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The mediating role of AI-assisted writing self-regulation on the predictors of writing quality

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Abstract

Aim: The increasing use of artificial intelligence (AI) writing tools has raised concerns about the writing quality of senior high school learners. This study aimed to determine whether AI-assisted writing self-regulation mediates the relationships of teacher feedback and writing mindfulness with learners' writing quality, providing insights into effective writing instruction and the responsible integration of AI in educational settings.

Methodology: This study employed a quantitative descriptive-correlational research design involving 224 Grade 12 Humanities and Social Sciences (HUMSS) learners from a public secondary school in Misamis Oriental, Philippines. Data were collected using three researcher-made questionnaires and an essay-writing activity assessed by two raters using an analytic rubric. Descriptive statistics, multiple regression, and path analysis with bias-corrected bootstrapping were employed to analyze the data.

Results: Findings revealed high levels of teacher feedback, writing mindfulness, and AI-assisted writing self-regulation, but only fair writing quality. The three variables jointly accounted for 12.8% of the variance in writing quality. Writing mindfulness and AI-assisted writing self-regulation positively predicted writing quality, whereas teacher feedback demonstrated a significant negative unique relationship with it. Furthermore, AI-assisted writing self-regulation significantly mediated the relationship between writing mindfulness and writing quality through complementary partial mediation, and between teacher feedback and writing quality through competitive mediation.

Conclusion: The findings highlight the importance of developing learners' writing mindfulness and their capacity to regulate their use of AI writing tools. Writing instruction may integrate AI literacy with explicit strategies for planning, monitoring, evaluating, and revising AI-assisted outputs, and teachers may pair feedback with opportunities to apply it. Future research may use longitudinal or experimental designs and examine feedback uptake and revision behavior.

Keywords: *AI-assisted writing self-regulation, teacher feedback, writing mindfulness, writing quality, senior high school learners, mediation analysis*

INTRODUCTION

Writing is an important skill for school, work, and daily communication (Graham et al., 2023), and weak writing in high school often continues into college (Mudau et al., 2025). Artificial intelligence (AI) writing tools such as ChatGPT, Grammarly, and QuillBot now give students instant feedback, grammar correction, and ready-made content (Kyambade et al., 2025; Levine et al., 2025). Students use them because they are useful and easy (Namatovu & Kyambade, 2025), but there are concerns about overdependence, weaker critical thinking, cheating, and loss of ownership of ideas (Cotton et al., 2024; Kasneci et al., 2023).

Whether AI helps or harms writing depends on how it is used (Pum, 2026). AI feedback improved high school students' writing (Ekizoğlu & Demir, 2025) and supported university students' self-regulated writing (Amani & Bisriyah, 2025), while heavy reliance may weaken independent thinking (Yang et al., 2025). Teachers now need to guide

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students in judging AI suggestions (Mohebbi, 2025), and assessments need to separate students' own writing from AI output (Cotton et al., 2024).

In the Philippines, many learners struggle with grammar, organization, coherence, and idea development (Ada & Funa, 2025) and with written English (Maramag-Manalastas & Batang, 2024). Grade 12 learners showed only developing writing skills (Patricio, 2022), and senior high school (SHS) students have difficulty writing clear and organized texts (Hajan et al., 2024; Mabasa & Protacio, 2025). Filipino SHS students may ignore teacher feedback when they lack confidence or receive too many comments (Taguba & Plata, 2025), and many now use AI tools such as QuillBot (Corcuera, 2024).

Locally, the study involved Grade 12 Humanities and Social Sciences (HUMSS) learners of a public secondary school in Misamis Oriental, Northern Mindanao. Based on the first author's personal experience and observations as a teacher, these learners showed recurring problems in sentence construction, vocabulary, paragraph development, and coherence, while easy access to AI tools has changed how they complete writing tasks and may limit independent writing.

Teacher feedback strongly influences learning (Mandouit & Hattie, 2023) but helps only when learners act on it (Dawson et al., 2024). Writing mindfulness, or staying focused and purposeful while writing, is less studied, although academic mindfulness is linked to resilience and self-regulated learning (Mahama et al., 2024).

Several gaps remained. Most studies looked at one factor at a time (Corcuera, 2024); few studied AI use and SHS writing quality (Mohebbi, 2025); most measured how often AI was used rather than how it was regulated; and few examined writing mindfulness (Cordeiro et al., 2022). Since outside and personal factors may affect performance through self-regulation (Bandura, 1986; Zimmerman, 2002), this study tested AI-assisted writing self-regulation as a mediator, used essays rated by two raters, and examined feedback and mindfulness in one model.

This study aimed to determine whether AI-assisted writing self-regulation mediates the relationships of teacher-provided writing feedback and writing mindfulness with the writing quality of SHS learners. The results may guide writing instruction, curriculum, teacher training, assessment, and Department of Education (DepEd) policies on responsible AI use, in support of United Nations Sustainable Development Goal 4 (SDG 4).

Review of Related Literature and Studies

Writing Quality

Writing quality has many dimensions and develops through language skills, transcription, and higher-order thinking (Kim & Graham, 2022), and it improves through strategy instruction, feedback, and revision (Graham et al., 2023). Filipino learners have difficulty with coherence and organization (Ada & Funa, 2025; Hajan et al., 2024). These studies guided the five rubric dimensions: content, grammar, organization of ideas, coherence of sentences, and mechanics.

AI-Assisted Writing Self-Regulation

AI-assisted writing self-regulation is the extent to which students plan, monitor, and evaluate their use of AI tools in writing; it is about students' control over when, why, and how they use AI, not just their acceptance of it. AI helps when students check and change its output instead of copying it (Heydarnejad, 2025; Levine et al., 2025). Guided AI use improved independence and writing (Heydarnejad, 2025; Mohebbi, 2025), while unregulated use led to cognitive inertia (Yang et al., 2025) and unoriginal writing (Wang et al., 2024). Students use ChatGPT when it is useful and easy (Namatovu & Kyambade, 2025), but this does not mean responsible use; regulation seems to explain these mixed results (Shi et al., 2025).

Teacher-Provided Writing Feedback

Teacher-provided writing feedback refers to students' views of the quality, clarity, frequency, and usefulness of their teachers' feedback on writing. Feedback works only when students act on it (Dawson et al., 2024; Lipnevich & Panadero, 2021; Zhang & Mao, 2023). Corrective feedback can improve accuracy (Brown et al., 2026; Nguyen & Chu, 2024), especially when focused on a few errors (Mao et al., 2024), while feedback that builds self-regulation improved writing more than task-level feedback (Yang et al., 2022). Gains depend on how students use feedback in revision (Cheng et al., 2023; Lau et al., 2024), and researchers now ask how teacher and AI feedback can work together (Lee, 2024).

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Writing Mindfulness

Writing mindfulness is the extent to which students stay attentive, reflective, and purposeful while writing. It is narrower than general mindfulness in daily life and academic mindfulness in learning, which is linked to resilience and self-regulated learning (Mahama et al., 2024). Studies on writing are few: mindful acceptance predicted sixth-graders' writing (Cordeiro et al., 2022), and a mindful writing program reduced emotions linked to writer's block (Strickland et al., 2023). Since planning, monitoring, and revising improve writing (Klein et al., 2022), mindfulness may support these steps and help students judge AI suggestions carefully.

Relationships Among the Study Variables

Feedback models put self-regulation at the center of how feedback works (Lipnevich & Panadero, 2021), and feedback that targeted self-regulation improved writing (Yang et al., 2022). Planning and monitoring are tied to writing development (Sun & Wang, 2020), and self-regulated learning predicted writing in AI-supported settings (Shi et al., 2025). These place self-regulation between feedback and mindfulness and writing quality, which supports testing AI-assisted writing self-regulation as a mediator (Hayes, 2022).

Synthesis and Research Gap

In sum, writing can be taught, AI helps when regulated, feedback helps when used, and mindfulness supports writing. However, most studies involved university students, studied variables separately, or measured how often AI was used, and few examined how feedback and mindfulness relate to AI use (Lee, 2024), which this study addressed among SHS learners.

Theoretical and Conceptual Framework

This study was anchored on Self-Regulated Learning Theory (Zimmerman, 2002), supported by Social Cognitive Theory (Bandura, 1986), Feedback Intervention Theory (Kluger & DeNisi, 1996), and the Technology Acceptance Model (Davis, 1989). Self-Regulated Learning Theory is the main theory because the mediator is about self-regulation; its forethought, performance, and self-reflection phases became the three dimensions of the AI-Assisted Writing Self-Regulation Scale (planning AI use, checking and revising AI suggestions, and judging whether the final text is one's own). Social Cognitive Theory treats feedback as an environmental factor and mindfulness as a personal factor. Feedback Intervention Theory explains that feedback directs attention but does not always improve performance, and the Technology Acceptance Model explains why learners use AI, although using a tool is different from regulating it.

Together, these theories position AI-assisted writing self-regulation as a possible process linking feedback and mindfulness to writing quality, and they guided the variables, items, and interpretation (Figure 1).

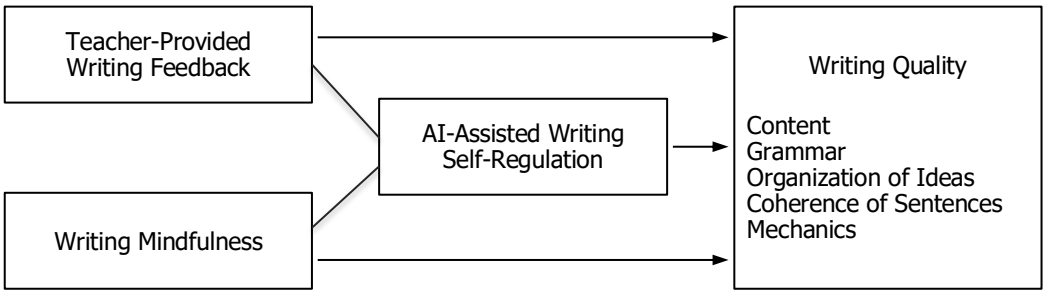


Figure 1
Schematic Presentation of the Study

Statement of the Problem

Senior high school learners are expected to produce written outputs with clear content, appropriate grammar, logical organization, coherence, and proper mechanics, yet quality writing remains an educational challenge as learners increasingly use AI writing tools to plan, draft, and revise their work. The usefulness of these tools may depend on how learners regulate their use, evaluate AI-generated suggestions, and retain responsibility for their own writing, and this regulation may also help explain how teacher-provided writing feedback and writing mindfulness are associated with writing quality. However, little is known about how these factors operate together among senior high school

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learners, and such evidence can inform teachers' feedback practices, learners' responsible use of AI, and writing instruction.

Thus, this study examined the relationships among teacher-provided writing feedback, writing mindfulness, AI-assisted writing self-regulation, and writing quality, with particular attention to the mediating role of AI-assisted writing self-regulation. The study covered Grade 12 HUMSS learners enrolled in one public secondary school in Misamis Oriental during School Year 2026–2027.

Research Objectives

General Objective

To determine the mediating role of AI-assisted writing self-regulation in the relationships of teacher-provided writing feedback and writing mindfulness with the writing quality of senior high school learners.

Specific Objectives

Specifically, the study aimed:

1. To determine the level of teacher-provided writing feedback as perceived by senior high school learners;
2. To determine the extent of writing mindfulness among senior high school learners;
3. To determine the extent of AI-assisted writing self-regulation among senior high school learners;
4. To determine the level of writing quality of senior high school learners in terms of content, grammar, organization of ideas, coherence of sentences, and mechanics;
5. To determine whether teacher-provided writing feedback, writing mindfulness, and AI-assisted writing self-regulation significantly predict the writing quality of senior high school learners; and
6. To determine whether AI-assisted writing self-regulation significantly mediates the relationships of teacher-provided writing feedback and writing mindfulness with the writing quality of senior high school learners.

Research Questions

1. What is the level of teacher-provided writing feedback as perceived by senior high school learners?
2. What is the extent of writing mindfulness among senior high school learners?
3. What is the extent of AI-assisted writing self-regulation among senior high school learners?
4. What is the level of writing quality of senior high school learners in terms of content, grammar, organization of ideas, coherence of sentences, and mechanics?
5. To what extent do teacher-provided writing feedback, writing mindfulness, and AI-assisted writing self-regulation significantly predict the writing quality of senior high school learners?
6. Does AI-assisted writing self-regulation significantly mediate the relationship between teacher-provided writing feedback and the writing quality of senior high school learners?
7. Does AI-assisted writing self-regulation significantly mediate the relationship between writing mindfulness and the writing quality of senior high school learners?

Hypotheses

Based on the theoretical framework and review of related literature, the following null hypotheses were tested at the .05 level of significance:

H_o1: Teacher-provided writing feedback, writing mindfulness, and AI-assisted writing self-regulation do not significantly predict the writing quality of senior high school learners when considered jointly.

H_o2: Teacher-provided writing feedback does not significantly predict the writing quality of senior high school learners.

H_o3: Writing mindfulness does not significantly predict the writing quality of senior high school learners.

H_o4: AI-assisted writing self-regulation does not significantly predict the writing quality of senior high school learners.

H_o5: The indirect effect of teacher-provided writing feedback on writing quality through AI-assisted writing self-regulation is not statistically significant.

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$H_0$6: The indirect effect of writing mindfulness on writing quality through AI-assisted writing self-regulation is not statistically significant.

METHODOLOGY

Research Design

This study employed a quantitative descriptive-correlational design, which describes variables and examines their relationships without manipulation (Creswell & Creswell, 2023). The descriptive component addressed Research Questions 1 to 4 and the correlational component Research Questions 5 to 7; the mediation analysis estimated indirect statistical relationships and did not establish causality.

Participants and Sampling

The participants were Grade 12 HUMSS learners of a public secondary school in Misamis Oriental, Philippines, during the second term of School Year 2026–2027. Through attempted total enumeration, all 230 Grade 12 HUMSS learners were invited. Learners were included if they were enrolled in Grade 12, had at least one semester of SHS writing instruction, reported access to and familiarity with AI tools such as ChatGPT, Grammarly, and QuillBot, and gave consent, with parental or guardian consent for minors. The AI-familiarity criterion was needed because the AI-Assisted Writing Self-Regulation Scale asked how learners regulate their AI use, so the findings apply to AI-using learners. Of the 230 learners, 224 (97.39%) completed all instruments; the other six were absent.

Instruments

Three researcher-made questionnaires with 15 items each were used. The Teacher's Writing Instruction Feedback Questionnaire covered clarity (Items 1–2), specificity (3, 8), timeliness (4–5), frequency (6, 15), and constructiveness (7, 9–14), rated from 1 (*strongly disagree*) to 5 (*strongly agree*). The Writing Mindfulness Scale covered attention to the writing process (1–4), awareness of language choices (5–8), and purposeful engagement (9–15), and the AI-Assisted Writing Self-Regulation Scale covered forethought (1–6), performance/self-control (7–11), and self-reflection (12–15), both rated from 1 (*never*) to 5 (*always*). Means were interpreted as Very High (4.51–5.00), High (3.51–4.50), Moderate (2.51–3.50), Low (1.51–2.50), or Very Low (1.00–1.50). The fourth instrument was an essay scored from 1 to 5 on content, grammar, organization of ideas, coherence of sentences, and mechanics using an analytic rubric; overall writing quality was the mean of the five scores, interpreted as Outstanding, Very Good, Good, Fair, or Poor using the same ranges.

Three doctorate-holding experts in English language education, writing instruction, measurement, and research validated the instruments for clarity, relevance, and appropriateness, and their comments guided the revisions. A pilot test with 15 SHS learners outside the sample gave McDonald's omega (ω) of .892, .866, and .906 for the three questionnaires, above the .70 criterion (Hair et al., 2019), although these are preliminary given the small pilot. The essays were rated separately by the first author and an inter-rater with a PhD in English language teaching who did not teach the participating classes; both practiced the rubric on non-study essays, rated coded essays, and settled differences through discussion or by averaging. A two-way, consistency, average-measures intraclass correlation coefficient (ICC), computed in R using the irr package, showed good reliability for content (.809) and moderate reliability for organization of ideas (.693), grammar (.667), coherence of sentences (.666), and mechanics (.640; Koo & Li, 2016). These moderate values are a limitation: scores for these four dimensions were less consistent across raters than content scores, so dimension-level results and relationships involving writing quality should be interpreted with caution. All reliability results were certified by a statistician.

Data Collection

After ethical clearance and permission from the Schools Division Office and the school principal were obtained, the instruments were administered face-to-face in classrooms using paper-based forms during the second term of School Year 2026–2027. In a single one-hour session, learners answered the three questionnaires and wrote an essay on the same topic given by the first author, following standardized instructions, with the first author or trained research assistants present. The essay was written independently under supervision without AI tools or devices, so the AI-assisted writing self-regulation scale described learners' usual practices rather than their behavior during the essay. Forms were collected immediately, checked for completeness, coded, and encoded.

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Data Analysis

IBM SPSS Statistics was used for the descriptive and regression analyses, and IBM SPSS AMOS for the path analysis. Frequency, percentage, mean, and standard deviation answered Research Questions 1 to 4. For Research Question 5, multiple regression was used with the three predictors entered together; there was no multicollinearity (variance inflation factor [VIF] = 1.30–2.09; tolerance = .479–.769), and the Shapiro–Wilk test and Q–Q plot showed a mild departure from normal residuals (W = 0.982, p = .007), to which regression is generally robust in samples of this size (Field, 2024). For Research Questions 6 and 7, feedback and mindfulness were entered as correlated predictors, AI-assisted writing self-regulation as the mediator, and writing quality as a latent variable measured by its five dimensions. Fit was judged using the chi-square to degrees-of-freedom ratio (CMIN/df), comparative fit index (CFI), Tucker–Lewis index (TLI), standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), and test of close fit (PClose) (Hu & Bentler, 1999). Effects were tested through bias-corrected bootstrapping with 5,000 samples (Hayes, 2022; Preacher & Hayes, 2008), and mediation was classified as complementary, competitive, or indirect-only (Zhao et al., 2010).

Ethical Considerations

The study was approved through review by the Lourdes College Research Ethics Committee (LC-REC Code 20262027269-MDA; August 17, 2026). Consent was obtained from participants aged 18 and above, and parental consent and student assent from those below 18. The first author handled all forms rather than the learners' teachers to avoid pressure; participation was voluntary, and the essays were not graded. Codes replaced names, data were kept in a locked cabinet and on encrypted devices, and data will be destroyed after five years. The study followed the Data Privacy Act of 2012 (Republic of the Philippines, 2012) and the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979) and was self-funded with no conflict of interest.

RESULTS AND DISCUSSION

Levels of Teacher-Provided Writing Feedback, Writing Mindfulness, and AI-Assisted Writing Self-Regulation

Table 1

Levels of Teacher-Provided Writing Feedback, Writing Mindfulness, and AI-Assisted Writing Self-Regulation (N = 224)

Variable	*M*	*SD*	Very High (%)	High (%)	Mod. (%)	Low (%)	Level
Teacher-provided writing feedback	3.79	0.47	4.91	70.54	23.21	1.34	High
Writing mindfulness	3.79	0.48	4.91	67.86	25.45	1.79	High
AI-assisted writing self-regulation	3.91	0.57	17.41	58.48	23.21	0.89	High

Note. No participant obtained a Very Low rating on any scale.

As shown in Table 1, the learners rated teacher-provided writing feedback as high (M = 3.79, SD = 0.47). They found it most helpful in improving content and grammar (M = 4.04 each) and less so in its timing (M = 3.52), regularity (M = 3.56), and the class time given for revision (M = 3.58). This suggests that the feedback was useful but did not always come early enough or with enough time to act on it. Since feedback helps only when learners use it (Dawson et al., 2024), returning feedback sooner and giving time to revise may make it more useful.

Writing mindfulness was also high (M = 3.79, SD = 0.48). The learners were most careful in choosing words (M = 4.14) but less aware when their attention drifted (M = 3.51). This supports the view that writing involves planning, monitoring, and adjusting (Sun & Wang, 2020) and shows that keeping focus is the part learners find hardest.

AI-assisted writing self-regulation was likewise high (M = 3.91, SD = 0.57). The learners often identified where they needed AI help (M = 4.12) and planned how to use it (M = 4.08), but they were less likely to check whether the final output showed their own voice (M = 3.73) and ability (M = 3.75). They plan their AI use well but pay less attention to ownership, which matters because AI can weaken originality and authorship (Cotton et al., 2024; Kasneci et al., 2023).

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Level of Writing Quality

Table 2

Distribution and Level of Writing Quality of the Participants (N = 224)

Dimension	Poor (%)	Fair (%)	Good (%)	Very Good (%)	*M*	*SD*	Level
Content	26.79	43.75	27.23	2.23	2.27	0.79	Fair
Grammar	39.29	48.66	12.05	0.00	1.98	0.62	Fair
Organization of ideas	49.11	37.95	11.61	1.34	1.88	0.72	Fair
Coherence of sentences	51.34	37.50	10.71	0.45	1.89	0.67	Fair
Mechanics	56.70	36.61	6.70	0.00	1.81	0.51	Fair
Overall writing quality					1.96	0.62	Fair

Note. No essay reached the Outstanding level in any dimension.

As shown in Table 2, overall writing quality was fair (M = 1.96, SD = 0.62). Most essays had limited ideas, frequent grammar errors, weak organization, poorly connected sentences, and many mechanical errors, which describe the Fair level of the rubric. Content was the strongest dimension (M = 2.27) and mechanics the weakest (M = 1.81), although the moderate inter-rater agreement in four dimensions (ICC = .640–.693) means that these dimension scores, and the small differences among them, should be interpreted with caution. Since all five dimensions were fair, the learners need support in both developing ideas and using language correctly. This agrees with earlier findings on Filipino learners (Ada & Funa, 2025; Hajan et al., 2024) and supports the use of strategy instruction, feedback, and revision in writing classes (Graham et al., 2023).

Teacher-Provided Writing Feedback, Writing Mindfulness, and AI-Assisted Writing Self-Regulation as Predictors of Writing Quality

Table 3

Multiple Regression Analysis of Teacher-Provided Writing Feedback, Writing Mindfulness, and AI-Assisted Writing Self-Regulation on Writing Quality

Predictor	*B*	*SE*	β	95% CI	*t*	*p*
(Constant)	0.74	0.36		[0.03, 1.46]	2.039	.043
Teacher-provided writing feedback	−0.20	0.09	−.153	[−0.38, −0.01]	−2.135	.034
Writing mindfulness	0.25	0.12	.198	[0.02, 0.48]	2.179	.030
AI-assisted writing self-regulation	0.26	0.10	.240	[0.07, 0.45]	2.712	.007

Note. R = .358, R^2 = .128, adjusted R^2 = .116, $F(3, 220)$ = 10.763, p < .001. TWF = teacher-provided writing feedback; WM = writing mindfulness; AWSR = AI-assisted writing self-regulation; WQ = writing quality. Model equation: WQ = 0.74 − 0.20(TWF) + 0.25(WM) + 0.26(AWSR). H_o1 to H_o4 were rejected at the .05 level.

As shown in Table 3, the three variables together significantly predicted writing quality, $F(3, 220)$ = 10.763, p < .001; thus, H_o1 was rejected. They explained 12.8% of the variance (adjusted R^2 = .116; f^2 = .147; Cohen, 1988), which indicates that other factors are also associated with writing quality. AI-assisted writing self-regulation was the strongest positive predictor (β = .240, p = .007; H_o4 rejected), followed by writing mindfulness (β = .198, p = .030; H_o3 rejected). Learners who planned, checked, and owned their AI use tended to write better, which supports the view that the value of AI depends on how it is used (Kasneci et al., 2023).

Teacher-provided writing feedback also predicted writing quality, but negatively (β = −.153, p = .034); thus, H_o2 was rejected. When writing mindfulness and AI-assisted writing self-regulation were held constant, learners who reported more feedback tended to have lower essay scores. Since the design was correlational, this does not mean that feedback lowers writing quality. One likely reason is that teachers give more feedback to learners who struggle, so weaker writers report receiving more of it; Katsantonis et al. (2023) likewise found a negative link between perceived teacher feedback and achievement. Another reason may be the kind of feedback given, as feedback that mainly corrects errors may help less than feedback that shows learners how to improve (Mao et al., 2024; Yang et al., 2022). Receiving feedback is also different from using it, since learners do not always understand, accept, or apply comments when they revise (Cheng et al., 2023; Lau et al., 2024). These possible reasons were not tested in this study and may be examined in future research. The result may also be partly statistical, because feedback was related to mindfulness (r

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= .46) and related predictors can change the direction of a coefficient (Field, 2024), even though multicollinearity was not a problem (VIF = 1.30). Thus, the finding does not call for less feedback; rather, it shows that how feedback is given and used, especially through chances to revise, matters.

Mediating Role of AI-Assisted Writing Self-Regulation

The path model fit the data acceptably (CMIN/df = 1.971, CFI = .991, TLI = .983, SRMR = .020, RMSEA = .066, 90% CI [.029, .101], PClose = .205; Hu & Bentler, 1999), although the chi-square test was significant, $\chi^2(15) = 29.565$, $p = .014$, as often happens in larger samples (Hair et al., 2019). The five dimensions loaded strongly on writing quality (.86 to .95), with two pairs of correlated errors (content–mechanics, $r = -.45$; grammar–organization, $r = -.44$). As shown in Figure 2, writing mindfulness (β = .64, $p = .020$) and teacher-provided writing feedback (β = .12, $p = .018$) were positively related to AI-assisted writing self-regulation and together explained 49% of it, and AI-assisted writing self-regulation was positively related to writing quality (β = .24).

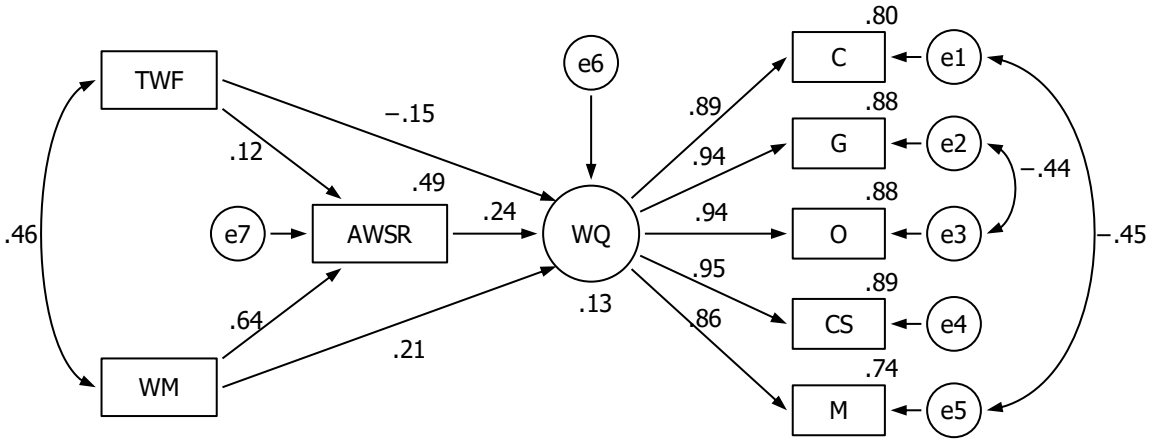


Figure 2

Best-Fit Mediation Model of Teacher-Provided Writing Feedback, Writing Mindfulness, AI-Assisted Writing Self-Regulation, and Writing Quality

Note. Standardized estimates. TWF = teacher-provided writing feedback; WM = writing mindfulness; AWSR = AI-assisted writing self-regulation; WQ = writing quality; C, G, O, CS, and M = content, grammar, organization of ideas, coherence of sentences, and mechanics; e = error term. Values above AWSR and below WQ are squared multiple correlations.

Table 4

Total, Direct, and Indirect Effects of Teacher-Provided Writing Feedback and Writing Mindfulness on Writing Quality Through AI-Assisted Writing Self-Regulation

Path	Total effect (p)	Direct effect (p)	Indirect effect (p)	Type of mediation	Decision
TWF → AWSR → WQ	−0.183 (.076)	−0.226 (.047)	0.042 (.012)	Competitive	Reject H₀5
WM → AWSR → WQ	0.530 (.004)	0.305 (.049)	0.225 (.046)	Complementary partial	Reject H₀6

Note. Unstandardized estimates. *p* values are bias-corrected bootstrap two-tailed significance values (5,000 samples). TWF = teacher-provided writing feedback; WM = writing mindfulness; AWSR = AI-assisted writing self-regulation; WQ = writing quality. Classification follows Zhao et al. (2010).

Table 4 shows that writing mindfulness was related to writing quality both directly ($B = 0.305$, $p = .049$) and indirectly through AI-assisted writing self-regulation ($B = 0.225$, $p = .046$), which indicates complementary partial mediation; thus, H₀6 was rejected. The estimated indirect effect through AI-assisted writing self-regulation accounted for approximately 42.5% of the total association between writing mindfulness and writing quality. This finding suggests that AI-assisted writing self-regulation may represent an important statistical pathway linking these variables. For teacher-provided writing feedback, the indirect effect was positive ($B = 0.042$, $p = .012$) while the direct effect was

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negative ($B = -0.226$, $p = .047$), which indicates competitive mediation; thus, $H_0 5$ was rejected. These opposite paths may account for the nonsignificant total effect ($B = -0.183$, $p = .076$), since mediation is judged by the indirect effect (Zhao et al., 2010). Feedback was therefore associated with better writing only through its positive association with learners' regulated use of AI.

These results support Social Cognitive Theory and Self-Regulated Learning Theory, as both an environmental factor (feedback) and a personal factor (mindfulness) were linked to writing quality through learners' self-regulation. They partly support Feedback Intervention Theory (Kluger & DeNisi, 1996), since feedback was linked to better writing only through this path. Because the data were gathered at one time, these relationships are associations rather than proof of cause and effect. The moderate inter-rater reliability in four dimensions may also have added measurement error to writing-quality scores and weakened the observed associations.

Conclusions

Based on the findings of the study, the following conclusions were drawn:

The learners rated their teachers' feedback, their writing mindfulness, and their regulation of AI use as high, but they saw the timing of feedback, time for revision, keeping focus, and ownership of AI-assisted work as areas to improve.

Despite these positive ratings, their writing quality was only fair in all five dimensions, with content highest and mechanics lowest. The learners' positive views of their writing support and practices did not match their actual writing performance.

Teacher-provided writing feedback, writing mindfulness, and AI-assisted writing self-regulation together explained 12.8% of writing quality. Mindfulness and AI-assisted writing self-regulation were positive predictors, while perceived feedback was a negative predictor when the other variables were controlled, a result that needs further study.

AI-assisted writing self-regulation partly mediated the relationship of writing mindfulness with writing quality (complementary mediation) and of teacher-provided writing feedback with writing quality (competitive mediation). How learners regulate their AI use therefore appears to be an important statistical link between feedback, mindfulness, and writing quality, although the cross-sectional design does not establish cause and effect.

These findings support Social Cognitive Theory (Bandura, 1986) and Self-Regulated Learning Theory (Zimmerman, 2002), partly support Feedback Intervention Theory (Kluger & DeNisi, 1996), and agree with the Technology Acceptance Model (Davis, 1989) only in part, since using AI was not enough unless it was used purposefully. Writing instruction for senior high school learners should therefore combine feedback, self-regulation, and responsible AI use.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are offered:

1. Senior High School Learners. Learners may monitor their attention, ideas, and language choices while writing; identify specific needs before using AI tools; critically evaluate AI suggestions; and revise outputs so that submitted work reflects their own understanding and abilities.
2. English Language Teachers. Teachers may give timely, specific, and actionable feedback; allot class time for revision; model writing strategies; and guide learners in evaluating AI-generated suggestions and explaining the revisions they make.
3. School Administrators. School administrators may organize professional development on writing feedback, writing assessment, learner self-regulation, and responsible AI integration, and set institutional guidelines on acceptable AI-assisted writing practices.
4. Curriculum Developers. Curriculum developers may integrate writing mindfulness, self-regulated writing strategies, and responsible AI literacy into English learning competencies and into materials that address content, grammar, organization of ideas, coherence of sentences, and mechanics.
5. Teacher Education Institutions and Programs. Teacher education institutions may include training on formative writing feedback, writing assessment, self-regulated learning, and responsible AI-assisted instruction in teacher preparation and professional development programs.
6. Future Researchers. Future researchers may replicate the study with learners from other strands, grade levels, schools, and contexts; use longitudinal or experimental designs to test whether interventions in writing

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mindfulness, teacher feedback, and AI-assisted writing self-regulation are associated with improved writing quality; examine the negative link between teacher feedback and writing quality by measuring prior proficiency, feedback uptake, revision behavior, and the type of feedback received; and use more raters, more extensive rater training, or several essays per learner to improve the reliability of writing-quality scores.

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