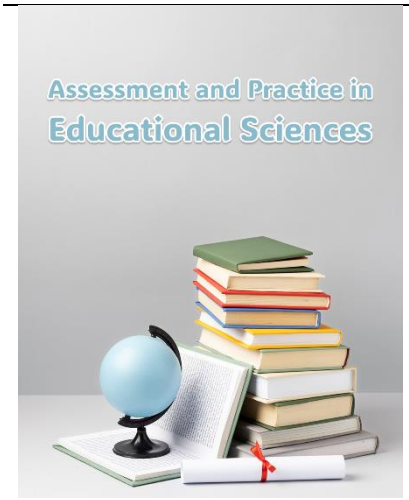
Assessment and Practice in Educational Sciences



Effect of AI-driven Conversational Agents on EFL Learners' Writing Anxiety, Agentic Engagement and Language Investment

1. Masoomeh. Benshams: Department of English Language, Marv.C., Islamic Azad University, Marvdasht, Iran
(Email: Masoomeh.Benshams@iau.ac.ir)

Article type:
Original Research

Article history:
Received 09 October 2025
Revised 22 January 2026
Accepted 29 January 2026
Initial Publish 08 April 2026
Published online 01 September 2026

How to cite this article:
Benshams, M. (2026). Effect of AI-driven Conversational Agents on EFL Learners' Writing Anxiety, Agentic Engagement and Language Investment. *Assessment and Practice in Educational Sciences*, *4*(4), 1-11. https://doi.org/10.61838/japes.214

ABSTRACT

The purpose of the study was to investigate the impact of AI-powered conversational agents (CAs) on Iranian EFL learners' writing anxiety, active participation, and commitment to language learning. To this end, 73 Iranian male and female EFL learners were randomly chosen from two language institutes in Iran. Following this, the OPT was administered, and a sample of 60 learners was selected and divided equally into two groups: an experimental group and a control group. The data collection process began with administering pretests, which included the second language writing anxiety inventory (SLWAI), the agentic engagement scale, and the language learning investment questionnaire. Participants were given 30 minutes to complete these pretests. Subsequently, the treatment phase commenced for each group. The study utilized materials from *American English File 1*, which consists of four sections per unit, along with two pages dedicated to practical English and writing, as well as a two-page review and check section. The experimental group was taught using AI-driven CAs. Participants were informed that their performance and class activities would be recorded for research purposes, but the specific aim of the study was not disclosed to avoid the Hawthorne effect. They engaged in sessions facilitated by AI-driven CAs and received feedback on their language errors. After each feedback session, learners were given the opportunity to reflect on their mistakes in preparation for upcoming tasks. In contrast, the control group did not receive any specialized intervention during the study period. They only received feedback directly from their instructor, as all tasks were corrected manually by the instructor. Upon completing the course, both groups were given posttests, which included the same SLWAI, agentic engagement scale, and language learning investment questionnaire. To analyze the results, descriptive statistics such as the mean and standard deviation for each group were calculated and reported. Additionally, skewness and kurtosis indices were examined to confirm the normality of data distribution. Once the assumptions for conducting parametric tests were met, a one-way ANCOVA was used to compare the two groups. The results indicated that AI-driven conversational agents significantly reduced writing anxiety and enhanced agentic engagement among the learners. Finally, some theortical and pedagogical implications are provided.

Keywords: AI-driven Conversational Agents; Agentic Engagement; EFL Learners; Language Investment; Writing Anxiety

Introduction

Writing in a foreign language is widely recognized as one of the most cognitively demanding and emotionally charged skills in second and foreign language learning contexts. Among the affective variables influencing writing performance, writing anxiety has consistently emerged as a critical factor that can undermine learners' motivation, engagement, and achievement. Early conceptualizations of foreign language writing anxiety emphasized its multidimensional nature, encompassing cognitive, somatic, and avoidance-related components that interact with learners' perceptions of competence and evaluation (1). Subsequent empirical research has repeatedly demonstrated that heightened levels of writing anxiety are associated with lower writing quality, reduced willingness to write, and negative attitudes toward language learning more broadly (2-4). These

findings underscore the importance of identifying pedagogical conditions and instructional innovations that can mitigate writing anxiety while simultaneously supporting learners' linguistic development.

Within the broader field of second language acquisition, affective factors such as anxiety are increasingly examined through sociocognitive and sociocultural lenses that highlight the role of learner identity, agency, and investment. From this perspective, anxiety is not merely an internal psychological state but is shaped by learners' interactions with classroom practices, assessment regimes, and broader ideological discourses surrounding language learning (5, 6). Learners' willingness to invest effort in writing tasks is closely linked to their sense of agency and perceived returns on investment, including symbolic and material benefits associated with language proficiency (7, 8). Empirical studies have shown that when learners perceive writing tasks as threatening to their identity or as sites of potential failure, anxiety intensifies, leading to disengagement and surface-level learning strategies (9, 10). Consequently, reducing writing anxiety requires instructional approaches that enhance learners' sense of control, relevance, and meaningful participation.

Traditional classroom-based interventions aimed at alleviating writing anxiety have focused on collaborative learning, formative feedback, and strategy instruction. Research on collaborative and blended learning environments suggests that peer interaction and shared responsibility can lower apprehension and foster more positive writing experiences (11). Similarly, instructional models that emphasize process-oriented writing and explicit strategy instruction have been found to improve learners' writing attitudes and achievement by demystifying the writing process and reducing fear of evaluation (12, 13). However, despite these pedagogical advances, writing anxiety remains a persistent challenge, particularly in contexts where high-stakes assessment, accuracy-oriented feedback, and limited opportunities for authentic communication prevail (14). This persistence has prompted scholars to explore how emerging technologies might offer new pathways for addressing affective barriers in writing instruction.

In recent years, artificial intelligence has become an increasingly prominent feature of educational technology, with applications ranging from adaptive tutoring systems to conversational agents and automated feedback tools. In language education, AI-driven technologies have been heralded for their potential to personalize learning, provide immediate feedback, and support learner autonomy (15). From a well-being perspective, readiness for the AI age involves not only technical skills but also affective and motivational dimensions that enable learners to engage productively with intelligent systems (15). As such, AI-enhanced learning environments may play a significant role in reshaping learners' emotional experiences of language learning, including writing anxiety.

Empirical research on AI in English as a foreign language contexts has grown rapidly, with studies examining learners' perceptions, motivational responses, and performance outcomes. Recent work has shown that AI chatbots and conversational agents can enhance learners' conversational proficiency by providing low-stakes, judgment-free opportunities for practice (16). Similarly, AI-enhanced writing instruction has been found to reduce writing anxiety among secondary school learners by offering personalized feedback and scaffolding that supports gradual skill development (17). These findings suggest that AI tools may help alleviate anxiety by shifting the focus from error avoidance to iterative learning and experimentation.

Motivation and engagement constitute another crucial dimension of AI-mediated language learning. Studies investigating learners' motivational orientations toward AI tools have reported generally positive attitudes, particularly when learners perceive these technologies as useful, user-friendly, and aligned with their learning goals (18). The capacity of AI systems to support self-regulated learning processes, such as goal setting, monitoring, and reflection, further contributes to sustained engagement and retention (19). From an agency-oriented perspective, AI tools may empower learners to take greater control over their writing practices, thereby reducing anxiety associated with teacher-centered evaluation and time pressure (20).

However, these benefits are not automatic and depend heavily on learners' perceptions of AI usage and the pedagogical contexts in which such tools are embedded.

The relationship between AI usage and writing anxiety has begun to attract focused scholarly attention. Correlational studies indicate that learners who engage more frequently with AI-assisted writing tools tend to report lower levels of writing anxiety, suggesting a potential buffering effect of technology-mediated support (21). Similarly, learners' positive perceptions of AI usage in language learning have been shown to predict reduced perceived writing anxiety, highlighting the importance of attitudinal factors in shaping affective outcomes (22). These findings align with earlier research on foreign language anxiety, which emphasizes the role of perceived competence and controllability in anxiety reduction (23). When learners view AI tools as supportive rather than evaluative, they may experience writing as a less threatening activity.

Despite these promising findings, the integration of AI into language education also raises critical questions regarding learner identity, investment, and equity. From a sociolinguistic standpoint, access to and engagement with AI technologies may differentially shape learners' opportunities to participate in meaningful writing practices (24). Learners' investment in AI-mediated writing tasks is influenced by their beliefs about the legitimacy and value of these tools, as well as by institutional norms and assessment practices (25). Moreover, individual differences in technological readiness and prior experiences with learning technologies can mediate emotional responses to AI use (26, 27). These considerations suggest that AI should not be viewed as a panacea for writing anxiety but rather as a pedagogical resource whose effectiveness depends on thoughtful integration and contextual sensitivity.

Another strand of relevant research concerns the measurement and conceptualization of writing anxiety itself. The development and validation of writing anxiety scales for different educational levels have contributed to more nuanced understandings of how anxiety manifests across learner populations (28). Such measurement tools enable researchers to examine the specific dimensions of anxiety most affected by instructional interventions, including AI-enhanced approaches. Furthermore, longitudinal and mixed-methods designs have been advocated to capture changes in anxiety over time and to explore learners' subjective experiences with emerging technologies (17). These methodological advances are crucial for building a robust evidence base on the affective impacts of AI in writing instruction.

Taken together, the existing literature points to a complex interplay between writing anxiety, learner agency, investment, and technological mediation. While traditional pedagogical strategies have made important contributions to anxiety reduction, AI-enhanced instruction offers novel affordances that warrant systematic investigation. Current studies provide encouraging evidence that AI tools can support writing development and reduce anxiety, yet there remains a need for integrative research that situates these findings within established theoretical frameworks of language learning and affect. In particular, understanding how learners' perceptions of AI usage interact with their writing anxiety can inform the design of pedagogically sound and emotionally supportive learning environments.

Accordingly, the present study aims to examine the relationship between EFL learners' perceptions of AI usage in language learning and their perceived writing anxiety, with the goal of elucidating how AI-mediated instructional practices may contribute to more positive and less anxiety-provoking writing experiences.

Methods and Materials

Study Design and Participants

This study utilized a quasi-experimental design in which it aimed to establish a cause-and-effect relationship between an independent variable (AI-driven CAs) and three dependent variables (i.e. EFL learners' writing anxiety, agentic engagement

and language investment). For the purpose of the research the true-experimental design was employed since, according to Cresswell (2007), a quasi-experimental design is used when random sampling of participants to groups is practical, allowing researchers to investigate causal relationships in real-world settings where true experiments are feasible. In addition, data collection was conducted under a pretest posttest design.

The minimum sample size of participants in the study was determined based on power analysis. The power analysis was conducted using G*Power 3.1.9.7 software (Faul et al., 2009). The results of power analysis (.66, p=.05, effect size=.544) revealed that at least 60 participants were needed to run statistical analysis. The population included 73 EFL female and male learners, selected randomly in two private language institutes in Shiraz, Iran. Then, 60 out 73 were chosen as the sample of the study were administered based on the placement test, and randomly divided into equal groups as experimental (n=30), and control (n=30), ranging from 17 to 26 years old. In addition to EFL learners, one experienced teacher was selected for both experimental and control groups. She had more than ten years of teaching English, holding M.A. in English language teaching.

To do the study, first, 73 Iranian male and female EFL learners were selected randomly in two language institutes in Iran. Then, OPT was administered and as the sample, 60 learners were selected and divided into two equal groups as one experimental and one control group. The data collection procedure began with conducting the pretests (i.e. SLWAI, agentic engagement scale, and language learning investment questionnaire).The learners had 30 minutes for completing the pretests. Next, the treatment for each group of the participants started. The materials of the study were *American English File* 1. Each unit of *American English File* 1 is composed of four sections plus two-page practical English and writing, and a two-page review & check section. The experimental group was taught through AI-driven CAs. They were informed that their performance and class activities were recorded for research, but they were not be informed directly about the study purpose to avoid the Hawthorne effect. They were asked to participate in the sessions provided and measured by DI-driven CAs. The participants received feedback on their language mistakes. At the end of each feedback stage, the learners had a chance to reflect on their errors in preparation for their subsequent tasks. In contrast, the control group did not get any specific intervention during the study period. They only received feedback from their instructor since all the tasks were corrected by the instructor. After finishing the course, SLWAI, agentic engagement scale, and language learning investment questionnaire, as posttests were administered for the two groups.

Data Collection Instruments

Oxford Placement Test: The researcher used Oxford Placement Test to select the participants of the study. The assessment tool consists of 80 multiple-choice questions, divided into three primary sections including: a sentence completion exercise, a grammar evaluation, and a vocabulary assessment. According Allan (2004), as a standard test, it possess acceptable levels of reliability and validity. The participants were supposed to answer the test within 65 minutes.

Second Language Writing Anxiety Inventory (SLWAI): In this study, the anxiety questionnaire is the Second Language Writing Anxiety Inventory (SLWAI) developed by Cheng (2004). The questionnaire consists of 27 items adopted a 5-point Likert response format (in all but one case, 1 = strongly disagree; 2 = disagree; 3 = no strong feelings either way; 4 = agree; 5 = strongly agree). The validity and reliability of SLWAI were estimated by Cheng (2004).

Agentic Engagement Scale: The student agent engagement was examined via original items from the Reeve and Tseng's (2011) scale. It has 10 items based on 5-point Likert scale from strongly agree to strongly disagree. Items 1–5 are the original AES items. Item 1b is a revised version of original Item 1; this item is revised to test the merit of limiting the context of question-asking to that which is specific to learning. (20)

Language Learning Investment Questionnaire: The Language Learning Investment Questionnaire by Dauzón-Ledesma and Izquierdo (2023) was used the purpose of a study that explored language learning investment and its underpinnings. This 36-item measure was used to assess investment dimensions among students. The validity and reliability of the questionnaire were ensured in different studies (29).

Data Analysis

To analyze the data, first, the descriptive statistics including mean and standard deviation of each group were calculated and reported. Then, to ensure the normality of data distribution, skewness and kurtosis indices of normality were measured. Finally, the assumptions of conducting parametric tests were met, and groups were compared via one-way ANCOVA.

Findings and Results

To have a homogeneous sample of the participants, OPT was run, and analysed. The descriptive statistics of OPT results are illustrated in Table 1.

Table 1. Descriptive Statistics of OPT

	N	Min	Max	M	SD
OPT	73	46	72	59	1.708

According to Table 1, the mean and standard deviation of OPT scores were 59 and 1.708, respectively. Based on OPT results, those who scored from 48 to 70 were selected, and administered as the main participants. Accordingly, 60 out of all 73 Iranian EFL learners were randomly selected and put into two equal experimental and control groups. Then, to ensure the normality of data skewness and kurtosis indices of normality were measured. The absolute values of the ratios of skewness and kurtosis over their standard errors were lower than 1.96. Therefore, an absolute value greater than 1.96 is significant at $p < 0.05$, above 2.58 is significant at $p < 0.01$, and above 3.29 is significant at $p < 0.001$". Based on the results displayed in Table 2, it can be concluded that the present data did not show any significant deviation from a normal distribution.

Table 2. Descriptive Statistics; Testing Normality of Data

		N	Skewness			Kurtosis		
Group		Statistic	Statistic	Std. Error	Ratio	Statistic	Std. Error	Ratio
Experimental	Pretests	30	.324	.374	0.87	-.549	.733	-0.75
	posttests	30	-.334	.374	-0.89	.188	.733	0.26
Control	Pretests	30	.209	.374	0.56	-1.132	.733	-1.54
	Posttests	30	-.087	.374	-0.23	.415	.733	0.57

After estimating the normality, one-way ANCOVA test was run for each dependent variable in order the answer the research question. Table 3 presents one-way ANCOVA results for the the two groups' writing anxiety.

Table 3. The ANCOVA Test Results for the Control and Experimental Groups' Writing Anxiety Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pretest	1.57	1	1.57	1.044	.315	.019
Group	168.66	1	168.66	112.44	.000	.654
Error	84.44	58	1.55			
Total	1109.00	60				

a. R Squared = .662 (Adjusted R Squared = .651)

As illustrated in Table 3, after adjusting the posttest scores for the possible effects of the pretest, a significant difference was found between the two groups on the scores ($F(1,58) = 112.44$, $p = .000<.01$, partial eta squared = .65 representing a very large effect size). Therefore, there is a significant difference between two groups' means on the posttest of writing anxiety while controlling for the possible effects of the pretest. Table 4 also presents the adjusted mean report on writing anxiety scores for each group. Here, the effect of the pretest scores has been statistically removed.

Table 4. The Adjusted Marginal Means on Writing Anxiety Scores

			95% Confidence Interval	
Group	Mean	Std.Error	Lower Bound	Upper Bound
Experimental	4.08	.29	1.68	2.55
Control	2.66	.29	4.88	5.92

The results provided in Table 4 show that the effect of pretest scores was controlled; the mean of the scores for the control and experimental groups were 2.66 and 4.08, respectively. It can be concluded that there was a significant difference between the writing anxiety between control and experimental groups (Mean Difference = 3.518, p = .000< .01, 95%), confirming the efficacy of AI-driven CAs on reducing EFL learners' writing anxiety. Further, the results of the two groups' agentic engagement were calculated by another one-way ANCOVA (Table 5).

Table 5. The ANCOVA Test Results for the Control and Experimental Groups' Agentic Engagement Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pretest	1.52	1	1.52	1.041	.312	.017
Group	161.69	1	161.69	108.47	.000	.633
Error	81.48	58	1.59			
Total	1105.00	60				

a. R Squared = .669 (Adjusted R Squared = .654)

According to Table 5, after accounting for the potential influence of the pretest, a significant difference was identified between the two groups' posttest scores ($F(1,58) = 108.47$, $p = .000<.01$, partial eta squared = .63, indicating a very large effect size). This demonstrates a significant disparity in the posttest means of agentic engagement between the two groups, with the pretest effects statistically controlled. Additionally, Table 6 provides the adjusted mean scores for agentic engagement for each group, with the impact of the pretest scores effectively removed.

Table 6. The Adjusted Marginal Means on Agentic Engagement Scores

			95% Confidence Interval	
Group	Mean	Std.Error	Lower Bound	Upper Bound
Experimental	3.29	.26	1.52	2.37
Control	2.05	.26	4.66	5.43

The data presented in Table 6 indicates that pretest scores were accounted for, with the mean scores for the control and experimental groups being 2.66 and 4.08, respectively. This suggests a notable difference in writing anxiety between the two groups (Mean Difference = 3.488, p = .000 < .01, 95% confidence interval), supporting the effectiveness of AI-driven conversational agents in increasing agentic engagement among EFL learners. Finally, the two groups were compared for their language investment.

Table 7. The ANCOVA Test Results for the Control and Experimental Groups' Language Investment Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pretest	1.48	1	1.48	1.569	.398	.018
Group	144.09	1	144.09	107.55	.655	.721
Error	72.65	58	1.37			
Total	1095.00	60				

a. R Squared = .643 (Adjusted R Squared = .690)

According to Table 7, after considering the potential impact of the pretest, no notable difference was found between the posttest scores of the two groups ($F(1,58) = 107.55$, $p = .000 > .01$, partial eta squared = .65). This indicates that there was no significant variation in the posttest means for language investment between the groups, with the pretest effects statistically accounted for. Furthermore, Table 8 presents the adjusted mean scores for language investment for each group, with the influence of the pretest scores effectively removed.

Table 8. The Adjusted Marginal Means on Language Investment Scores

			95% Confidence Interval	
Group	Mean	Std.Error	Lower Bound	Upper Bound
Experimental	3.62	.25	1.39	2.65
Control	3.48	.25	4.08	5.91

Table 8 shows that pretest scores were taken into consideration, with the mean scores for the control group and the experimental group being 3.48 and 3.62, respectively. This indicates no significant difference in language investment between the two groups (Mean Difference = 3.591, $p = .000 > .01$, 95%). This finding suggests that AI-driven conversational agents do not have a notable impact on EFL learners' language investment.

Discussion and Conclusion

The findings of the present study provide empirical support for a significant and meaningful relationship between EFL learners' perceptions of AI usage in language learning and their perceived writing anxiety. Overall, the results indicated that more positive perceptions of AI-assisted language learning were associated with lower levels of writing anxiety, suggesting that AI-based tools may function as affective mediators that reshape learners' emotional experiences of writing. This result is consistent with recent correlational evidence demonstrating that learners who frequently engage with AI-assisted writing environments tend to report reduced anxiety and increased confidence in writing tasks (21, 22). The findings thus reinforce the growing consensus that technology-enhanced instruction, when perceived as supportive and learner-centered, can alleviate affective barriers that traditionally hinder EFL writing development.

One of the most salient outcomes of the study was the strong inverse association between perceived usefulness of AI tools and cognitive aspects of writing anxiety, such as fear of negative evaluation and excessive concern over linguistic accuracy. This pattern aligns closely with earlier research on foreign language writing anxiety, which has shown that anxiety is often exacerbated by error-focused instruction and high-stakes assessment practices (1, 2). AI-enhanced writing tools, particularly those providing immediate, individualized, and non-judgmental feedback, may reduce learners' fear of evaluation by shifting attention from performance to process. Similar conclusions were drawn by Aydın-Yıldız (17), who found that AI-enhanced writing instruction in secondary school contexts significantly reduced writing anxiety by enabling learners to revise iteratively without the pressure of teacher surveillance.

The results also demonstrated that learners who perceived AI as facilitating autonomy and self-regulated learning reported lower levels of somatic and avoidance-related writing anxiety. This finding resonates with research highlighting the role of learner agency in mitigating anxiety and promoting engagement (20). AI-driven systems often allow learners to control the pace, timing, and focus of their writing practice, which can foster a sense of ownership and reduce feelings of helplessness commonly associated with writing tasks. Du (19) similarly reported that AI conversational agents enhanced self-regulated learning behaviors and retention among EFL learners, suggesting that autonomy-supportive technologies can indirectly influence affective outcomes such as anxiety.

From a motivational perspective, the present findings are consistent with studies demonstrating that positive attitudes toward AI-based learning environments are associated with higher motivation and persistence in language learning (18, 30). Writing anxiety has long been linked to negative motivational patterns, including avoidance and reduced effort (12, 13). By contrast, learners who perceive AI tools as motivating and helpful may be more willing to engage in challenging writing tasks, thereby weakening the anxiety–avoidance cycle described in earlier research (3). The present study extends this line of inquiry by demonstrating that learners' subjective perceptions of AI usage are a key mechanism through which technology influences emotional responses to writing.

The findings can also be interpreted through the lens of identity and investment theories in second language acquisition. Writing anxiety is not merely an individual emotional state but is embedded in learners' social identities and perceived opportunities for participation (5, 6). Learners who view AI tools as legitimate and valuable resources may perceive greater returns on their investment in writing, such as improved proficiency and academic success, which in turn reduces anxiety (7, 8). The present results align with Liu's (24) argument that sociocultural factors and learning contexts play a crucial role in shaping affective experiences in language learning. AI-enhanced environments may offer alternative spaces for identity construction, where learners can experiment with language use without the immediate social risks associated with traditional classrooms.

Another important finding was the differential impact of AI perceptions on various dimensions of writing anxiety. While overall anxiety levels were lower among learners with positive AI perceptions, the strongest effects were observed for avoidance behaviors, such as reluctance to start writing tasks. This is consistent with evidence that supportive learning environments can reduce avoidance by increasing learners' perceived competence and readiness (9, 10). AI tools that provide prompts, examples, and scaffolding may help learners overcome initial writing paralysis, a phenomenon frequently reported in studies of EFL writing anxiety (4). In this sense, AI may function as a cognitive and emotional scaffold that lowers the threshold for task initiation.

The present findings also converge with broader research on educational technology and learner well-being. Dai et al. (15) emphasized that readiness for the AI age includes emotional resilience and positive learning dispositions. The observed reduction in writing anxiety among learners with favorable AI perceptions suggests that AI-enhanced instruction may contribute to learners' overall well-being by reducing stress and negative emotions associated with language learning. This interpretation is supported by studies showing that technology-mediated learning environments can enhance learners' emotional comfort when designed with user experience and affective factors in mind (26, 27).

In addition, the findings complement earlier work on blended and collaborative writing environments. Challob (11) demonstrated that blended learning contexts reduced writing apprehension by providing multiple channels of support. AI-enhanced writing environments can be seen as an extension of this approach, offering personalized and continuous support that supplements peer and teacher feedback. Unlike traditional collaborative settings, however, AI tools may reduce social comparison and fear of embarrassment, which are known contributors to writing anxiety (14). This distinctive affordance of AI may explain its particularly strong association with reduced anxiety in the present study.

Despite these positive implications, the findings should be interpreted with caution. While the results indicate a robust association between AI perceptions and writing anxiety, they do not imply that AI usage alone is sufficient to eliminate anxiety. Previous research has shown that anxiety is influenced by a constellation of factors, including proficiency level, assessment practices, and cultural expectations (23). Moreover, learners' experiences with AI are shaped by the quality of tool design and pedagogical integration. As Kew (31) noted in the context of technology-enhanced pronunciation learning, technological innovation must be accompanied by sound instructional frameworks to achieve meaningful learning outcomes. Thus, the

effectiveness of AI in reducing writing anxiety depends on how these tools are implemented within broader curricular and assessment structures.

Overall, the discussion of results highlights that learners' perceptions of AI usage play a pivotal role in shaping affective outcomes in EFL writing. The findings corroborate and extend prior research by situating AI-assisted writing within established theoretical frameworks of anxiety, motivation, agency, and investment. By demonstrating that positive AI perceptions are associated with lower writing anxiety, the study contributes to a more nuanced understanding of how emerging technologies can support not only cognitive but also emotional dimensions of language learning.

Despite its contributions, the present study is subject to several limitations that should be acknowledged. First, the correlational design of the study limits the ability to draw causal inferences about the relationship between perceptions of AI usage and writing anxiety. Second, the reliance on self-report measures may have introduced response bias, as learners' reported anxiety and perceptions may not fully reflect their actual behaviors or emotional states during writing tasks. Third, the sample was drawn from a specific EFL context, which may limit the generalizability of the findings to other educational levels, cultural settings, or instructional environments with different levels of AI integration.

Future research could address these limitations by employing experimental or longitudinal designs to examine causal relationships between AI-enhanced writing instruction and changes in writing anxiety over time. Qualitative approaches, such as interviews or think-aloud protocols, could provide deeper insights into learners' subjective experiences with AI tools and the mechanisms through which these tools influence anxiety. Additionally, comparative studies across different AI applications and educational contexts would help clarify which features of AI-enhanced instruction are most effective in reducing writing anxiety.

From a practical perspective, language educators and curriculum designers should consider integrating AI-assisted writing tools in ways that emphasize learner autonomy, formative feedback, and emotional support. Teachers may benefit from professional development focused on pedagogically sound uses of AI that align with affect-sensitive writing instruction. Institutions should also ensure equitable access to AI technologies and provide guidance to help learners develop positive and informed perceptions of AI usage in language learning.

Acknowledgments

We would like to express our appreciation and gratitude to all those who helped us carrying out this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

References

1. Cheng YS. Factors associated with foreign language writing anxiety. Foreign Language Annals. 2002;35(5):647-56. doi: 10.1111/j.1944-9720.2002.tb01903.x.
2. Zorbaz KZ. Writing apprehension and measurement of it. e-Journal of New World Sciences Academy. 2011;6(3):2271-80.
3. Kara S. Writing anxiety: A case study on students' reasons for anxiety in writing classes. Anadolu Journal of Educational Sciences International. 2013;3(1):103-11.
4. Ekmekçi E. Exploring Turkish EFL students' writing anxiety. The Reading Matrix. 2018;18(1):158-75.
5. Norton B, Gao Y. Identity, investment, and Chinese learners of English. Journal of Asian Pacific Communication. 2008;18(1):109-20.
6. Norton B, Toohey K. Identity, language learning, and social change. Language Teaching. 2011;44(4):412-46.
7. Norton B. Identity, investment, and faces of English internationally. Chinese Journal of Applied Linguistics. 2015;38(4):375-91.
8. Norton B. Identity and language learning: Back to the future. TESOL Quarterly. 2016;50(2):475-9.
9. Lileikienė A, Danilevičienė L. Foreign language anxiety in student learning. Baltic Journal of Sport and Health Sciences. 2016;3(102):18-23. doi: 10.33607/bjshs.v3i102.61.
10. Sadiq JM. Anxiety in English language learning: A case study of English language learners in Saudi Arabia. English Language Teaching. 2017;10(7):1. doi: 10.5539/elt.v10n7p.
11. Challob AAI, Bakar NA, Latif H. Collaborative blended learning writing environment: Effects on EFL students' writing apprehension and writing performance. English Language Teaching. 2016;9(6):229-41. doi: 10.5539/elt.v9n6p22.
12. Graham S, Perin D. Writing next: Effective strategies to improve writing of adolescents in middle and high schools. Alliance for Excellent Education, 2007.
13. Graham S, Berninger V, Fan W. The structural relationship between writing attitude and writing achievement in first and third grade students. Contemporary Educational Psychology. 2007;32(3):516-36. doi: 10.1016/j.cedpsych.2007.01.00.
14. Chan AYW. Towards a taxonomy of written errors: Investigation into the written errors of Hong Kong Cantonese ESL learners. TESOL Quarterly. 2010;44(2):295-319. doi: 10.5054/tq.2010.219941.
15. Dai Y, Chai CS, Lin PY, Jong MS, Guo Y, Jian-jun Q. Promoting students' well-being by developing their readiness for the artificial intelligence age. Sustainability. 2020;12(16):6597. doi: 10.3390/su12166597.
16. Aliakbari M, Barzan P, Sayyadi M. Exploring the impact of AI chatbots on EFL learners' conversational proficiency. Journal of Interdisciplinary Research in English Language Communication. 2025;1(2):66-73. doi: 10.30470/IRELC.2025.2058730.1022.
17. Aydın-Yıldız A. Reducing writing anxiety in secondary school EFL learners through AI-enhanced writing instruction: A mixed-methods study. Journal of Computer and Education Research. 2025;13(26):1483-98. doi: 10.18009/1697983.
18. Aydın-Yıldız T. The impact of ChatGPT on language learners' motivation. Journal of Teacher Education and Lifelong Learning. 2023;5(2):582-97. doi: 10.51535/tell.1314355.

19. Du Q. How artificially intelligent conversational agents influence EFL learners' self-regulated learning and retention. Education and Information Technologies. 2025;30:21635-701. doi: 10.1007/s10639-025-13602-9.

20. Reeve J, Tseng M. Agency as a fourth aspect of student engagement during learning activities. Contemporary Educational Psychology. 2011;36:257-67. doi: 10.1016/j.cedpsych.2011.05.00.

21. Yu Z. The study of the correlation between AI-assisted EFL writing frequency and writing anxiety among Chinese university students. Academic Journal of Humanities & Social Sciences. 2024;7(7):44-59. doi: 10.25236/AJHSS.2024.070702.

22. Yılmaz A, Üstünel E. Exploring the impact of EFL learners' perceptions of AI usage in language learning on their perceived writing anxiety: A correlational study. Language Teaching and Educational Research. 2025;8(1):49-70. doi: 10.35207/later.1686314.

23. Wang S. The correlation between anxiety levels and foreign language learning among university students. Pacific International Journal. 2023;6(2):206-9. doi: 10.55014/pij.v6i2.385.

24. Liu C. A critical understanding of second language acquisition from two sociolinguistic strands: The variationist approach and the investment perspective. Journal of Language Teaching. 2023. doi: 10.54475/jlt.2023.006.

25. Wharton A, Eslami Z. Investment and benefits of adult female English language learners. International Journal of Business and Social Science. 2015;6(1):49-58.

26. Ebenezer J, Sitthiworachart J, Na KS. Architecture students' conceptions, experiences, perceptions, and feelings of learning technology use: Phenomenography as an assessment tool. Education and Information Technologies. 2021;27(2):1-25. doi: 10.1007/s10639-021-10654-5.

27. Setyaningrum RW, Purwati O, Sabgini KNW. Exploring pre-service teachers of English for young learners experience: Innovations during their teaching practicum. Journal of English Educators Society. 2022;7(1):77-92. doi: 10.21070/jees.v7i1.1645.

28. Karakuş-Tayşi E, Taşkın Y. Development of the writing anxiety scale for secondary school students: Reliability and validity study. Uluslararası Türkçe Edebiyat Kültür Eğitim Dergisi. 2018;7(2):1172-89.

29. Dauzón-Ledesma L, Izquierdo J. Language learning investment questionnaire. APA PsycTests; 2023.

30. Xodabande I, Babaii E. Directed motivational currents (DMCs) in self-directed language learning: An interpretative phenomenological analysis. Journal of Language and Education. 2021;7(3):201-12. doi: 10.17323/jle.2021.12856.

31. Kew SN, Mohamed F, Isham MIM, Siang CV, Tasir Z, Abas MA, editors. Virtual reality application integrated with learning analytics for enhancing English pronunciation: A conceptual framework. IEEE Conference on e-Learning, e-Management and e-Services (IC3e); 2020: IEEE.