

The Impact of AI-Assisted Writing Tools on the Argumentative Writing Performance and Self- Efficacy of Omani Female EFL Learners

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Abstract:

The growing integration of Artificial Intelligence (AI) into education has introduced innovative tools with the capacity to reshape the way languages are taught and learned. This research explores how AI-supported writing applications influence the argumentative writing skills and writing self-efficacy of English as a Foreign Language (EFL) learners in Oman. A quasi-experimental design with pre- and post-testing was adopted, involving 80 tenth-grade female students from a public school in Salalah. Participants were divided into two groups: the experimental group ($n = 40$), which engaged in a six-week program using AI writing assistants (Grammarly and QuillBot) alongside their writing instruction, and the control group ($n = 40$), which continued with conventional methods. Writing performance was evaluated through a standardized rubric, while self-efficacy was measured using a validated scale. Data were analyzed through both independent and paired samples t-tests. Findings indicated that the experimental group achieved significantly greater gains in writing proficiency ($M = 15.94$, $SD = 5.72$) and writing self-efficacy ($M = 0.88$, $SD = 0.51$) than their peers. Moreover, writing improvement was moderately and positively correlated with increased self-efficacy ($r = 0.506$, $p < .001$). These results highlight the pedagogical potential of structured AI integration in strengthening not only EFL learners' linguistic and argumentative abilities but also their confidence as writers. The paper concludes with recommendations for classroom practice and reflections on the ethical

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implications of employing AI tools in culturally specific educational contexts.

Keywords: Artificial Intelligence, Writing Tools, EFL, Argumentative Writing, Self-Efficacy, Technology Acceptance, Omani Learners

1. Introduction

Proficiency in academic writing, particularly in English as a Foreign Language (EFL), is a cornerstone of educational and professional success in an increasingly globalized world. Among the various genres of academic writing, argumentative writing is recognized as one of the most cognitively and linguistically demanding. It requires learners to not only master grammatical and lexical conventions but also to develop complex rhetorical skills such as formulating a clear thesis, constructing logical arguments, integrating evidence, and addressing counterarguments. However, EFL learners often face significant challenges in mastering this skill, stemming from issues like first language (L1) interference, limited vocabulary, and insufficient practice.

In the Sultanate of Oman, English language is the official foreign language, and its mastery is pivotal for national development in commerce, higher education, and international engagement. Despite national reforms aimed at promoting a communicative language teaching (CLT) approach, Omani students continue to face challenges in achieving high levels of English proficiency, particularly in productive skills like writing. The educational context is further shaped by unique socio-cultural factors, including a mono-gender school system that transitions to mixed-gender environments in higher education, which can influence student self-efficacy and classroom participation. The Omani education system has undergone significant reforms to promote English proficiency, yet challenges persist. Large class sizes limited instructional hours, and a curriculum that sometimes prioritizes grammar over communicative competence can hinder writing development. Furthermore, a "colonialist/culturalist" ideology has been identified in some ELT materials, which can create a disconnect between the content and the learners' local culture and identity. While students recognize the instrumental value of English for academic and career advancement, there is also a desire to maintain cultural values. This highlights the need

for pedagogical approaches and tools that are not only effective but also culturally responsive. This study, by focusing on female students within their specific educational setting, seeks to provide insights that are sensitive to this unique context.

The recent proliferation The use of Artificial Intelligence (AI) in education is emerging as a promising response to long-standing instructional challenges. Writing assistants like Grammarly, QuillBot, and ChatGPT can now offer learners timely and personalized feedback on aspects such as grammar, style, and clarity. By doing so, these tools have the potential to reshape traditional approaches to teaching writing and make the learning process more engaging and supportive. These tools can act as digital writing assistants, helping students identify errors, refine sentence structures, and expand their vocabulary, thereby freeing up valuable class time for instructors to focus on higher-order writing skills. However, the rapid adoption of these technologies also raises questions about their pedagogical effectiveness, potential for over-reliance, and ethical implications.

2. Statement of the Problem:

While an increasing number of studies explores the usefulness of AI writing tools, there is a significant gap in empirical evidence regarding their specific impact on the argumentative writing skills of secondary school EFL learners. Much of the existing literature focuses on university students or general writing proficiency. Furthermore, few studies have investigated the influence of these tools on affective factors, such as self-efficacy, which is a critical indicator of academic achievement and persistence. This gap is particularly pronounced in the Omani context, where socio-cultural and educational system dynamics create a unique learning environment. The transition from a mono-gender secondary education system can impact the confidence and participation of female students. Therefore, understanding how technology-mediated interventions affect not only cognitive skills but also the self-perceptions of these learners is crucial. This study seeks to fill this gap by conducting a rigorous, context-sensitive investigation into the effectiveness of AI-assisted writing instruction among female EFL students in Oman.

3. Research Questions

This investigation was driven by the following research questions:

- How significantly does an intervention using AI-aided writing tools (Grammarly and QuillBot) affect the argumentative writing performance of 10th-grade Omani female EFL learners compared to a control group receiving traditional instruction?
- How does the AI-assisted intervention influence the writing self-efficacy of these students compared to the control group?
- To what degree are improvements in writing ability linked with changes in self-efficacy?
- How is the experimental group's perception of AI writing tools shaped, as indicated by technology acceptance measures?

4.Literature review

The study draws upon two complementary theoretical perspectives: Social Constructivism and the Technology Acceptance Model (TAM).

4.1Social Constructivism and AI as a More Knowledgeable Other (MKO)

Social constructivism, originally advanced by Lev Vygotsky, emphasizes that learning is fundamentally a social process in which knowledge is co-created through meaningful interaction. A key principle of this perspective is the Zone of Proximal Development (ZPD), which refers to the space between what a learner can accomplish independently and what they can achieve with appropriate support or scaffolding from a more knowledgeable other. This guidance is provided by a "More Knowledgeable Other" (MKO) typically a teacher or peer. In the context of this study, we propose that AI writing tools can function as a digital MKO. By providing instant, scaffolded feedback on grammar, syntax, and style, these tools offer personalized support that helps learners bridge their ZPD. The interactive and iterative nature of using AI feedback, where a student writes, receives feedback, revises, and resubmits, simulates a dialogic process, facilitating the active construction of writing competence.

4.2 The Technology Acceptance Model (TAM):

To examine how learners adopt AI tools, this study draws on the Technology Acceptance Model (TAM), a widely recognized framework for understanding technology adoption. TAM, along with its extension, the Unified Theory of Acceptance and Use of Technology (UTAUT), proposes that adoption decisions are shaped primarily by two constructs: perceived usefulness—how strongly users believe the technology will improve their performance—and perceived ease of use—the extent to which they view the technology as effortless to operate. For the purposes of this research, the model is further extended to incorporate additional dimensions such as social influence and facilitating conditions, thereby offering a more comprehensive perspective on students' readiness to integrate AI tools into their learning practices. Measuring technology acceptance helps to contextualize the quantitative outcomes, offering insights into why the intervention was or was not effective from the learners' perspective.

4.3 AI-Powered Tools in English language Writing Instruction:

Integration AI into teaching English writing has moved from theoretical discussion to practical application, with a surge in tools designed to provide automated writing evaluation (AWE). Platforms like Grammarly, Turnitin, and QuillBot are now commonplace in academic settings. Research suggests these tools can significantly improve surface-level accuracy in student writing. Specifically, studies on QuillBot have shown positive effects on EFL writing performance and a reduction in writing apprehension, while Grammarly has been found effective for improving grammatical accuracy and fostering learner autonomy.

However, the efficacy of these tools is not without debate. One of the main criticisms of AI-assisted writing tools is their limited capacity to assess higher-order writing skills such as argumentation, coherence, and creativity. In addition, scholars have cautioned that excessive dependence on these tools may hinder the growth of learners' independent editing abilities and their critical thinking development. Wang et al. (2024) stated that while ChatGPT-4 could provide more reliable holistic scores than human teachers, the feedback from both teachers and AI often focused more on language than on content and

organization, highlighting the need for pedagogical guidance in using these tools effectively.

4.4 Writing Self-Efficacy and Affective Factors

Writing is an affective process as much as a cognitive one. Self-efficacy—understood as an individual's belief in their ability to carry out the actions required to achieve particular goals—has been widely recognized as a strong predictor of writing achievement. Learners with higher levels of self-efficacy tend to approach demanding tasks with greater confidence, show persistence when confronted with obstacles, and ultimately demonstrate stronger performance outcomes. On the other hand, lower levels of self-efficacy and high writing apprehension can create significant barriers to learning. In the Omani context, the transition from single-gender to co-educational environments can impact self-efficacy, with some studies reporting that female learners, while often higher achievers, may experience anxiety in mixed-gender classroom activities. Interventions that can bolster confidence are therefore of particular importance. The immediate, private, and non-judgmental feedback offered by AI tools may help reduce writing apprehension and build confidence, allowing students to experiment and make mistakes in a low-stakes environment.

5. Methodology

5.1 Design and Participants

This study adopted a quasi-experimental pretest–posttest design with a non-equivalent control group. Such a design is commonly employed in educational research when it is not feasible or appropriate to randomly assign participants to groups. In this case, two intact classes of tenth-grade students were designated as the experimental and control groups. The instructional approach (AI-assisted versus traditional) served as the independent variable, while the dependent variables were students' argumentative writing performance and their writing self-efficacy.

The participants were 80 female, 10th-grade EFL students from a public girls' school in Salalah, Oman. The participants were between 15 and 17 years old ($M = 15.92$, $SD = 0.57$). They were divided into two groups of equal size: an experimental group ($n = 40$) and a control group

($n = 40$). An independent samples t-test showed no statistically significant difference in pre-test writing scores between the groups ($t(78) = 0.398$, $p = .692$), confirming that both groups began the study with a comparable level of writing proficiency.

5.2 Data Collection Instruments

- **Writing Proficiency Test:** A pre and posttest of argumentative essay task were conducted to measure writing proficiency. Students were given a prompt on a relevant social issue and 45 minutes to write an essay. The essays were scored holistically by two independent, trained raters using an analytic rubric adapted from the ACTFL Writing Proficiency Test (WPT) framework. The rubric assessed five domains: Content & Organization, Language & Grammar, and Vocabulary & Style.
- **Self-Efficacy Scale of English language writing:** A pre- and post-intervention questionnaire was administered to measure students' writing self-efficacy. The instrument comprised eight items measured on a five-point Likert scale, adapted from well-established self-efficacy questionnaires.
- **Technology Acceptance Scale:** After the treatment, the investigational group completed a 6-item questionnaire based on the UTAUT model to measure their acceptance and perception of the AI tools.

5.3 Reliability and Validity

Establishing the validity and reliability of the data collection tools was an essential step in this study. Validity concerns the extent to which an instrument accurately captures the construct it is designed to measure, whereas reliability relates to the consistency and stability of the results obtained.

The content validity of all instruments was established through expert review. Three experienced EFL instructors and a measurement expert evaluated the writing prompts, rubrics, and questionnaire items for clarity, relevance, and alignment with the research objectives. The overall Content Validity Index (CVI) was high for the writing assessment (0.92), self-efficacy scale (0.88), and technology acceptance scale (0.91). Also, Construct validity was evidenced through significant correlations

among related measures. For instance, pre-test and post-test writing scores showed a strong positive relationship ($r = .654$, $p < .001$), and a similarly robust correlation was observed between pre- and post-intervention self-efficacy scores ($r = .778$, $p < .001$). In the same vein, the internal consistency of the scales was tested using alpha Cronbach's. All scales demonstrated excellent reliability: Content & Organization ($\alpha = 0.944$), Language & Grammar ($\alpha = 0.906$), Vocabulary & Style ($\alpha = 0.925$), Self-Efficacy Scale ($\alpha = 0.994$), and Technology Acceptance Scale ($\alpha = 0.976$). Inter-rater reliability for the essay scoring was established using a Pearson correlation on a 30% subsample, yielding a high coefficient ($r = 0.91$), indicating strong agreement between the two raters.

5.4 Procedure

The study was conducted over six weeks. In the first week, all participants took the pre-test essay and completed the self-efficacy scale.

- Control Group ($n=40$): This group was guided by the traditional writing teaching. The teacher provided lessons on the structure of argumentative essays, conducted grammar exercises, and gave written feedback on drafts. The process followed the standard curriculum guidelines.
- Experimental Group ($n=40$): This group received instruction on using AI writing tools (Grammarly for grammar/mechanics and QuillBot for paraphrasing/style) as part of the writing process. After initial drafting, students used the tools to receive feedback and revise their work collaboratively in pairs. The teacher acted as a facilitator, guiding students on how to interpret and critically evaluate the AI-generated suggestions, rather than accepting them passively. This approach aligns with the "Human $\rightarrow$ AI $\rightarrow$ Human" model, where human inquiry initiates the process and concludes it. In the final week, all participants took the post-test essay and completed the post-intervention self-efficacy scale. The experimental group also filled out the technology acceptance questionnaire.

5.5 Ethical Considerations:

Conducting research with minors and involving AI technology necessitates meticulous attention to ethical principles. The study was conducted under the approval of both the university's Institutional Review Board and the Omani Ministry of Education. Informed consent was secured from parents or guardians, and student assent was obtained through age-appropriate forms explaining the study and their right to withdraw freely. To safeguard privacy, all data were anonymized, and students were advised not to include personal details when using the AI tools. The research was judged to pose minimal risk, as activities aligned with normal classroom practice, and beneficence was ensured by designing the intervention to enhance learning. The control group was not disadvantaged, as they followed the standard curriculum and later received a workshop on AI writing tools. Finally, the study addressed fairness by acknowledging the risk of algorithmic bias and encouraging students to critically evaluate AI feedback, thereby fostering independent thinking and maintaining their authorial voice.

6. Results:

The data were analyzed using statistical software comparable to SPSS. The analysis involved descriptive statistics to summarize the data, independent samples t-tests to compare the experimental and control groups, paired samples t-tests to examine within-group differences across time, and correlation analyses to explore relationships between variables. A significance threshold of $p < .05$ was adopted for all tests.

6.1 Descriptive Statistics

Table 1 displays the descriptive statistics for the main study variables, both for the overall sample and separated by group. The experimental group demonstrated a mean improvement in writing scores of 15.94 points, which was considerably higher than the 3.27-point gain observed in the control group.

Table 1: Descriptive Statistics for Key Variables

Variable	Group	N	Mean	Std. Deviation
Pre-test Writing	Control	40	52.08	6.89
	Experimental	40	52.74	7.84
Post-test Writing	Control	40	55.35	7.56

Variable	Group	N	Mean	Std. Deviation
Writing Improvement	Experimental	40	68.68	8.67
	Control	40	3.27	3.65
	Experimental	40	15.94	5.72
Efficacy Improvement	Control	40	0.16	0.33
	Experimental	40	0.88	0.51
Technology Acceptance	Experimental	40	4.12	0.64

6.2 Pre-Post Improvements (Paired Sample T-Tests):

Paired-samples t-tests were performed to examine within-group changes from pre-test to post-test, as summarized in Table 2. Both groups showed statistically significant improvements in writing proficiency and self-efficacy. However, the magnitude of the improvement in the experimental group was substantially larger, as indicated by the very large effect sizes (Cohen's $d = 2.788$ for writing and 1.731 for self-efficacy).

Table 2: Paired Sample T-Tests for Within-Group Changes

Group	Variable	Pre-test M(SD)	Post-test M(SD)	t(39)	p	Cohen's d
Control	Writing Proficiency	52.08 (6.89)	55.35 (7.56)	5.657	<0.001** *	0.894
	Self-Efficacy	2.74 (0.66)	2.90 (0.71)	3.119	0.003**	0.493
Experimental	Writing Proficiency	52.74 (7.84)	68.68 (8.67)	17.633	<0.001** *	2.788
	Self-Efficacy	3.04 (0.49)	3.92 (0.72)	10.947	<0.001** *	1.731

** $p < 0.01$, *** $p < 0.001$

6.3 Between-Group Comparisons (Independent Samples T-Tests)

Independent-samples t-tests were conducted to compare post-test outcomes and improvement scores between the experimental and control groups (see Table 3). Results showed that the experimental group outperformed the control group across all measures: post-test writing scores, overall writing improvement, post-intervention self-efficacy, and gains in self-efficacy. These differences were statistically significant, indicating that the AI-assisted intervention had a meaningful impact on

both writing performance and learners' confidence. All comparisons yielded large effect sizes, confirming the practical significance of the intervention.

Table 3: Independent Sample T-Tests for Between-Group Comparisons

Variable	t(78)	P	Cohen's d	Effect Size
Post-test Writing	7.333	<0.001***	1.640	Large
Writing Improvement	11.815	<0.001***	2.642	Large
Post-intervention Efficacy	6.349	<0.001***	1.420	Large
Efficacy Improvement	7.501	<0.001***	1.677	Large

*** $p < 0.001$

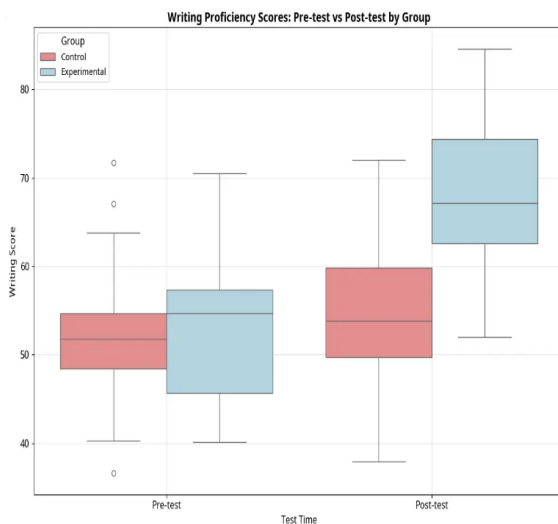


Figure 1. Comparison of Writing Proficiency Scores by Group and Time.

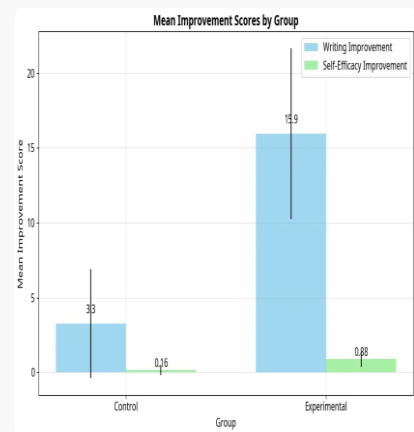


Figure 2. Mean Improvement Scores for Writing Proficiency and Self-Efficacy.

6.4 Correlation Analysis

A Pearson correlation analysis was carried out to explore the association between writing improvement and self-efficacy gains across the full sample ($N = 80$). The analysis revealed a strong, positive, and statistically significant correlation ($r = .506$, $p < .001$). This suggests that students who demonstrated greater progress in their writing performance were also more likely to report notable increases in their writing self-efficacy.

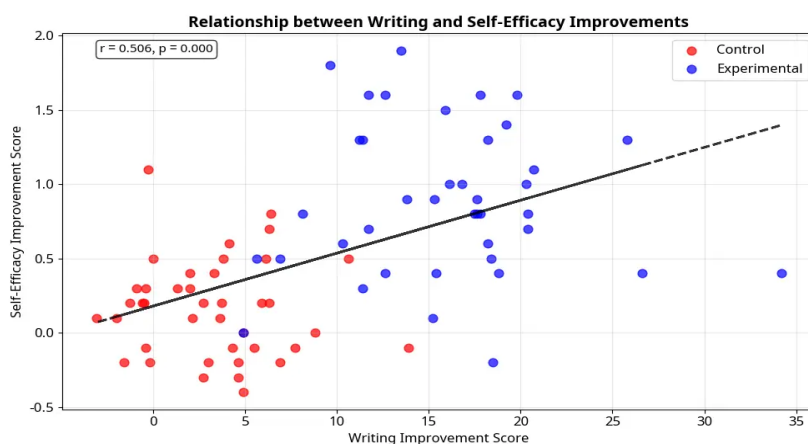


Figure 3. Correlation between Writing Improvement and Self-Efficacy Improvement.

6.5 Technology Acceptance

The experimental group demonstrated a high level of technology acceptance, with an average score of 4.12 out of 5 (SD = 0.64). This indicates that the Omani EFL learners perceived the AI tools as useful and easy to use. Interestingly, technology acceptance scores did not significantly correlate with post-test writing scores or writing improvement, suggesting that while students found the tools acceptable, their attitude towards the technology was not the primary driver of their learning gains, which may instead be attributed to the structured pedagogical use of the tools.

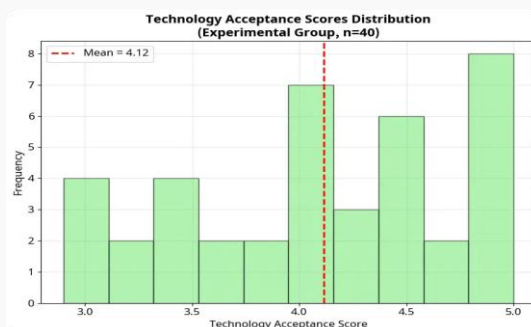


Figure 4. Distribution of Technology Acceptance Scores in the Experimental Group (n=40).

7. Conclusion:

The findings of this study offer robust support for the effectiveness of integrating AI-assisted writing tools into EFL instruction for Omani secondary school students. The findings clearly demonstrate that a structured intervention using tools like Grammarly and QuillBot led to significantly greater improvements in argumentative writing performance compared to traditional teaching methods. The large effect sizes observed underscore the practical significance of this pedagogical shift. Crucially, the intervention not only improved students' technical writing skills but also had a marked positive effect on their writing self-efficacy. The strong correlation observed between gains in writing performance and self-efficacy points to a virtuous cycle, in which increased proficiency fosters greater confidence, which in turn encourages further skill development: as students see tangible improvements in their writing through AI-scaffolded feedback, their confidence grows, which in turn motivates them to engage more deeply with the writing process. This affective outcome is particularly important in the Omani context, where fostering confidence in female learners is a key educational goal. The results align with the relevant previous studies, suggesting that AI tools can indeed function as a "More Knowledgeable Other" by providing personalized scaffolding that helps students navigate their Zone of Proximal Development. The high technology acceptance scores indicate that students found the tools to be valuable and user-friendly, which is a prerequisite for successful technology integration. However, the lack of correlation between acceptance and performance gains highlights a critical point: it is not the mere presence of technology, but its purposeful and pedagogically sound integration that drives learning. The teacher's role in guiding students to think critically about AI feedback was central to the intervention's success.

8. Recommendations and Implications:

This study offers various recommendations for educators, curriculum developers, and policymakers:

1. Educators should focus on designing structured activities that integrate AI tools into the writing process, rather than simply making the tools available. Instruction should emphasize critical evaluation of AI

suggestions, positioning the student as the ultimate author and decision-maker.

2. Writing instruction should aim to build not only skills but also confidence. AI tools can be leveraged as a low-stakes environment for practice and revision, which can help reduce writing apprehension and build self-efficacy.
3. To effectively implement AI-assisted instruction, teachers require training in both the technical use of the tools and the pedagogical strategies for integrating them. This includes developing AI literacy and understanding how to guide students in using AI responsibly and ethically.
4. While this study used general argumentative prompts, future implementations should consider using AI to generate or adapt content that is more culturally relevant to Omani students, thereby increasing engagement and bridging the gap between global English and local identity.
5. Future Research: Further research is needed to explore the long-term effects of AI-assisted writing instruction. Longitudinal studies could track students' development over time. Additionally, comparative studies examining different AI tools (e.g., generative models like ChatGPT vs. feedback tools like Grammarly) and their effects on different writing sub-skills would be valuable. Investigating the impact on male students in the Omani context would also provide a more complete picture.

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