AI-based EFL writing and feedback: A study of effects and efficacy at the Saudi tertiary level

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Abstract—Research and practice have established the benefits of the language classroom. In the same direction, this study dealt with the effects of AI on Saudi higher education learners' writing skills. The tools used here were Grammarly and ChatGPT and the language skill under the lens was writing. The study approach was quasi-experimental with a pre-post-test design. The study sample comprised 70 EFL learners divided into three groups according to language proficiency at Majmaah University, Saudi Arabia. Writing tasks aligning with the prevalent syllabus were assigned to gather data at the initial and closing phases of the study with prior training in the use of Grammarly and ChatGPT in classroom sessions. Results showed a significant difference between the pre-test and posttest scores, as the group means rose from 9.90 to 23 respectively. Paired t-test supported the finding at 44.71 and $p<0.01$ indicative of statistically significant improvement in performance, suggesting the efficacy of digital tools to boost EFL writing in the Saudi context.

Index Terms—Artificial Intelligence (AI), EFL Writing Skills, Saudi Arabia, University Students, Grammarly, ChatGPT

I. INTRODUCTION

English language proficiency is desirable for academic, professional, and personal success in the shrinking contemporary world. Stakeholders in educational institutions target the enhancement of global language skills, geared towards optimal communicative proficiency. However, writing takes a back seat, as it is a complex amalgamation of the other three skills and is the last to be introduced in EFL classrooms. In academic settings, strong writing abilities are essential for communicating concepts, optimizing resource use, and synthesizing knowledge, all of which enhance critical thinking. However, the acquisition and improvement of writing skills can be challenging for EFL learners.

Asadi et al. (2025) stated that the use of artificial intelligence (hereafter AI) in education has revolutionized teaching of EFL. Traditional classroom approaches, which often rely on teacher-centered instruction and memorization, may not sufficiently address these challenges, leaving students unprepared for the demands of academic and professional writing. This is true for EFL learners in Saudi Arabia, who often struggle due to lack of exposure to the language, cultural disparities, and practice opportunities in real-world settings (Aljabr & Al-Ahdal, 2024). Inherently, AI tools cater to individual learning needs by guiding learners through the learning process (Zhai & Ma, 2023). Shadiev and Yang (2020) add that with technology in the center, practice of the learnt content, feedback, and handling of errors are adequately supported by AI. AI tools work on prompts and with the ability to analyze learning and needs deeply they help scaffold the Saudi EFL learners (Al-Ahdal & Hussein, 2020). The immediacy of feedback helps make changes in grammar or vocabulary and sparks self-evaluation in students, encouraging them to look for better words and structures, all the while revising their drafts. This keeps them engaged with the task while also experimenting with different options for improvement with the support of AI tools or the teacher. Ultimately, by granting users greater control over revisions, these platforms encourage the autonomy and confidence needed to produce accurate, polished texts in English.

Assessments of grammar, syntax, vocabulary, are instant in AI tools, and writing output quality is enhanced with the coherence and cohesion that the tools provide to the body of the output (Raheem et al., 2023). Built on machine-learning algorithms and natural language processing research, AI gives person-specific guidance and takes the user one step at a time to help improve the output at one's own pace. Moreover, anxiety which is natural in a conventional classroom where the teacher overtly gives the feedback, is absent in AI assisted classrooms as each learner is on his/ her own with a personal learning assistant tuned to their exclusive needs. Learning quality is certainly better in this case. Beyond assisting with tasks, many AI platforms provide plagiarism checks, inculcating sensitivity to ethical issues in the learners. Aligned with traditional methods, a healthy confluence of man and machine can greatly benefit the learners as they will reap the benefits of autonomy alongside scaffolding.

The contemporary Saudi socio-economic sphere is guided by Vision 2030 plan which emphasizes synergy of education and technology, making the education sector more international than ever. As the system pushes for stronger English proficiency of Saudi students, it is natural for attention to be diverted to the role of AI (Al-Jarf, 2005). Nonetheless, because learners' cultural habits, prior experiences, and institutional norms shape how and whether they benefit from bot-driven guidance, questions remain about the actual impact of these technologies within Saudi classrooms. The current research examines these challenges in the EFL writing classroom while also probing the practical barriers and motivational levers that emerge along the way.

A. Problem Statement

Saudi university EFL students routinely report serious difficulties with writing with reasons ranging from cultural norms to limited everyday contact with the language (Jamshed et al., 2024). Classrooms across Saudi Arabia still devote maximum time to reading and listening, projecting writing as a minor concern. In addition, teacher-centered methods highlight memorization causing many Saudi university graduates to lag behind in writing which impacts their ability to compete in the globalized labor market and pursue higher education opportunities abroad (Al-Seghayer, 2014).

Raheem et al. (2023) claimed that integrating AI applications into EFL instruction offers a solution to these problems. Real-time feedback on vocabulary, grammar, coherence, and style is provided by AI technologies such as Grammarly, ChatGPT, and other language learning applications. As a result, learners can correct the mistakes on their own. Additionally, by meeting each student's unique needs and enabling them to practice writing at their own pace and offering valuable writing suggestions, these tools provide personalized learning experiences that cater to individual learning styles (Jafari & Yazdi, 2024; Kanchon et al., 2024). However, there is limited empirical evidence on how far AI applications might improve EFL writing skills in a Saudi context. Cultural and educational factors, such as students' familiarity with technology, their desire to utilize AI tools, and the extent to which these technologies align with the Saudi curriculum, may also have an impact. Effective use of AI in the prevalent classrooms is the need of the hour but not seen much in practice. This study aims to fill these gaps by examining how AI applications support Saudi university students in developing their EFL writing skills and identifying the factors that either enhance or hinder their effectiveness in this context. The study answers the following research questions:

1. Which EFL writing aids do Saudi second-year university students need?
2. How can the use of AI applications like ChatGPT and Grammarly improve the EFL writing skills of Saudi second-year university students?

B. Significance of the study

This study adds to the available literature in EFL by its treatment of the writing needs and performance of learners in the Saudi paradigm. New developments in EdTech have highlighted the need for their continuous evaluation in classroom dynamics if they are to be gainfully integrated into the pedagogy. By exploring the relationship between AI tools and writing skill

development, the study also contributes to theories of personalized learning, feedback, and learner autonomy, which are central to modern educational practices.

II. LITERATURE REVIEW

Exploration of education technology in higher education settings has attracted much scholarly attention. While their integration began with some amount of skepticism, recent studies indicate potential that is worthy of exploration (Zou et al., 2023). Certain features that are inbuilt in AI tools such as immediacy of feedback, one-to-one assistance and hand-holding leading to anxiety free learning, mandate application (Li et al., 2015). AI tools are no less assistants to teachers than they are to learners as they perform some of the teachers' functions with the additional feature of speed (Donmez, 2024), adding to scaffolding, autonomy, and richer learning experiences (Elola & Oskoz, 2017; Lee, 2017; Alkodimi & Al-Ahdal, 2025). With so much happening in AI research in the EFL classroom, educational implications need to be examined in writing skill as it is one of the last and most challenging of all the four language skills introduced to EFL learners. Alrasheedi (2024) noted that the integration of AI has greatly metamorphosed the traditional approach to learning wherein there was no scope for individual variations. Advanced technologies assess classwork and examine the results, thus providing personalized content matched to each student's strengths and weaknesses.

Moreover, AI tools can assist teachers with charting learner performance and identifying their weak spots. In a nutshell, AI makes learning process simpler for students to study and for teachers to instruct. AI-assisted translation tools can add to multilingual learner classrooms allowing learners to participate in the same lesson simultaneously. Smart dashboards, on the other hand, can inform teachers on learners' performance. However, problems about algorithmic bias, breaches in data privacy, and excessive reliance on automated solutions still prevent unconditional integration of AI into classrooms though it shows potential for such integration in the future (Selwyn, 2019).

Educators have been wary of integrating AI into education, research indicated that this distrust sprang from lack of knowledge in applying AI pedagogically. However, the vast potential of ChatGPT changed this attitude. Several studies conducted in Western educational contexts suggest that AI tools enhance coherence, broaden lexical variety, and reduce grammatical inaccuracies by providing instantaneous, context-sensitive feedback (Lee & Lee, 2024; Caires et al., 2023; Magne et al., 2025). Grammarly, for instance, identifies typographical errors and stylistically marks errors in real-time, allowing students to correct them immediately and thereby experience cumulative, measurable improvement.

In the same way ChatGPT provides authentic day-to-day conversations which are easily comprehensible for learners (Raheem et al., 2023). Students in China who used AI tools such as iFlyTek while practicing English reported improved speech clarity and better pronunciation (Qiao & Zhao, 2023). Also, in line with the goals of Vision 2030 Saudi Arabia encourages the integration of AI into the educational system, including in the EFL context. EFL classrooms in KSA place a great deal of emphasis on trying new pedagogies in writing development as it is perceived as the most difficult to attain proficiency in, and positive outcomes have been reported. For example, Rababah and Talafha (2024) reported that the use of Grammarly increased vocabulary and improved the grammatical range and accuracy of university students' writing. Similarly, Alshammri (2024) reported that ChatGPT can help students write richer, more coherent essays. Taken together, these studies underline the now-essential role of AI in exposing learners to authentic language, which was not possible in conventional Saudi classrooms. Some studies have analyzed the specific challenges Saudi learners face in using AI, such as difficulty interpreting AI feedback or adapting to emerging software (Aldawsari & Almohish, 2024; Alotaibi & Alshehri, 2023; Metwally & Bin-Hady, 2025).

Other studies that opened new vistas in the use of AI in EFL classrooms are Alkamel and Alwagieh (2024) that arrived at positive results of AI applications on syntactic precision, compositional flow, and general academic refinement; Azennoud (2024) which demonstrated the efficacy of Grammarly and ChatGPT in aiding EFL learners' compositions in terms of length and accuracy; Etaat (2025) which showed that Wordtune and Instagram Text applications led to gains in overall ability, particularly in vocabulary, mechanics, grammar, task completion, and organization; enhancement of lexical resources, task completion, coherence, cohesiveness as a result of ChatGPT integrated writing (Ismail, 2023); benefits of AI in writing and grading (Xiao et al., 2025); positive outcomes with the use of QuillBot, Grammarly, and ChatGPT in terms of capabilities, quality, productivity, user experience, and ethical aspects (Raheem et al., 2023).

III. METHOD

A quasi-experimental approach was employed in this study with a pre-post-test design. AI tools were used to teach the selected sample over a period of three weeks, and the effectiveness of these tools in developing students' writing skills at Majmaah University was compared using test scores before and after the intervention.

A. Study Sample

The study sample comprised 70 EFL students from Majmaah University, all aged 18–24. They were stratified by English proficiency level based on the Oxford Placement Test. Twenty participants were assigned to A2 (elementary), twenty-five to B1 (intermediate), and an number to B2 (upper-intermediate). All participants were Arabic speakers, 70% reported prior experience with AI tools like Grammarly or ChatGPT, while 30% of them reported that they would use AI tools for the first-time.

B. EFL writing skills test setting

The test time was calculated and results summarized in Table 1.

TABLE 1 TEST TIME

Number Average Times	Total Times	Average Times	Time Required for Instructions	Time Required for Test
20	921	46	4	50

The researcher found that the time needed for the pretest was 50 minutes. To calculate the reliability of the EFL writing skills test, Cronbach's alpha was computed, yielding 0.832, indicative of test reliability. These computations are recorded in Table 2.

TABLE 2 THE RELIABILITY OF THE EFL WRITING SKILLS TEST

Skill	Cronbach's Alpha
Organization	0.831
Content	0.828
Vocabulary	0.830
Grammar	0.827
Mechanics	0.830
EFL writing skills	0.832

Reliability by re-application method: The test was re-administered two weeks after the initial attempt and correlation coefficient between scores of the two iterations was calculated serving as an indicator of test reliability. The scores showed stability and validity of the test. These computations are summarized in Table 3.

TABLE 3 CORRELATION COEFFICIENT BETWEEN THE TWO ITERATIONS

Skill	Correlation coefficient between the two iterations
Organization	0.849
Content	0.827
A Vocabulary	0.882
Grammar	0.813
Mechanics	0.876
Total scores of EFL writing skills	0.863

C. Adjusting the list of skills

A sample of 20 participants completed the questionnaire, and the researcher verified the checklist (A) used to evaluate the test's reliability. Cronbach's Alpha for the checklist was 0.824, indicating its reliability.

TABLE 4 RELIABILITY STATISTICS BY CALCULATING CRONBACH'S ALPHA OF THE SCORES OF THE 'A' CHECKLIST OF EFL WRITING SKILLS

Skill	Organization	Content	Vocabulary	Grammar	Mechanics	EFL writing skills
Cronbach's Alpha	0.821	0.822	0.820	0.817	0.816	0.824

IV. RESULTS

The data were analyzed by calculating the frequency, percentage, mean, and standard deviation using the checklist of EFL writing skills, as shown in Table 5.

TABLE 5 DESCRIPTIVE STATISTICS OF THE IMPACT OF THE CHECKLIST OF EFL WRITING SKILLS

Main skills	Sub skills	Mean	%	% main skills
1- Organization skills	1- Developing clear introductions, body paragraphs, and conclusions.	2.68	89.33 %	
	2- Crafting effective topic sentences.	2.52	84.00 %	
	3- Using logical transitions to connect ideas.	2.6	86.67 %	86.67%
2- Content skills	4- Formulating strong and precise thesis statements.	2.53	84.33 %	
	5- Providing relevant and sufficient evidence to support arguments.	2.51	83.67 %	84.33%

	6- Expanding on ideas with depth and insight.	2.55	85.00 %	
3- Vocabulary skills	7- Using a wide range of vocabulary to enhance expression.	2.59	86.33 %	
	8- Choosing words that fit the context and tone of the writing.	2.46	82.00 %	
	9- Incorporating subject-specific and academic terms appropriately.	2.53	84.33 %	84.22%
4- Grammar skills	10- Ensuring subjects and verbs agree in number and tense.	2.44	81.33 %	
	11- Maintaining consistent verb tenses throughout the writing.	2.61	87.00 %	
	12- Constructing complete and complex sentences.	2.47	82.33 %	83.56%
5- Mechanical skills	13- Using correct punctuation, including commas, periods, and quotation marks.	2.59	86.33 %	
	14- Applying appropriate capitalization rules.	2.53	84.33 %	
	15- Ensuring correct spelling and avoiding typographical errors.	2.47	82.33 %	84.33%
Total		2.54	84.62 %	84.62%

As per Table 5, the total mean of 2.54 and the average percentage of 84.62% indicate that most participants thought all sub-skills were equally important for improving their writing. Organization skills had the highest mean score (2.6) of the five main categories. This shows that respondents attributed great value to structural clarity in writing, with the main characteristics being a well-developed introduction, coherent body paragraphs, and logical transitions. Content, vocabulary, grammar, and mechanics skills had mean scores close to 2.53, indicating they were consistently seen as important. Maintaining consistent verb tenses (2.61) and using a wide range of vocabulary (2.59) were two of the most highly rated sub-skills. Grammar and mechanics, such as sentence structure and spelling, were seen as areas for further improvement, even though they were rated slightly lower.

TABLE 6 RESULTS OF PRE-TEST IN EFL WRITING SKILLS OF THE THREE GROUPS

Skill	A2 (n=20)	B1 (n=25)	B2 (n=25)	Total (n=70)
Organization	1.33	2.11	2.66	2.11
Content	1.00	1.89	2.48	1.89
Vocabulary	1.02	1.93	2.52	1.93
Grammar	1.10	1.99	2.58	1.99
Mechanics	1.07	1.99	2.59	1.99

Table 6 shows that in the pretest, the three groups' performance was lower than expected. The first group's mean scores clustered between 1.00 and 1.33, the second between 1.89 and 2.11, and the third between 2.48 and 2.66. Proficiency level of the groups seemed to affect performance across the five writing skills.

TABLE 7 RESULTS OF POST-TEST IN EFL WRITING SKILLS OF THE THREE GROUPS

Skill	A2 (n=20)	B1 (n=25)	B2 (n=25)	Total (n=70)
Organization	3.81	4.47	4.98	4.47

Content	3.99	4.73	5.24	4.73
Vocabulary	3.84	4.76	5.38	4.76
Grammar	4.10	4.99	5.58	4.99
Mechanics	4.10	5.04	5.68	5.04

In the post-test phase, results indicated significant increase in mean values across all groups, implying significant advancement in EFL learners' writing proficiency. The three groups were found to have well harnessed the AI tools to develop their writing skills.

As the three groups —A2, B1, and B2 — exhibited average scores above 3.80 across the five writing skills—organization, content, vocabulary, grammar, and mechanics—indicating a marked improvement from pre-test levels.

Further, the elementary group showed notable progress in their writing skills, with scores of 3.81 for organization, 3.99 for content, 3.84 for vocabulary, 4.10 for grammar, and 4.10 for mechanics. These values show significant jump in development in generation of ideas and organization of content. The other two groups also made significant progress. One noteworthy point is that the level of performance among these three groups was similar, ranging from medium to high at 5.86.

TABLE 8 RESULTS OF PRE-TEST AND POST-TEST IN EFL WRITING SKILLS OF THE EXPERIMENTAL GROUP (N = 70)

					Paired Differences			
Skill	Application	N	Mean	Std. Deviation	Mean	Std. Deviation	t. value	Sig. Value
1. Organization	Post-test	70	4.47	0.65	2.36	0.96	20.47	0.01
	Pre-test	70	2.11	0.77				
2. Content	Post-test	70	4.73	0.74	2.84	1.10	21.65	0.01
	Pre-test	70	1.89	0.89				
3. Vocabulary	Post-test	70	4.76	0.92	2.83	1.20	19.66	0.01
	Pre-test	70	1.93	0.91				
4. Grammar	Post-test	70	4.99	0.89	3.00	1.23	20.45	0.01
	Pre-test	70	1.99	0.89				
5. Mechanics	Post-test	70	5.04	0.94	3.06	1.27	20.10	0.01
	Pre-test	70	1.99	0.92				
Total scores of EFL writing skills	Post-test	70	23.99	2.32	14.09	2.64	44.71	0.01
	Pre-test	70	9.90	1.68				

Table 8 shows the combined mean score of the groups. The EFL writing skills post-test score was 23.99, higher than the pretest score of 9.90, with greater homogeneity (Standard Deviation/Mean) in the post-test grades than in the pre-test grades, attributable to the application of AI in the absence of any other distinguishing factor.

Table 8 shows a significant difference between the overall mean scores of the pre- and post-test in favor of the post-test in the experimental group: T-value was (44.71), which is significant at (0.01). This is represented graphically in Figure 1.

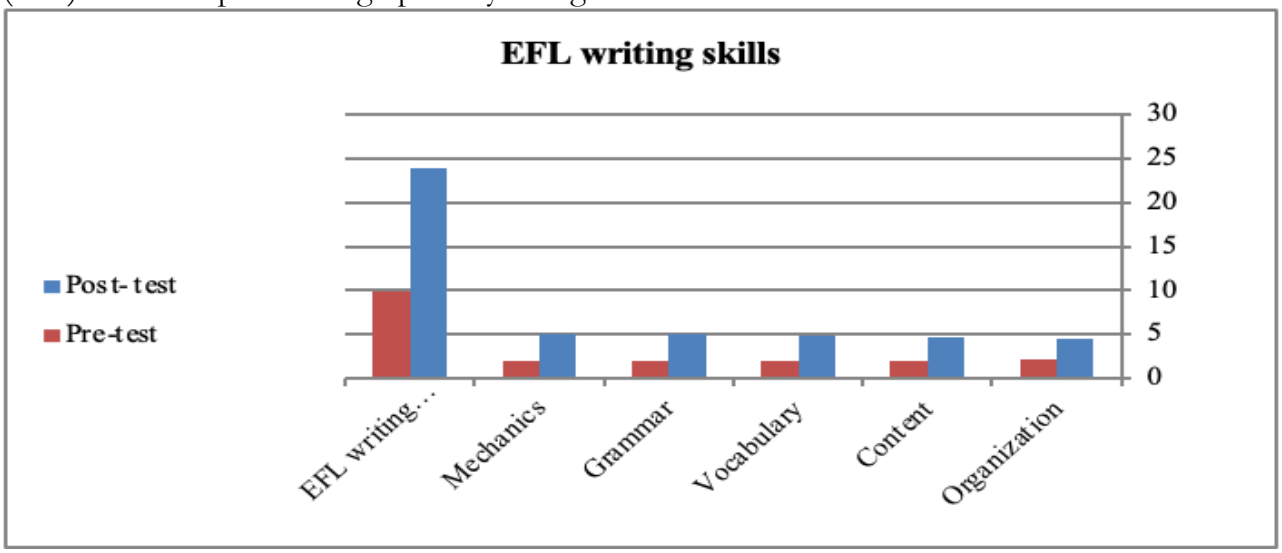

Figure 1: Bar Chart of the Mean Scores of the pre- and posttest

To investigate the effect and educational importance of the results, the value of ETA squared ($^{2}\eta$) and the effect size (d) were calculated using the following equation, as shown in Table 7.

$$\eta^2 = \frac{t^2}{t^2 + d.f} \quad (1)$$

COHEN'S D = $\frac{t}{\sqrt{n}}$

TABLE 9 REFERENCE STANDARDS OF (H2) AND (D) VALUES

Test	Effect volume		
	Small	Medium	Large
η^2	0.01	0.06	0.14
D	0.2	0.5	0.8

The data in Table 10 shows that all the aspects of students' EFL writing performance improved after the intervention as shown by large t-values and effect sizes. All results attained statistical significance at 0.01, indicating the probability of these outcomes occurring by chance is exceedingly low. The t-values which range from 19.66 to 44.71 show that there is a difference between students' performance in the pre and post-test for all writing sub-skills.

TABLE 10

T-TEST RESULTS, $^{2}\eta$ AND COHEN'S D

Skill	t. value	Sig	$^{2}\eta$	d	Effect size
Organization	20.47	at (0.01)	0.86	2.45	Large
Content	21.65	at (0.01)	0.87	2.59	Large

Vocabulary	19.66	at (0.01)	0.85	2.35	Large
Grammar	20.45	at (0.01)	0.86	2.44	Large
Mechanics	20.10	at (0.01)	0.85	2.40	Large
EFL writing skills	44.71	at (0.01)	0.97	5.34	Large

Cohen's d values for each skill—organization, content, vocabulary, grammar, and mechanics—are between 2.35 and 2.59, which is much higher than the usual level for a strong educational impact ($d \geq 0.8$). The most significant improvement is observed in overall EFL writing skills, as the t value is 44.71 and the d is 5.34, indicating a significant improvement in writing proficiency and a markedly advantageous instructional effect.

Further, ETA squared is 0.97, which means the effect size is large and significant. Moreover, in light of this, it can be stated that 97% of the variations between students' scores could be attributed to the use of AI tools, with an effect size of 5.34 indicating a significant effect. It can be inferred that these tools are educationally important for improving and developing EFL writing skills among Saudi Students at Majmaah University.

V. DISCUSSION

Findings in the study showed that most participants considered all language sub-skills as equally important for improving their writing. However, organization skills had the highest mean even amongst these. This finding aligns with previous studies, such as EL Hosayny et al. (2025), who found that students reported high levels of perceived practicality and ease of use of AI in aiding them across various academic aspects. It was also found that AI stimulated critical and reflective thinking. This shows that respondents attributed great value to structural clarity in writing a well-developed introduction being the highlight, coherent body paragraphs, and logical transitions. Content, vocabulary, grammar, and mechanical skills were also perceived as important.

Pretest results of all the groups performance was poor, but significant improvement was seen in the post-test. This finding aligns with that of Al Mahmud (2023), who showed that using Word Tune, the experimental group upgraded their writing and outperformed the control group in the final writing exam. Also, this study reported that the experimental group made modest gains in writing at the lexical and syntactic levels. While lexical gains included more concrete nouns, vivid adjectives, and precise verbs, sentence-structure gains included the increasing presence of complex phrases and bith complex and compound sentences. The combined mean score of the groups in the writing skills post-test was higher than the pretest score; this was attributed to the application of AI, in the absence of any other distinguishing factor.

Regarding the EFL students' writing performance, it was found to improve after the intervention, and the t-values and effect sizes were large. Further, ETA squared was big and significant. These scores were attributed to the use of AI tools. So these tools were inferred to be educationally important for improving EFL writing skills among Saudi Students at Majmaah University.

VI. CONCLUSION

Findings of this study show strong consensus among Saudi EFL learners about the benefits of using AI in education, as evidenced by pre-post test mean scores and statistical analyses. The here-and-now nature of AI tools is their biggest boon for EFL learners. These tools are like a supplement to the teacher, helping identify errors and improve writing. Practice opportunities are abundant in AI applications because of a 1:1 AI-learner ratio: each learner has a personal

teaching assistant at their disposal, tuned to their needs, proficiency, and learning speed. Learning motivation is high in tech-led classrooms, reinforcement is positive, and AI can track learning progress and support course correction. The positive learning environments so fostered build self-assurance as these students can see measurable improvements in their writing.

Finally, the boost in writing scores seen in this study in the post-test is indicative of the efficacy of AI tools (Grammarly and ChatGPT) to enhance the writing skills of Saudi university students, making a valid case for incorporating AI into regular classrooms, which provides both learners and teachers a robust scaffold to enhance writing skills and confront learning challenges. Looking ahead, larger and more diverse student groups studied over longer periods to assess AI efficacy will help researchers map the full range and limits of these technologies in EFL.

RECOMMENDATIONS

From the findings, the study offers the following recommendations:

- Teachers should routinely use AI tools, such as Grammarly and ChatGPT, in EFL writing classes to provide students with fast, tailored feedback on their work.
- University leaders and curriculum planners should develop policies that support the use of AI tools in language teaching, aligning with the forward-looking targets outlined in Saudi Arabia's Vision 2030.
- Research and development teams in universities and industry should create AI programs specifically designed for Arabic-speaking learners, addressing issues such as grammatical transfer errors and vocabulary gaps.

SUGGESTIONS FOR FURTHER RESEARCH

The research suggests the following directions for future study.

- Examine how cutting-edge AI technologies, such as chatbots and virtual writing assistants, can be used for interactive and conversational writing practice.
- Analyze how cultural perspectives affect the efficacy of AI tools in the Saudi environment.
- Investigate newer AI tools that are relevant and efficient while catering to the linguistic and cultural requirements of Saudi students.

LIMITATIONS OF THE STUDY

The study sample consisted of a group of seventy Majmaah University second-year students which was not a diverse sample.

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