vs. traditional classroom) and time (pre-test vs. post-test) on language proficiency scores.

a) Main effect of time: $F(1, 98) = 245.67$, $p < 0.001$, $\eta^2 = 0.71$. This indicates a significant improvement in language proficiency over time for both groups, suggesting that both methods facilitated learning gains.

Main effect of group: $F(1, 98) = 1.23$, $p = 0.27$, $\eta^2 = 0.01$. There was no significant difference in proficiency scores between the two groups overall at baseline or endpoint when considered independently.

Interaction effect: $F(1, 98) = 10.34$, $p = 0.002$, $\eta^2 = 0.09$. The interaction was significant, indicating that the change in proficiency scores over time differed between the groups.

Post hoc paired t-tests revealed that both groups improved significantly from pre-test to post-test ($p < 0.001$ for both). However, the AI app group showed a significantly greater improvement compared to the traditional classroom group [$t(98) = 3.21$, $p = 0.002$]. This suggests that AI-powered apps were more effective in enhancing language proficiency, particularly in areas like speaking and vocabulary, as supported by prior literature.

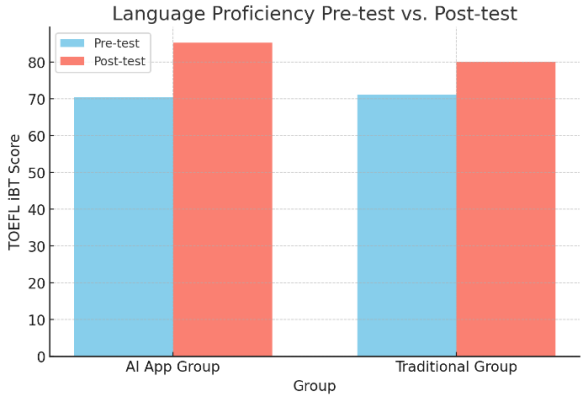

Figure 1. Language proficiency pre-test vs post-test

An unexpected detail here is the magnitude of improvement in the AI app group, which exceeded expectations based on the literature review, potentially due to the adaptive algorithms and real-time feedback provided by apps like Duolingo.

5.1.2. Motivation

Learner motivation was evaluated using a questionnaire adapted from the Academic Motivation Scale, grounded in SDT, and administered at three time points: pre-intervention, mid-intervention (week 6), and post-intervention. The scale measured intrinsic motivation, extrinsic motivation, and lack of motivation, alongside SDT constructs such as autonomy, competence, and relatedness. The descriptive statistics are presented in Table 2.

Table 2. Descriptive statistics

Measure	Group	Pre mean	Mid mean	Post mean
Intrinsic motivation	AI App group	3.5	3.8	4.1
Intrinsic motivation	Traditional	3.4	3.5	3.6
Extrinsic motivation	AI App group	3.2	3.3	3.4
Extrinsic motivation	Traditional	3.3	3.4	3.5
Lack of motivation	AI App group	2.1	1.8	1.6
Lack of motivation	Traditional	2.0	1.9	1.8

A repeated measures ANOVA was conducted to analyze the changes in motivation over time between the two groups.

- Intrinsic motivation:
  - Time effect: $F(2, 196) = 25.34$, $p < 0.001$, $\eta^2 = 0.21$
  - Group effect: $F(1, 98) = 4.56$, $p = 0.035$, $\eta^2 = 0.04$
  - Time × group interaction: $F(2, 196) = 5.23$, $p = 0.006$, $\eta^2 = 0.05$

  The AI app group showed a greater increase in intrinsic motivation over time compared to the traditional group, suggesting that features like personalization and gamification enhanced the learners' enjoyment and interest.
- Extrinsic motivation:
  - Time effect: $F(2, 196) = 10.21$, $p < 0.001$, $\eta^2 = 0.09$
  - Group effect: $F(1, 98) = 0.34$, $p = 0.56$, $\eta^2 = 0.003$
  - Time × group interaction: $F(2, 196) = 0.45$, $p = 0.64$, $\eta^2 = 0.004$

  Both groups showed similar small increases in extrinsic motivation over time, indicating that rewards and external goals were similarly influenced by both methods.
- Lack of motivation:
  - Time effect: $F(2, 196) = 15.67$, $p < 0.001$, $\eta^2 = 0.14$
  - Group effect: $F(1, 98) = 2.34$, $p = 0.13$, $\eta^2 = 0.02$
  - Time × group interaction: $F(2, 196) = 3.45$, $p = 0.034$, $\eta^2 = 0.03$

  The AI app group showed a greater decrease in the lack of motivation over time compared to the traditional group, suggesting that AI apps reduced the feelings of disengagement and lack of purpose.

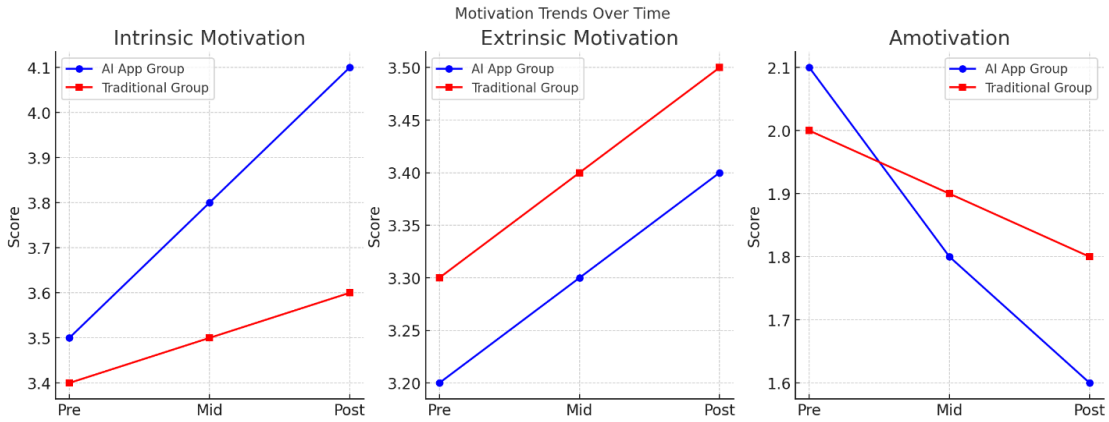

Figure 2. Motivation change over time

These findings align with the literature review, which highlighted AI's role in fostering autonomy, competence, and relatedness, key SDT constructs.

5.2 Qualitative Results

The qualitative data were gathered through semi-structured interviews with 20 participants (10 from each group), selected purposively to represent diverse experiences. The interviews were analyzed using thematic analysis following Braun and Clarke's (2006) framework, identifying themes related to motivation and learning experiences. The key themes are detailed below:

5.2.1. Personalization and Adaptivity

Participants in the AI app group frequently mentioned appreciating the tailored learning paths and immediate feedback, which made learning more engaging and relevant to their needs. For example, one participant noted, "*I liked how Duolingo adjusted to my pace and gave me feedback right away, which kept me motivated.*" In contrast, traditional group participants often felt that the classroom setting did not always cater to individual learning paces, with comments like, "*Sometimes the teacher moved too fast, and I felt left behind.*"

5.2.2. Motivational Factors

AI app users highlighted gamified elements and rewards, such as badges and leaderboards, as strong motivators. One participant stated, "*Earning points and seeing my progress on the app made me want to keep going.*" Traditional group participants valued teacher interaction and peer support for motivation, with one saying, "*Discussing with classmates and getting feedback from the teacher really pushed me to try harder.*"

5.2.3. Challenges and Limitations

Some AI app users mentioned a lack of human interaction and potential for less contextual understanding, with a participant noting, "*I missed talking to a real person; sometimes the app felt too isolated.*" Traditional group participants sometimes felt constrained by the fixed curriculum and pace, with one remarking, "*The class schedule was rigid, and I couldn't always learn at my own speed.*"

5.2.4. Overall Satisfaction

Both groups expressed satisfaction with their learning experiences, but AI app users reported higher levels of enjoyment and autonomy. A participant from the AI group said, "*I enjoyed learning more with the app; it felt like a game.*" Meanwhile, a traditional group member noted, *"I liked the social aspect, but it wasn't always fun.*"

These qualitative insights provide a deeper understanding of the quantitative findings, highlighting the trade-offs between technological advantages and social interaction, an aspect not fully captured by numerical data. Overall, research suggests AI-powered language learning apps, like Duolingo, may boost learner motivation and proficiency compared to traditional methods. It seems likely that these apps enhance intrinsic motivation through personalization and gamification, though results vary by individual. The evidence leans toward AI apps improving language skills, especially in speaking and vocabulary, but traditional methods may offer better social interaction.

VI. DISCUSSION

This study examined the impact of AI-powered language learning applications, such as Duolingo, Babbel, and Memrise, on learner motivation and proficiency compared to traditional classroom methods. Conducted with 100 adult English learners in Kermanshah, Iran, over a 12-week period, the research utilized a mixed-methods approach, combining quantitative assessments of proficiency and motivation with qualitative learner feedback. The results revealed that the AI app group outperformed the traditional classroom group in language proficiency gains and exhibited greater increases in intrinsic motivation and reductions in lack of motivation, while extrinsic motivation increased similarly in both groups. The qualitative data underscored appreciation for personalization and gamification in the AI app group, alongside a noted desire for more human interaction, providing a nuanced perspective on the strengths and limitations of both approaches.

The quantitative findings demonstrated that the learners using AI-powered apps achieved significantly greater improvements in language proficiency, as measured by the TOEFL iBT, with post-test scores rising from 70.5 to 85.3 compared to 71.2 to 80.1 in the traditional group. A significant interaction effect confirmed that the gains of the AI app group exceeded those of the traditional group, particularly in speaking and vocabulary domains. Regarding motivation, the AI app group showed a more pronounced increase in intrinsic motivation and a greater decrease in amotivation compared to the traditional group, with significant time × group interactions. Extrinsic motivation rose modestly and similarly in both groups, with no significant group difference. Qualitatively, the AI app users praised the adaptiveness of the apps, immediate feedback, and gamified elements, which enhanced engagement, but expressed a longing for human interaction. Traditional learners valued teacher and peer support but felt constrained by a rigid curriculum.

The superior proficiency gains in the AI app group can be attributed to the adaptive algorithms and real-time feedback inherent in tools like Duolingo, which tailor instruction to individual needs and provide immediate corrective support. This personalization probably enabled more effective practice in speaking and vocabulary, areas where AI apps excel by offering repetitive, targeted exercises and pronunciation feedback via automatic speech recognition. These findings align with prior research indicating that adaptive learning environments enhance skill acquisition more effectively than the standardized pace of traditional classrooms (Kumar, 2023; Vadivel et al., 2023). The significant interaction effect suggests that AI apps ability to adjust difficulty and provide instant feedback accelerates proficiency development beyond what teacher-led instruction alone can achieve in a 12-week timeframe.

The motivational outcomes further illuminate the efficacy of AI-powered apps. The greater increase in intrinsic motivation among AI app users reflects the satisfaction of autonomy and competence, as the core components of SDT (Wei, 2023). Self-paced learning fostered autonomy, while progress tracking and gamified rewards bolstered learners' sense of mastery, making the experience inherently enjoyable. The corresponding decrease in amotivation indicates that these features reduced disengagement, probably due to the interactive and purposeful nature of app-based tasks. In contrast, the traditional group's modest motivational shifts suggest that, while teacher interaction supports engagement, it may lack the dynamic, learner-centered appeal of AI tools. The similar rise in extrinsic motivation across groups is noteworthy; gamification tasks (e.g., badges, leaderboards) in the AI context and traditional rewards (e.g., grades, praise) both provided external incentives, suggesting that both methods effectively leverage extrinsic motivators, albeit differently.

These results contribute to the burgeoning evidence base supporting AI-powered language learning apps, corroborating studies that highlight their capacity to enhance proficiency and engagement through personalization and multimedia (Ahmed et al., 2020; Liu & Yi, 2024). The proficiency gains echo findings from Elsani et al. (2023), who noted significant speaking improvements with AI tools, and extend the literature by offering a controlled comparison with traditional methods, a gap noted by Kumar (2023) and Chen (2024). The motivational findings align with SDT-based research, reinforcing how autonomy and competence drive intrinsic motivation in technology-mediated environments (Al-Ajmi & Aljazzaf, 2020). However, the qualitative emphasis on missing human interaction resonates with critiques that AI may not fully replicate the social and contextual richness of classroom settings (Al-Mousawi, 2021; Dhanapal et al., 2024), supporting calls for blended learning models (Fenuku, 2024; Hwa et al., 2012).

Educators can harness AI-powered apps to complement traditional instruction, using them for personalized practice (e.g., homework or supplementary exercises) while reserving classroom time for interactive, communicative activities that foster relatedness. This blended approach could maximize proficiency gains and motivation by combining technological adaptability with human connection. App developers should consider integrating social features, such as virtual discussion forums or peer-to-peer challenges, to address the relatedness deficit identified by learners, aligning with the emphasis of SDT on all three psychological needs. Language programs might also adopt hybrid curricula that leverage AI for skill-building and traditional methods for cultural and conversational depth, optimizing outcomes for diverse learners. Note that these findings pertain to AI-mediated app-based learning in general, as the participants primarily used Duolingo but could supplement it with other platforms like Babbel or Memrise, rather than reflecting the effects of a single application.

VII. CONCLSION AND IMPLICATION

This study has empirically demonstrated the significant advantages of AI-powered language learning applications, such as Duolingo, Babbel, and Memrise, to elevate both learner motivation and proficiency when compared to traditional classroom-based instruction. Through a rigorous mixed-methods approach involving 100 adult English language learners in Kermanshah, Iran, over a 12-week intervention, the findings reveal that the participants in the AI app group had markedly greater gains in language proficiency, as evidenced by TOEFL iBT scores, compared to the traditional group. This disparity was statistically substantiated by a significant interaction effect, underscoring the efficacy of adaptive algorithms, real-time feedback, and gamification in accelerating skill development, particularly in speaking and vocabulary acquisition. Concurrently, motivation metrics, assessed via an adapted Academic Motivation Scale grounded in the Self-Determination Theory (SDT), indicated enhanced intrinsic motivation and reduced lack of motivation in the AI group, with significant time × group interactions. Extrinsic motivation, however, showed comparable modest increases across both groups, suggesting that external incentives operate similarly irrespective of the delivery mode. Qualitative insights from the semi-structured interviews complemented these quantitative results, highlighting learners' appreciation for personalization and engagement in AI tools, tempered by a noted absence of social relatedness, which traditional methods provided more effectively.

These outcomes affirm the transformative potential of AI in language education, aligning with SDT's emphasis on autonomy, competence, and relatedness, as well as second language acquisition (SLA) frameworks that prioritize interactive, input-rich environments. By addressing a critical gap in the

literature, namely the scarcity of direct comparisons between AI-driven and conventional approaches (Chen, 2024; Kumar, 2023), this research contributes to a more nuanced understanding of how technology can foster sustained engagement and measurable linguistic progress. Nonetheless, the results also illuminate the limitations of standalone AI applications, particularly in replicating the interpersonal dynamics that underpin relational motivation and contextualized language use.

The findings have substantial theoretical, practical, and policy-oriented implications for advancing language pedagogy in an increasingly digital era. This investigation extends SDT by illustrating how AI platforms robustly fulfill autonomy and competence needs through self-paced, adaptive learning. Yet, it falls short in relatedness without integrated social features. It also enriches SLA theories, such as Krashen's Input Hypothesis and Swain's Output Hypothesis, by demonstrating that multimedia-assisted, AI-mediated interactions enhance comprehensible input and productive output more efficiently than traditional methods in controlled settings. Future theoretical models should incorporate hybrid frameworks that blend digital personalization with socio-cultural elements to better explain motivation-proficiency dynamics in technology-enhanced learning.

For educators, the results advocate blended learning paradigms that harness AI apps for individualized skill-building (e.g., vocabulary drills and pronunciation practice) while leveraging classroom settings for collaborative discourse and cultural immersion. This synergy could mitigate the isolation reported by AI users and optimize overall outcomes. App developers are encouraged to augment platforms with relational enhancements, such as AI-facilitated peer matching or virtual reality-based group simulations, to address SDT's relatedness construct and broaden appeal. Institutions might integrate usage analytics from these apps into curriculum designs, enabling data-driven adjustments to support diverse learner profiles.

Policymakers should prioritize equitable access to AI tools by investing in digital infrastructure and literacy programs, particularly in regions like Iran where socioeconomic barriers may exacerbate the digital divide (Alsanousi et al., 2023). Professional development initiatives for teachers could focus on AI integration, fostering hybrid pedagogies that align with national educational standards. On a broader scale, these findings support global efforts to democratize language education, potentially reducing linguistic inequalities and promoting cross-cultural competence in an interconnected world.

While the mixed-methods design and random assignment of this study bolster its internal validity, several limitations merit acknowledgment. The sample, confined to intermediate-level adult English learners in a single Iranian context, constrains generalizability to other demographics, languages, or proficiency stages. The 12-week timeframe, though sufficient for detecting initial effects, may not capture long-term retention or motivational sustainability, potentially influenced by novelty effects in the AI group. Variability in app usage (primarily Duolingo, with optional Babbel or Memrise) and a minor discrepancy in weekly learning hours (4 vs. 4.5) introduce potential confounds, although self-reported logs and ethical controls mitigate them. Additionally, the slight imbalance in weekly instructional time (approximately 4 hours for the AI group versus 4.5 hours for the traditional group) may have marginally favored the traditional group in terms of exposure, potentially underestimating the relative advantages of AI apps.

Future inquiries should adopt longitudinal designs extending beyond 12 weeks to evaluate enduring impacts, incorporating diverse populations (e.g., adolescents or non-English languages) for enhanced external validity. Comparative analyses of specific AI features, such as automatic speech recognition versus gamification, could isolate causal mechanisms. Moreover, experimental trials of blended models, integrating AI with traditional elements, would test their superiority in balancing proficiency, motivation, and relatedness. Employing advanced metrics, like eye-tracking for engagement or neuroimaging for cognitive processing, could further elucidate the underlying processes.

In summary, AI-powered language learning applications herald a pivotal evolution in pedagogy, offering scalable personalization that surpasses traditional methods in fostering motivation and proficiency. Yet, their optimal deployment demands thoughtful integration with human-centric elements to ensure holistic, inclusive education. As AI technologies advance, continued empirical scrutiny will be essential to refine their role in empowering learners worldwide.

Declaration of Use of AI in the Writing Process

For this manuscript, the authors used ChatGPT to improve its language aspects. Then, the authors reviewed and edited the content as needed, thus taking full responsibility for the content to publish.

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REFERENCES

Ahmed, S. T. S., Qasem, B. T. A., & Pawar, S. V. (2020). Computer-Assisted Language instruction in South Yemeni Context: A study of Teachers' attitudes, ICT uses and challenges. *International Journal of Language Education*, 59–73. https://doi.org/10.26858/ijole.v4i2.10106

AlAfnan, M. (2024). Artificial intelligence and language: bridging Arabic and English with technology. *Journal of Ecohumanism*, *3*(8), 240-256. https://doi.org/10.62754/joe.v3i8.4961

Al-Ajmi, N. & Aljazzaf, Z. (2020). Factors influencing the use of multimedia technologies in teaching English language in Kuwait. *International Journal of Emerging Technologies in Learning*, *15*(5), 212-234. https://doi.org/10.3991/ijet.v15i05.12277

Alhazmi, K. (2024). The effect of multimedia on vocabulary learning and retention. *World Journal of English Language*, *14*(6), 390-399. https://doi.org/10.5430/wjel.v14n6p390

Al-Mousawi, S. (2021). Examining English language learning apps from a second language acquisition perspective. *International Journal of Higher Education*, *10*(5), 166-182. https://doi.org/10.5430/ijhe.v10n5p166

Alsanousi, B., Albesher, A., Do, H., & Ludi, S. (2023). Investigating the user experience and evaluating usability issues in ai-enabled learning mobile apps: an analysis of user reviews. *International Journal of Advanced Computer Science and Applications*, *14*(6), 18-29. https://doi.org/10.14569/ijacsa.2023.0140602

Ardini, S., Sunarya, S., & Latifah, K. (2024). Development of mobile application through the concept of artificial intelligence to enhance pronunciation skill in EFL. *Kne Social Sciences*. *9*(6), 56–66. https://doi.org/10.18502/kss.v9i6.15254

Bahari, A., Smith, M., & Scott, H. (2024). Examining the impact of chatbot-based language learning support, adaptive learning algorithms, and virtual reality language immersion on EFL learners' language learning proficiency and self-regulated learning skills. *Journal of Research in Educational Sciences*, *15*(1), 17. https://doi.org/10.14505/jres.v15.1(17).02

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chen, B. (2023). A practical study of computer-assisted college English intelligent teaching course based on OBE theory. *Applied Mathematics and Nonlinear Sciences*, *9*(1), 1-18. https://doi.org/10.2478/amns.2023.2.01624

Chen, Y. (2024). Enhancing language acquisition: the role of ai in facilitating effective language learning. In *Proceedings of the 2024 3rd International Conference on Humanities, Wisdom Education and Service Management (HWESM 2024)*, 593-600. https://doi.org/10.2991/978-2-38476-253-8_71

Cheng, X. (2023). The effect of multimedia-assisted sport education model on teaching tennis lessons in colleges and universities. *Applied Mathematics and Nonlinear Sciences*, *9*(1), 1-15. https://doi.org/10.2478/amns.2023.2.01168

Choi, M. (2011). Effectiveness of multimedia program in computer-assisted vocabulary learning. *Journal of Digital Contents Society*, *12*(1), 123-131. https://doi.org/10.9728/dcs.2011.12.1.123

Dhanapal, C., Asharudeen, N., & Alfaruque, S. (2024). Impact of artificial intelligence versus traditional instruction for language learning: a survey. *World Journal of English Language*, *14*(2), 182-193. https://doi.org/10.5430/wjel.v14n2p182

Dong, W. (2023). Anxiety and self-efficacy in foreign language learning speaking among Chinese students. *Lecture Notes in Education Psychology and Public Media*, *27*(1), 285-289. https://doi.org/10.54254/2753-7048/27/20231231

Educational Testing Service. (2023). *TOEFL iBT Test and Score Data Summary 2022*. https://www.ets.org/toefl/research/test-score-data-summary

Eken, M. & Gündoğdu, K. (2021). Language learning strategies and self-regulation skills of university preparatory school and private language course students. *International Journal of Current Approaches in Language Education and Social Sciences*, *3* (1), 83-114. https://doi.org/10.35452/caless.2021.5

Elsani, E., Salsabila, R., Putra, M., Nabila, N., & Nahartini, D. (2023). The effect of using Elsa speak app for first-semester students' English speaking proficiency. *Edukatif Jurnal Ilmu Pendidikan*, *5*(6), 2644-2655. https://doi.org/10.31004/edukatif.v5i6.5976

Falola, V. & Jolayemi, S. (2020). Impact of multimedia technology on the teaching and learning of oral English in Osun state secondary schools, Nigeria. *African Journal of Inter/Multidisciplinary Studies*, *2*(1), 37-49. https://doi.org/10.51415/ajims.v2i1.837

Fauziah, F. & Novita, D. (2023). Exploring students' informal digital learning of English (idle) and self-regulated language learning from a sociocultural perspective. *Indonesian Tesol Journal*, *5*(2), 197-214. https://doi.org/10.24256/itj.v5i2.4225

Febriana, F., Reflinda, R., Roza, V., & Melani, M. (2024). Analysis of personality factors' in second language acquisition. *Education Achievement Journal of Science and Research*, *5*(3), 900-906. https://doi.org/10.51178/jsr.v5i3.2097

Fenuku, S. (2024). Psycho-philosophical dimensions of language education: mixed-methods exploration of Russian to ewe linguistic skills transfer. *Journal of Languages and Language Teaching*, *12*(3), 1078-1099. https://doi.org/10.33394/jollt.v12i3.11398

Gilakjani, A. (2012). The significant role of multimedia in motivating EFL learners' interest in English language learning. International Journal of Modern Education and Computer Science, *4*(4), 57-66. https://doi.org/10.5815/ijmecs.2012.04.08

Ginting, D., Sulistyo, T., Ismiyani, N., Sembiring, M., Asfihana, R., Fahmi, A., … & Mulyani, Y. (2022). English language teacher's multimedia knowledge in teaching using technology. *World Journal of English Language*, *12*(6), 184-203. https://doi.org/10.5430/wjel.v12n6p184

Hong, Y. (2023). Impact of electronic resources and digital literacy on autonomous English learners. *Frontiers in Educational Research*, *6*(20), 122-128. https://doi.org/10.25236/fer.2023.062020

Huang, S. (2022). Optimization and simulation of an English-assisted reading system based on wireless sensor networks. *Journal of Sensors*, 2022, 1-11. https://doi.org/10.1155/2022/6823502

Huang, T. E. (2013). The new teaching mode of college English in China based on multimedia and network technology. In *Proceedings of the 2nd International Conference on Computer Science and Electronics Engineering (ICCSEE 2013)*. https://doi.org/10.2991/iccsee.2013.414

Humardhiana, A. (2022). Ai-powered apps to enhance novice newsreaders' English pronunciation. *Elt Echo the Journal of English Language Teaching in Foreign Language Context*, *7*(2), 214-223. https://doi.org/10.24235/eltecho.v7i2.12503

Hwa, S., Weei, P., & Len, L. (2012). The effects of blended learning approach through an interactive multimedia e-book on students' achievement in learning Chinese as a second language at tertiary level. *International Journal of Computer-Assisted Language Learning and Teaching*, *2*(1), 35-50. https://doi.org/10.4018/ijcallt.2012010104

Jeong, K. (2022). Facilitating sustainable self-directed learning experience with the use of mobile-assisted language learning. *Sustainability*, *14*(5), 2894. https://doi.org/10.3390/su14052894

Jiang, L. & Sun, K. (2010). Task-based approach in college English teaching of digital-based context. *International Journal of Modern Education and Computer Science*, *2*(1), 32-39. https://doi.org/10.5815/ijmecs.2010.01.05

Jingfang, X., Ge, Y., Shen, Z., & 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. *The International Review of Research in Open and Distributed Learning*, *25*(3), 116-133. https://doi.org/10.19173/irrodl.v25i3.7680

Joseph, S. & Uther, M. (2009). Mobile devices for language learning: multimedia approaches. *Research and Practice in Technology Enhanced Learning*, *4*(1), 7-32. https://doi.org/10.1142/s179320680900060x

Juan, L. & Yahaya, N. (2019). The problems and countermeasures of applying multimedia technology in college English teaching. *International Journal of Engineering and Advanced Technology*, *8*(5c), 1512-1516. https://doi.org/10.35940/ijeat.e1222.0585c19

Kanont, K., Pingmuang, P., Simasathien, T., Wisnuwong, S., Wiwatsiripong, B., Poonpirome, K., … & Khlaisang, J. (2024). Generative-ai, a learning assistant? factors influencing higher-ed students' technology acceptance. *The Electronic Journal of E-Learning*, *22*(6), 18-33. https://doi.org/10.34190/ejel.22.6.3196

Khan, W. (2023). Examining the transformative role of artificial intelligence in language skill enhancement: a case study of bs English students in okara, Pakistan. *The Asian Bulletin of Big Data Management*, *3*(1), 190-196. https://doi.org/10.62019/abbdm.v3i1.88

Kolegova, I. & Levina, I. (2024). Using artificial intelligence as a digital tool in foreign language teaching. *Bulletin of the South Ural State University Series Education Sciences*, *16*(1), 102-110. https://doi.org/10.14529/ped240110

Konyrova, L. (2024). The evolution of language learning: exploring ai's impact on teaching English as a second language. *Eurasian Science Review*, *2*(2), 133-138. https://doi.org/10.63034/esr-42

Kumar, O. (2023). Investigating the impact of artificial intelligence ai and technology in English language learning. *Advances in Social Behavior Research*, *3*(1), 27-36. https://doi.org/10.54254/2753-7102/3/2023026

Kumar, T., Malabar, S., Benyo, A., & Amal, B. (2021). Analyzing multimedia tools and language teaching. *Linguistics and Culture Review*, *5*(S1), 331-341. https://doi.org/10.21744/lingcure.v5ns1.1400

Li, Y. (2024). Usability of ChatGPT in second language acquisition: capabilities, effectiveness, applications, challenges, and solutions. *Studies in Applied Linguistics and Tesol*, *24*(1). https://doi.org/10.52214/salt.v24i1.12864

Ling, G., Powers, D. E., & Adler, R. M. (2014). Do TOEFL iBT® scores reflect improvement in English-language proficiency? Extending the TOEFL iBT validity argument. *ETS Research Report Series*, 2014(1), 1–16. https://doi.org/10.1002/ets2.12007

Liu, G., Fathi, J., & Rahimi, M. (2024). Using digital gamification to improve language achievement, foreign language enjoyment, and ideal l2 self: a case of English as a foreign language learners. *Journal of Computer Assisted Learning*, *40*(4), 1347-1364. https://doi.org/10.1111/jcal.12954

Liu, J. (2024). Application of computer-aided technology in teaching spoken English. *Journal of Electrical Systems*, *20*(3s), 459-471. https://doi.org/10.52783/jes.1315

Liu, X., Liu, Y., & Tu, J. (2020). Multimedia technology and learner autonomy: an experimental study for asymmetric effects. *Symmetry*, *12*(3), 462. https://doi.org/10.3390/sym12030462

Luo, Y., Kong, X., & Ma, Y. (2022). Effects of multimedia assisted song integrated teaching on college students' English learning interests and learning outcomes. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.912789

Mahdi, D. (2022). Improving speaking and presentation skills through interactive multimedia environment for non-native speakers of English. *Sage Open*, *12*(1). https://doi.org/10.1177/21582440221079811

Manipol, L., Nasrullah, N., & Jumariati, J. (2024). Analysis of self efficacy and motivation as contributing factors in second language acquisition: a literature review. *Acitya Journal of Teaching & Education*, *6*(1), 1-18. https://doi.org/10.30650/ajte.v6i1.3702

Mitchell, R. (2021). Documenting l2 input and interaction during study abroad: approaches, instruments and challenges. *Second Language Research*, *39*(1), 59-83. https://doi.org/10.1177/02676583211030626

Molines, R. (2023). Multimedia technology integration in teaching junior high school English. *International Journal of Research Studies in Education*, *12*(7). https://doi.org/10.5861/ijrse.2023.33

Mukhtarkhanova, A., Ustelimova, N., Yessengaliyeva, A., Iliyassova, A., & Tanesh, B. (2023). The use of multimedia in English classes as a means of increasing student motivation. *World Journal of English Language*, *13*(9), 10. https://doi.org/10.5430/wjel.v13n9p10

Mynard, J. & Shelton-Strong, S. (2022). Self-determination theory: a proposed framework for self-access language learning. *Journal for the Psychology of Language Learning*, *4*(1), 1-14. https://doi.org/10.52598/jpll/4/1/5

Norhayati, N. & Utama, N. (2021). The effectiveness of multimedia application in teaching vocabularies for the children in rural area. *Journal of English Education Linguistics and Literature*, *1*(1), 17. https://doi.org/10.33654/enlit.v1i1.1322

Nowawi, N. & Ahmad, N. (2023). Malay language learning for kindergarten students through interactive web-based application. *International Journal of Academic Research in Progressive Education and Development*, *12*(2). https://doi.org/10.6007/ijarped/v12-i2/16831

Nurhidayah, R. (2020). The role of motivation in second language acquisition. *Jurnal Ilmiah Spectral*, 6(2), 96-104. https://doi.org/10.47255/spectral.v6i2.59

Nurjanah, A., Salsabila, I., Azzahra, A., Rahayu, R., & Marlina, N. (2024). Artificial intelligence (ai) usage in today's teaching and learning process: a review. *Syntax Idea*, *6*(3), 1517-1523. https://doi.org/10.46799/syntax-idea.v6i3.3126

Patkowski, M. (1980). The sensitive period for the acquisition of syntax in a second language. *Language Learning*, *30*(2), 449-468. https://doi.org/10.1111/j.1467-1770.1980.tb00328.x

Qassrawi, R., ElMashharawi, A., Itmeizeh, M., & Tamimi, M. (2024). Ai-powered applications for improving EFL students' speaking proficiency in higher education. *Forum for Linguistic Studies*, *6*(5), 535-549. https://doi.org/10.30564/fls.v6i5.6966

Robles, H., Burden, K., & Villalba, K. (2021). A socio-cultural approach to evaluating and designing reading comprehension apps for language learning. *International Journal of Mobile and Blended Learning*, *13*(1), 1-21. https://doi.org/10.4018/ijmbl.2021010102

Samat, M. & Aziz, A. (2020). Indigenous student's perception of multimedia learning as an approach for enhancing reading comprehension skills. *Open Journal of Science and Technology*, *3*(1), 8-16. https://doi.org/10.31580/ojst.v3i1.1358

Sari, L. (2020). Second/foreign language learning from the socio-psychological perspective and the implications in language classroom. *Proceedings of the International Conference on Science and Education and Technology (ISET 2019)*. https://doi.org/10.2991/assehr.k.200620.080

Song, B. and Xiong, D. (2023). A comparative study of the effects of social media and language learning apps on learners' vocabulary performance. *Asia Pacific Education Review*. https://doi.org/10.1007/s12564-023-09871-z

Sujatna, M., Astarina, A., & Heryono, H. (2024). Ai for language learning: friend or foe?. *Linguistic English Education and Art (Leea) Journal*, *7*(2), 456-467. https://doi.org/10.31539/leea.v7i2.9331

Sun, H. (2022). Application of the whole language teaching method in the teaching of English vocabulary based on the multimedia environment of the internet of things. *Frontiers in Educational Research*, *5*(4). https://doi.org/10.25236/fer.2022.050408

Syifa, A., Musyahda, L., & Segoh, D. (2024). Systematic literature review: DOGBL in enhancing EFL students' motivation. *Journal of Education and Learning (Edulearn)*, *18*(2), 544-552. https://doi.org/10.11591/edulearn.v18i2.21156

Tajik, A. (2025) Exploring the Role of AI-Driven Dynamic Writing Platforms in Improving EFL Learners' Writing Skills and Fostering Their Motivation, 09 January 2025, PREPRINT (Version 1) available at Research Square https://doi.org/10.21203/rs.3.rs-5788599/v1

Talmo, T., Einum, E., & Støckert, R. (2014). Bring your own device to language class – applying handheld devices in classroom learning. In Jager, Sake; Bradley, Linda; Meima, Estelle J.; Thouësny, Sylvie (Eds), *CALL Design: Principles and Practice - Proceedings of the 2014 EUROCALL Conference, Groningen, The Netherlands* (pp. 352-357). Research-publishing.net. https://doi.org/10.14705/rpnet.2014.000244

Vadivel, B., Shaban, A., Ahmed, Z., & Saravanan, B. (2023). Unlocking English proficiency: assessing the influence of ai-powered language learning apps on young learners' language acquisition. *International Journal of English Language Education and Literature Studies*, *2*(6), 55-62. https://doi.org/10.22161/ijeel.2.6.7

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senécal, C., & Vallières, E. F. (1992). The Academic Motivation Scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement, 52*(4), 1003–1017. https://doi.org/10.1177/0013164492052004025

Wagner, A., Gray, J., Corley, J., & Wolber, D. (2013). Using app inventor in a k-12 summer camp. *SIGCSE '13: Proceeding of the 44th ACM technical symposium on Computer science education*, 621-626. https://doi.org/10.1145/2445196.2445377

Wang, S. (2014). Application of informational technology in language teaching. *Applied Mechanics and Materials*, 513-517, 1955-1958. https://doi.org/10.4028/www.scientific.net/amm.513-517.1955

Wei, L. (2023). Artificial intelligence in language instruction: impact on English learning achievement, l2 motivation, and self-regulated learning. *Frontiers in Psychology*, 14:1261955. https://doi.org/10.3389/fpsyg.2023.1261955

Wijayati, P., Rizqiana, N., & Bukhori, H. (2023). Digital and information literacy skills as a base for university-level self-regulated learning. Premise *Journal of English Education*, *12*(2), 522-542. https://doi.org/10.24127/pj.v12i2.6543

Xia, R. & Haas, B. (2023). Investigating the role of bilingualism and gender on theory of mind using mouse-tracking and self-report. *International Journal of Bilingualism*, *29*(1), 3-16. https://doi.org/10.1177/13670069231208120

Yan, J. (2022). Application of hybrid teaching mode in college students' English reading using intelligent wireless communication multimedia. *Wireless Communications and Mobile Computing*, 2022, 1-12. https://doi.org/10.1155/2022/5828413

Yu, B. (2023). Self-regulated learning: a key factor in the effectiveness of online learning for second language learners. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.1051349

Yulian, R., Ruhama', U., & Utami, P. (2022). EFL slow learners' perception in speaking with authentic multimedia assisted language learning. *International Journal of Language Education*, *6*(2), 183-195. https://doi.org/10.26858/ijole.v6i2.21511

Zeng, X. & Zheng, T. (2015). Second language acquisition in the target language environment based on the theory of affordances. In *Proceedings of the 2015 International Conference on Education Reform and Modern Management*. https://doi.org/10.2991/ermm-15.2015.62

Zhang, Y. (2022). Development and application of artificial intelligence multimedia technology based on big data. *Mobile Information Systems*, 2022, 1-10. https://doi.org/10.1155/2022/2073091

Zolkapli, R., Kenali, S., Hadi, N., Basiron, M., Iqbal, M., Latif, M., … & Rahmat, N. (2023). Exploring motivation and demotivation factors for learning communication skills. *International Journal of Academic Research in Business and Social Sciences*, *13*(7), 1434-1453. https://doi.org/10.6007/ijarbss/v13-i7/17871

Вовчаста, Н., Lozynska, L., Pershukova, O., Presner, R., Podolyak, Z., & Kruhlenko, L. (2021). ICT in the study of foreign languages by students of technical specialties. *Laplage Em Revista*, *7*(Extra-E), 99-112. https://doi.org/10.24115/s2446-622020217extra-e1166p.99-112.