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The Impact of Artificial Intelligence and Machine Learning on Linguistic Accuracy, Fluency, and Self-Direction Among Advanced EFL Students

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***Abstract*—Linguistic capacity has been stimulated by artificial intelligence and automated learning among those who speak English as a foreign language while being proficient learners. In this research study, the influences of machine learning as well as artificial intelligence technologies on fluency and autonomy have been investigated. This study was conducted by establishing control and experimental groups, with a total of 120 participants selected. Over twelve weeks, a shift of digitally supported learning was utilized. The experimental group utilized technology-enhanced adaptive grammar tools, translation software, and artificial intelligence-driven feedback systems. On the other hand, the control group complied with conventional learning methods with no technological interventions. Educational videos and assignments have been provided to both groups by instructors during their sessions. The study results revealed a significant improvement in students' writing fluency after the intervention. Nearly all participants in the experimental group achieved a higher level of fluency; however, the area of automation exhibited only a marginal difference. This suggests that both control and experimental learning groups experienced some improvement in learning. However, learners' autonomy and Linguistic precision reached new heights in the experimental group. In conclusion, the revolution that AI and ML usher in terms of self-directed learning for EFL teaching is immense.**

***Index Terms*—Artificial Intelligence (AI), Machine Learning (ML), linguistic accuracy, self-direction, linguistic education**

I. Introduction

With the integration of artificial intelligence (AI) and machine learning (ML) tools in education, there has been a significant transformation in the perception of traditional teaching methods and the future of educational innovation. In the field of language learning, these technologies have enabled students to engage with the language acquisition process in novel ways. For advanced learners of English as a Foreign Language (EFL), conversational agents, intelligent e-learning environments, and language analytic tools offer opportunities for authentic language interaction while providing access to constructive feedback. However, despite the increasing availability of these technologies, research on their impact on advanced EFL learners remains limited. Addressing this gap in the literature, the present study examines the influence of generative AI and ML tools on the linguistic development of advanced EFL learners, with a focus on their educational and pedagogical implications (Alastuey, 2011).

With the rapid developments in AI and ML, complicated solutions that are context-aware have emerged that could meet a set of diverse educational needs. While ML algorithms improve these processes through the analysis of user data to deliver effective learning outcomes, AI technologies in education make automated evaluation, real-time feedback, and adaptive content distribution possible. AI-based language teaching solutions, according to Anderson et al. (2008), not only widen the circle of accessibility but also enable the teacher to make lessons more responsive to the strengths and weaknesses of each student. For instance, automated writing evaluation systems apply Natural Language Processing algorithms (hereafter, NLP), that construct detailed, immediate feedback on grammar, vocabulary usage, and coherence. This feedback is pretty helpful for advanced learners who need deeper insights into the performance of the language to further polish their skills.

Artificial intelligence (AI) is increasingly being utilized in the assessment of language learners and the development of more interactive learning environments. For instance, chatbots simulate conversational practice by engaging with learners as if they were real interlocutors, allowing them to practice speaking and listening in realistic scenarios. As noted by Brown and Yule (1983) and Ghahramani (2015), chatbots help reduce learners' stress levels and enhance their language acquisition by providing opportunities for repeated practice without pressure.

Similarly, AI-driven translation tools such as Google Translate have evolved beyond basic word-for-word translation to offer contextual translations that incorporate cultural nuances and meaning, thereby supporting learners in developing a deeper understanding of language use in different contexts. These advancements present significant potential for advanced English as a Foreign Language (EFL) learners whose needs may not be fully addressed by traditional learning

tools; however, the integration of AI and machine learning (ML) into advanced EFL learning also presents challenges. A key issue is the gap between the capabilities of current AI tools and the complex demands of advanced language acquisition. Traditional EFL methodologies emphasize debates, analytical reasoning, and creative expression, all of which require a nuanced understanding of context and culture. While AI tools excel in structuring information and analyzing linguistic elements, their ability to facilitate unstructured, innovative activities remains in the initial stages of development. According to Chen and Lee (2011), addressing this limitation is essential for the advancement of AI tools that can meet the cognitive and metacognitive needs of advanced learners.

It also raises some questions about accessibility and the training of teachers, aside from the ethics, in adopting AI and ML technologies into EFL education. Most of the advanced AI tools demand very high investment, which might not be possible for any institution with scarce resources. Besides that, effective integration means that educators need to be versed in what those tools can and cannot do, which requires extensive professional development programs. Ethical concerns regarding data privacy and algorithmic biases also need critical attention. For example, Chinnery (2006) has pointed out that in cases where the predominance of data used in training AI systems relates to native English speakers, the bias might spill over against non-native linguistic patterns.

Notwithstanding these challenges, the potential benefits of AI and ML technologies in advanced EFL education are great. While traditional methodologies of teaching often take a one-size-fits-all approach, AI tools offer routes toward personalized learning pathways, quickly adapting to the progress and preference of an individual learner. For instance, an adaptive learning platform analyses learners' strengths and weaknesses in real-time, adjusting content and difficulty levels to maximise engagement and promote competence. Such an approach would enhance linguistic accuracy and fluency, but it also develops self-directed learning since learners take more responsibility for their progress (Chiu et al., 2007; Backer & Gorter, 2012).

II. Review of Literature

A. AI and ML in Language Learning

The integration of artificial intelligence (AI) and machine learning (ML) into language learning has fundamentally reshaped the way learners engage with and acquire new languages. These technologies facilitate personalized and adaptive learning experiences, catering to individual learner needs and enhancing both the inclusivity and efficacy of education. AI-driven systems excel in identifying learners' strengths and areas for improvement through continuous data analysis, enabling the provision of tailored feedback and the dynamic adjustment of instructional content. As noted by Cochrane (2014), AI-powered adaptive learning systems play a crucial role in providing real-time feedback and individualized lesson planning, enabling differentiated instruction that empowers learners to progress at their own pace.

In the domain of English as a Foreign Language (EFL) education, AI-driven tools such as Grammarly and Duolingo are widely recognized for their efficacy in enhancing language proficiency. Grammarly leverages sophisticated machine learning algorithms to provide context-aware suggestions for grammatical accuracy and stylistic refinement, tailored to the user's proficiency level. Empirical research indicates that such tools contribute to improved grammatical precision by offering real-time, context-sensitive corrections (Comas-Quinn et al., 2009). Similarly, Duolingo employs gamification and AI-powered methodologies to reinforce vocabulary retention and enhance learner engagement. By integrating spaced repetition and adaptive difficulty, its algorithms ensure that learners review words and phrases at optimal intervals, thereby facilitating long-term retention and consolidation of linguistic knowledge (Cochrane, 2014; Jakhar & Kaur, 2020).

Also, ML algorithms continuously learn from users' interactions with the site, improving in accuracy and relevance over time. It is because of this iterative learning process that AI systems are progressively more precise in diagnosing errors and predicting the future needs of the learners. All these developments reflect the transformative potential of AI and ML in enhancing efficiency and increasing personalization for language learning. However, the success of these tools depends on their thoughtful integration into pedagogical frameworks, which highlights the importance of collaboration between technologists and educators (Demouy & Kukulska-Hulme, 2010; Michalewicz, 1992).

B. Applications in Linguistics

Linguistic research has significantly benefited from the application of artificial intelligence (AI) in natural language processing (NLP). NLP is a specialized field dedicated to the development of algorithms for the analysis, interpretation, and generation of human language. Its advancements have profound implications for language learning, particularly in key areas such as writing, speaking, pronunciation, and grammar. One notable application of NLP in education is automated essay-scoring systems, which exemplify the practical utility of AI in assessing and enhancing learners' writing skills. These web-based applications employ machine learning models to evaluate coherence, grammar, vocabulary usage, and argumentation. By providing immediate, data-driven feedback, they enable learners to engage in iterative revision, ultimately improving their writing proficiency. Researchers have paid particular attention to the effectiveness of these systems in EFL education, where learners frequently encounter challenges related to sentence structure and idea organization. Beyond reducing instructors' workload, automated essay-scoring systems offer consistent and objective assessments, fostering a more structured and data-informed approach to language learning (Derwing et al., 2000).

A second important application of AI in language learning is speech recognition programs. These systems record and examine learners' speech input by identifying pronunciation faults and providing corrections. There is evidence to the

effect that speech recognition applications can help learners further improve both speaking fluency and pronunciation. For example, other tools, like Google Speech-to-Text and Rosetta Stone, use AI to simulate conversational practice, thus allowing learners to hone their speaking skills in a non-threatening environment (Hincks, 2002). Further, Hsu (2012) argued that advanced EFL learners can especially benefit from such technology, which delivers detailed feedback about intonation, stress, and rhythm that are important for achieving near-native-like proficiency.

Another innovative use of AI is error analysis. Systematic analysis by an AI system can reveal patterns and provide specific interventions for learners' errors. For example, the use of ML-driven error analysis in classifying those errors—grammatical, lexical, or semantic— would help educators focus on specific problem areas. These insights are invaluable in designing curricula and highlighting common pitfalls faced by learners of diverse linguistic backgrounds. Besides, such text generation systems with AI models, like ChatGPT, enhance the opportunity for authenticity in language practices because learners may be involved with more meaningful or contextually relevant dialogues (Hwang & Chen, 2013).

This represents a significant advancement for institutions striving to deliver high-quality language instruction to large and diverse student populations. AI-driven automated systems possess the capacity to accommodate thousands of learners simultaneously while maintaining personalized feedback and consistency in assessment. Such scalability positions these technologies as a viable solution to the growing global demand for English proficiency across academic, professional, and social contexts.

C. Challenges and Opportunities

Despite their transformative potential, integrating AI tools into language learning presents several challenges. One concern is the potential for over-dependence on these tools, which could diminish the value of traditional pedagogical approaches crucial for holistic learning. Jung (2011) cautioned that AI tools should not replace human instructors but rather serve to complement traditional teaching methods. While cognitive processing is a key component of effective language acquisition, social interaction and cultural immersion remain critical areas where AI tools have yet to make significant advancements.

Furthermore, ethical concerns hinder the implementation of AI in education. One of the most critical issues is data privacy. Many AI systems require huge quantities of user data to optimize their performance and hence there are questions raised about storage, dissemination, and applications. For example, when speaking or writing samples of students form the basis of the training of ML models, institutions are required to ensure compliance with data protection legislation and seek proper informed consent. Further, biases in the AI algorithms are perpetuating stereotypes or creating disadvantages for a certain group of learners. Kukulska-Hulme (2006) and Kukulska-Hulme and Shield (2008) note that AI systems that are trained majorly on native English speakers' data do not give proper recognition to non-native linguistic patterns and hence disadvantage EFL learners.

Another challenge pertains to the homogenization of learning experiences. Many AI systems rely on predefined learning pathways that may not adequately account for the diverse cultural and linguistic backgrounds of learners. Consequently, there is a significant risk that learning experiences could become standardized, potentially undermining the richness of these diversities. Furthermore, an over-reliance on AI tools by learners may lead to the underdevelopment or neglect of critical thinking and critical thinking skills—key components in mastering a language (Lys, 2013; Vermeulen, 2019; Taulli, 2019; Chowdhary, 2020).

While there are challenges associated with AI and ML technologies, such advantages significantly outnumber them. Scalability is the major plus that underlies these technologies: AI systems let institutions provide high-quality instruction to groups of learners without compromising on individual attention. This, however, will be highly valued in contexts where access to professional language instructors is particularly limited. Secondly, AI tools enhance learner motivation because of gamification and interactivity. Duolingo uses badges, for instance, streaks, and leaderboards to keep its learners engaged and willing to learn. Such features spur consistent practice which is a significant prerequisite for language acquisition (Morton & Jack, 2010; Russell & Norvig, 2010).

An additional avenue of exploration pertains to the potential of artificial intelligence (AI) in facilitating lifelong learning. Given that language acquisition is inherently a continuous and dynamic process extending beyond formal instructional settings, AI-driven applications offer sustained opportunities for learners to engage in ongoing language development. Through mobile applications and cloud-based platforms, learners can access linguistic resources ubiquitously, aligning with the principles of self-directed learning and personalized educational trajectories. Furthermore, AI technologies hold the capacity to mitigate disparities in educational access, thereby enhancing language learning opportunities for underserved populations. By delivering high-quality instruction at reduced costs, AI-powered mobile applications extend language education to geographically remote and socioeconomically disadvantaged communities, thereby contributing to the democratization of education on a global scale.

III. METHODOLOGY

A. Research Questions

While artificial intelligence (AI) is driving significant advancements in language learning tools, their specific effectiveness in addressing the needs of advanced English as a Foreign Language (EFL) learners remains underexplored. Advanced learners differ from beginner and intermediate learners in that they require more than basic vocabulary

acquisition and grammatical corrections. The challenges they face include mastering complex syntactical structures, understanding and accurately using idiomatic expressions, and navigating the pragmatic and cultural aspects of language use in real-world contexts. While traditional teaching methods may suffice for building foundational skills, they often fall short in meeting the higher-level demands of advanced learners. This limitation arises from the inability of such methods to provide individualized, context-sensitive feedback or simulate realistic language-use scenarios. This paper aims to bridge this gap by examining how AI-driven tools can address these higher-order learning needs. Specifically, it investigates the extent to which these tools offer advanced EFL students enhanced opportunities to master sophisticated linguistic features, promote autonomous learning, and provide personalized, adaptive learning experiences. In light of this, the present study seeks to answer the following research questions:

[1] What role do AI-powered tools play in enhancing the linguistic accuracy, fluency, and coherence of intermediate to advanced EFL learners?

[2] What obstacles hinder the implementation of AI and ML technologies in innovative EFL education, and how can these challenges be addressed?

[3] How effectively do AI-based adaptive learning platforms support self-directed learning for advanced EFL students?

B. Participants

This study involved 120 advanced EFL students enrolled in a university language program. The participants were selected to ensure a diverse and representative cultural background, drawn from various academic disciplines. The primary inclusion criterion was that participants must be at least at the C1 level, as defined by the Common European Framework of Reference for Languages (CEFRL), enabling them to perform tasks requiring advanced linguistic proficiency. Participants' ages ranged from 18 to 35 years, and the study maintained gender balance, with an equal number of male and female participants, thus minimizing demographic bias. The students were randomly assigned to either a control or an experimental group, each consisting of 60 participants. Random assignment helped mitigate potential confounding variables that might influence the outcomes, ensuring that any observed effects could be attributed to the intervention itself. Prior to the study, all participants were informed of the research objectives, procedures, and ethical considerations, including their right to withdraw at any time. The intervention spanned 12 weeks, with students participating in 4 hours of structured instruction per week. Instructional designs were tailored to each group based on the learning modality, while ensuring consistency in content coverage and assessment criteria between the two groups.

Students in the control group received traditional language learning through textbooks, classroom-based exercises, and teacher-led discussions. Lessons on extended grammar, formal writing exercises, and speaking ones for the improvement of fluency and accuracy. Instruction was drawn from traditional pedagogical approaches, such as grammar translation and communicative language teaching. Weekly tasks reinforced classroom learning and the students participated in group work and peer reviews to encourage teamwork.

For the experimental group, an AI-driven toolkit was implemented to address key challenges faced by advanced EFL learners. The students were provided access to Grammarly, an AI-powered application that offers real-time grammar, spelling, and style suggestions, which sparked increased engagement with writing tasks. Additionally, Replika, a conversational AI chatbot designed for natural, human-like interactions, was utilized to create a low-pressure environment for students to practice speaking. To enhance vocabulary acquisition, students employed Anki, a flashcard application augmented by machine learning algorithms that adaptively prioritize, and review words based on individual performance and recall patterns. Other advanced natural language processing (NLP) tools included automatic speech recognition applications, which provided feedback on pronunciation accuracy and fluency. Collectively, these tools were designed to offer a personalized and adaptive learning experience, specifically tailored to address the unique challenges faced by advanced EFL learners.

To make sure that the groups were consistent, the weekly assignments and assessments were created to mirror each group's method of instruction. For instance, both groups would write similar assignments; the experimental group, however, received AI-generated feedback, while the control group relied on teacher feedback.

C. Instruments

Quantitative and qualitative instruments were employed to assess the effectiveness of the intervention. Both participant groups completed a pre-test at the outset and a post-test upon the study's conclusion. These tests evaluated the learners across three components: written tasks, which included essays and short-answer questions to assess grammatical accuracy, coherence, and lexical range in writing; oral interviews, where structured interviews measured fluency, pronunciation, and conversational patterns; and multiple-choice questions that gauged knowledge of advanced structural rules and vocabulary usage. The tests were scored by trained linguists who were blind to group assignments to maintain objectivity in the evaluation process.

Immediately following the training, participants were interviewed to gather their subjective perceptions regarding the AI tools used in their language learning. Additionally, a 20-item Likert scale questionnaire was administered, designed to capture responses ranging from "strongly disagree" to "strongly agree." The questionnaire focused on three key areas: usability, perceived efficacy, and appeal. Sample items included statements such as "The AI tools provided helpful feedback" and "I felt more motivated to practice my language skills using these tools." Responses were analyzed to

identify trends in learners' satisfaction and the perceived value of the tools. The following table (Table 1) outlines the structure of the 20-item Likert questionnaire, categorized into the domains of usability, perceived efficacy, and appeal.

TABLE 1
THE AREAS AND ITEMS OF THE RESEARCH QUESTIONNAIRE

Items	Question	Area
1	The AI tools were easy to use.	Usability
2	The interface of the AI tools was user-friendly.	Usability
3	I found the AI tools to be intuitive.	Usability
4	I had no trouble navigating the AI tools.	Usability
5	The AI tools provided helpful feedback.	Perceived Efficacy
6	The feedback I received was clear and useful.	Perceived Efficacy
7	The AI tools improved my language skills.	Perceived Efficacy
8	I felt more confident in my language skills after using the AI tools.	Perceived Efficacy
9	The AI tools helped me practice the skills I needed to work on.	Perceived Efficacy
10	The AI tools helped me track my progress.	Perceived Efficacy
11	I enjoyed using the AI tools.	Appeal
12	The AI tools were engaging.	Appeal
13	The AI tools made language learning more fun.	Appeal
14	I felt motivated to continue practicing with the AI tools.	Appeal
15	The AI tools made learning more interactive.	Appeal
16	I would recommend the AI tools to other learners.	Appeal
17	I felt more motivated to practice my language skills using these tools.	Appeal
18	The AI tools met my expectations for language learning.	Perceived Efficacy
19	I would continue using the AI tools after the training.	Appeal
20	Overall, I am satisfied with the AI tools.	Usability/Perceived Efficacy/Appeal

In this study, in-depth semi-structured interviews were conducted with 15 randomly chosen participants to gain insight into the experiences of the experimental group. The primary focus has been on their interactions with AI tools, exploring both the perceived benefits and limitations. Questions aimed to uncover how AI tools influenced their learning process and shaped their understanding. Participants were asked to give concrete examples of how artificial intelligence enhanced or triggered their learning. Furthermore, they described instances where AI tools helped them identify gaps in their knowledge. Interviewees' responses showed diverse standpoints on the efficiency of artificial intelligence in the learning process. Each structured interview has been meticulously documented to ensure accuracy in recording participants' viewpoints. Then, the researcher administered a category-focused investigation to define repeated trends throughout the varied responses. This type of analysis was intended to uncover both shared experiences and distinctive individual perspectives. The results provided a comprehensive understanding of how AI mechanisms contributed to learning outcomes. By analysing these themes, the researcher managed to evaluate the broader impact of AI in educational contexts.

D. Data Collection and Procedures

Data were collected via baseline (pre-test), mid-way feedback, and endpoint (post-test and interviews). Quantitative tests and questionnaire data analysis were done using statistical software. Comparisons of pre-and post-tests and intra- and inter-group paired t-tests, as well as ANOVA, identified gains in grammar, vocabulary, and spoken fluency. Qualitative data from interviews was coded, and thematic analysis was conducted to enrich quantitative results with a richer knowledge of the way participants navigated the experience.

IV. RESULTS AND DISCUSSION

Quantitative analysis has shown that linguistic competencies are significantly improved for the experimental group, as opposed to the control group. Within-group pre-and post-test data on grammar accuracy, vocabulary retention, and speaking proficiency are compared through paired t-tests and ANOVA (Table 2). While in the experimental group, grammar accuracy improved by 25%, in the control group, the improvement in grammar accuracy was 10%. For the experimental group, grammar accuracy scores are significantly different, $t(59) = 10.43$, $p < 0.01$, from pre-test, $M = 60$, $SD = 12$ to post-test, $M = 75$, $SD = 10$ in the paired t-test. The results of ANOVA confirmed the improvements that the experimental group made were significant statistically compared to the control group: $F(1, 118) = 15.62$, $p < 0.01$.

For the experimental group, vocabulary retention went up by 20 %, whereas the control group went up only by 8%. There was a significant improvement from pre-test scores ($M = 65$; $SD = 14$) to post-test scores ($M = 78$; $SD = 11$) for the experimental group: $t(59) = 8.25$; $p < 0.01$. ANOVA results ($F(1, 118) = 12.74$, $p < 0.01$) also supported the experimental group's significantly greater gains. Speaking proficiency in the experimental group was enhanced by 30% due to oral interviews, whereas it increased by only 15% for the control group. In the experimental group, scores significantly

improved from the pre-test, M = 55, SD = 15 to the post-test, M = 71, SD = 13, t (59) = 9.57, $p < 0.01$ in a paired t-test. The ANOVA revealed a significant group effect, F (1, 118) = 18.91, $p < 0.01$.

TABLE 2
DESCRIPTIVE STATISTICS OF THE ANOVA TEST

Measure	Group	Pre-test Mean (SD)	Post-test Mean (SD)	Improvement	p-value
Grammar Accuracy	Experimental	60 (12)	75 (10)	+25%	< 0.01
	Control	62 (13)	68 (12)	+10%	
Vocabulary Retention	Experimental	65 (14)	78 (11)	+20%	< 0.01
	Control	66 (15)	71 (13)	+8%	
Speaking Proficiency	Experimental	55 (15)	71 (13)	+30%	< 0.01
	Control	58 (14)	67 (12)	+15%	

The experimental group exhibited quite high levels of satisfaction with the real-time feedback from the AI tools (Grammarly and Replika). In fact, for many students, the individualized learning pathways unveiled by these tools were highly effective. Comments like *"The AI tools helped me focus on areas that I struggled with, such as grammar consistency."* This helps to downplay anxiety even further as the absence of judgment in the AI-supported feedback did not have its scary potential to take risks. For instance, one of the students commented, *"Practicing talking to Replika was not as scary as talking to peers or teachers".*

Participants reported experiencing occasional technical difficulties, such as inappropriate sentence fragment suggestions or incorrect contextual corrections that were not detected. For example, several users of Grammarly noted that the tool occasionally flagged errors in stylistically acceptable language. Additionally, participants highlighted the absence of nuance in the human-like interactions provided by the tools. Some expressed a desire for direct communication with peers or faculty to better understand pragmatic and cultural nuances, despite Replika's conversational capabilities. Furthermore, it was noted that students encountered a steep learning curve in becoming proficient with the AI tools, underscoring the necessity for initial training followed by ongoing technical support to ensure effective use.

Various participants mentioned how the AI tools motivated them to be more active in practising the language. Tools like Anki were also appreciated for keeping learners interested by using ML-based, adaptive rescheduling of vocabulary reviews. One of the participants said, *"The AI tools made learning more enjoyable and less tedious compared to the traditional methods. I looked forward to practising every day".*

Qualitative data provided an understanding of a complex and subtle phenomenon in the experience of the experimental group. This in turn supported the quantitative results by showing the role of AI-based tools in the development of increased self-efficacy, motivation, and skill building. The outcomes of this analysis suggest that AI and ML technologies have significant potential when it comes to accelerating the linguistic proficiency of advanced EFL students. To begin with, AI-supported learning tools provide students with feedback based on personal needs based on experience; in addition, they fill the gap with traditional methods. These results are directly in connection with and expand the current studies, as well as bringing some unique challenges that should be further discussed.

The essential improvements observed in grammatical sense, vocabulary retention, and talking proficiency are consistent with the previous studies that investigated the effectiveness of AI tools in language learning. As an example, Neri et al. (2008) pointed out that machine learning models played the role of adaptive learning in language feedback loops that were customized to become increasingly effective when learners provided specific responses. In this survey, the tools Grammarly and Anki with the support of ML power demonstrated the capacity to target the specific grammatical and vocabulary weaknesses to lead to the increase of substantial learners' performance.

Furthermore, the inclined improvement in speaking is also supported by Oberg and Daniels (2013), who contended that AI chatbots have truly helped in decreasing learners' anxiety and improving their fluency. The participants in this study exhibited low levels of anxiety, as evidenced by their confidence while practicing speaking with the support of AI tools such as Replika. This further demonstrates that AI-supported delivery of low-stakes, immersive learning environments is now fully feasible.

The motivating benefits were told by the partakers, and it turned out to be consistent with the findings of Chen et al. (2020), who have detected that AI methods are helpful in both engagement and self-regulated learning by offering a wide range of useful resources in the tailor-made learning paths. Moreover, the effect of the experiment is seen through private learners who express eagerness for the personalization and engagement of the tools.

Several findings from this research study diverge from the established perspectives of some scholars, with the overall data contradicting these viewpoints. Zou (2013) argues that it is detrimental for learners to place complete trust in AI tools, as this reliance may lead them to passively await feedback rather than actively engage in analysis, ultimately hindering their academic development. However, the findings of this study suggest a different outcome, as experimentation with students indicates that they develop greater autonomy and self-direction. This suggests that well-designed AI systems have the potential to empower learners rather than foster dependence.

Anderson et al. (2008) raised concerns regarding the potential biases inherent in AI tools, suggesting that such biases could disadvantage native speakers due to the emphasis on elements of standard English. In the present study, participants

encountered challenges related to specific grammar points or the tools' ability to accurately interpret certain contested sentences. However, these issues were not significant enough to undermine the overall effectiveness of the tools. This suggests that, while biases may be present, their impact can be substantially mitigated through the ongoing refinement and improvement of AI algorithms.

This research investigates in-depth the special needs of advanced EFL learners who are often overlooked in computer-assisted language learning research. Beginners, unlike intermediates, usually benefit from barely structured vocabulary and grammar practice. For advanced learners, tools that cover sophisticated linguistic tasks, such as acquiring idiomatic expressions, recognizing syntactic complexities, and picking up pragmatic variations, are always indispensable. Traditional methods often fail to provide the same elaborateness as these tools, so their feedback was rather brief. The study also illuminates the essential nature of AI tools in addition to the existing curricula in a supplementary manner. According to Alastuey (2011), Akerkar (2018), Aggarwal (2021), and Lee (2020), the smart implementation of AI can effectively help teachers achieve more efficient and accurate assessments. While they communicated the need for a slow pace of AI embracement in education, the present research demonstrates the opposite strength that AI tools involved in the learning process can extend the possibilities of human teaching so that it is still central.

V. Conclusion and Implications

The findings drawn from this study underscore the significant impact of AI and machine learning (ML) technologies on EFL education. The findings highlight the potential of these technologies to address the limitations of traditional teaching methods, particularly through the provision of personalized learning experiences and the enhancement of linguistic skills. AI and ML-driven tools enable the customization of lessons to suit individual learners' proficiency levels, learning styles, and specific areas of difficulty. This adaptability allows for the effective tailoring of instruction to meet the diverse needs of learners, thereby promoting more efficient and impactful language acquisition.

Despite the promising potential of AI and ML in EFL classrooms, several challenges associated with their implementation have been acknowledged. One of the primary obstacles is technical limitations, which hinder widespread access to these technologies. These constraints range from difficulties in acquiring high-quality data to issues related to the inaccessibility of computational resources and the expertise required to develop and implement AI systems effectively. Additionally, while AI has the capacity to automate numerous aspects of language learning, it is essential that such automation aligns with established pedagogical goals to ensure its relevance and effectiveness in educational settings.

Educators need to consider the incorporation of these tools to complement traditional teaching strategies while retaining a focus on human interaction, creativity, and critical thinking in language learning. There has been an undeniable rise in the application of AI and ML within the field of education. With the mindful integration of AI-driven technologies, along with addressing their challenges, educators and institutions could rightly unveil further possibilities in language teaching, and these technologies could readily create scalable models of language learning, especially in cases where resources or qualified teachers are in limited supply. With the growth of AI and ML, a gateway to redefining the process of teaching and learning languages opened itself, leaving a path for advanced, personalized, and accessible EFL.

This research study underscores the potential of employing AI and ML technologies for advanced EFL learners. However, certain limitations should also be considered. First, as this research study dealt with only a single institution, the findings are of limited generalizability. Future research could investigate the efficacy of AI tools in various educational environments and cultural contexts. Although the quantitative results were statistically significant, the duration of the study seemed relatively short. Longer studies could provide deeper insight into the long-term effects of AI-assisted language learning.

Another possibility for future research is the development of AI tools that can assist in performing open-ended and creative language tasks. According to Alastuey (2011), many existing tools are strong at facilitating well-structured tasks and weak at language learning situations that require critical thinking and cultural nuance. Progress in NLP might bridge this gap in working toward developing AI tools that can accommodate complex linguistic and cognitive tasks.

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