

DEVELOPING METACOGNITIVE AWARENESS THROUGH AI-SUPPORTED PROCESS WRITING IN EFL CONTEXTS

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ABSTRACT: In recent years, artificial intelligence (AI) writing tools have entered English as a foreign language writing classrooms and have created new opportunities for feedback, revision, and learner reflection. However, the value of AI support depends not only on the accuracy of automated suggestions but also on whether learners can plan, monitor, and evaluate their own writing decisions. This proposed study investigates the effect of AI-supported process writing on EFL learners' metacognitive awareness in writing and explores students' perceptions of using AI feedback during drafting and revision. The study is designed for intermediate EFL learners who will complete a process-writing intervention in which AI tools are used as supplementary feedback sources rather than as text generators. Data are planned to be collected through a metacognitive awareness questionnaire, students' writing drafts, semi-structured interviews, and classroom observation notes. The expected contribution of the study is to clarify how structured AI-supported writing activities may encourage learners to become more strategic, reflective, and responsible writers in EFL contexts.

Keywords: *AI-supported writing, process writing, metacognitive awareness, EFL learners, writing feedback, student perception*

Introduction

Writing is widely recognized as one of the most demanding skills for EFL learners because it requires the simultaneous control of ideas, organization, vocabulary, grammar, mechanics, audience awareness, and revision. In traditional EFL classrooms, students often treat writing as a one-time product submitted to the teacher for correction. This product-oriented habit may limit learners' opportunities to reflect on how they generate ideas, make choices, revise sentences, and evaluate the effectiveness of their texts. Process writing addresses this problem by viewing writing as a recursive activity that includes planning, drafting, receiving feedback, revising, editing, and publishing (Flower & Hayes, 1981; Hyland, 2003).

At the same time, AI-supported writing tools have become increasingly available to language learners. Automated writing evaluation systems, grammar checkers, and generative AI assistants can provide immediate feedback on grammar, vocabulary, cohesion, and clarity. Earlier research on automated writing evaluation shows that computer-generated feedback can support revision when it is integrated with teacher guidance and classroom instruction (Warschauer & Grimes, 2008; Li, Link, & Hegelheimer, 2015; Stevenson & Phakiti, 2014). More recent studies on intelligent writing assistance and generative AI suggest that these tools may help learners notice language problems, compare alternatives, and engage in repeated revision (Godwin-Jones, 2022; Kohnke, Moorhouse, & Zou, 2023). However, AI tools may also lead to overdependence, superficial correction, and uncritical acceptance of machine suggestions if students are not guided to use them strategically.

For this reason, metacognitive awareness is central to AI-supported writing. Metacognition refers to learners' knowledge about their own thinking and their ability to regulate learning through planning, monitoring, and evaluation (Flavell, 1979; Schraw & Dennison, 1994). In writing, metacognitive awareness enables learners to set goals, select strategies, identify problems, evaluate feedback, and decide which revisions are meaningful. In EFL contexts, where students may lack confidence and have limited exposure to authentic feedback, AI-supported process writing can become a useful pedagogical approach only when AI feedback is connected to reflection and learner decision-making.

Although a growing body of research has examined automated feedback and second language writing quality, fewer studies have focused specifically on how AI-supported process writing develops learners' metacognitive awareness. In addition, many learners' perceptions of AI tools are still mixed: some view AI as a helpful writing partner, while others may use it mainly to correct errors or produce ready-made texts. Therefore, this study aims to investigate both the development of metacognitive awareness and the learners' perceptions of AI-supported process writing in an EFL classroom.

The following research questions guide the proposed study: (1) Does AI-supported process writing improve EFL learners' metacognitive awareness in writing, particularly planning, monitoring, and evaluation? (2) How do EFL learners perceive the use of AI tools during the stages of process writing? (3) What difficulties do learners experience when using AI feedback for revision?

Literature Review

Metacognitive awareness in EFL writing

Metacognitive awareness has long been regarded as a key factor in successful language learning. Flavell (1979) defined metacognition as knowledge and regulation of cognitive processes, while Schraw and Dennison (1994) further distinguished between knowledge of cognition and regulation of cognition. In language learning, Wenden (1998) argued that metacognitive knowledge helps learners understand themselves as learners, the nature of learning tasks, and the strategies needed to complete those tasks. Applied to writing, metacognitive awareness includes understanding what makes a text effective, knowing which strategies can help during writing, monitoring the success of those strategies, and evaluating the final product.

EFL writers often struggle not only because they lack language knowledge but also because they lack strategic control over the writing process. Students may begin writing without planning, revise only surface-level grammar errors, or rely entirely on teacher correction. Metacognitively aware writers, in contrast, are more likely to generate ideas before drafting, check whether each paragraph supports the thesis, evaluate whether feedback matches their intended meaning, and revise with clear goals. Thus, the development of metacognitive awareness is closely linked with writing improvement

because it helps learners become active managers of their own learning rather than passive receivers of correction.

Process writing as a framework for reflection

Process writing provides a suitable instructional framework for developing metacognitive awareness because it makes the hidden stages of writing visible. Instead of asking students to submit only one final composition, the teacher guides learners through pre-writing, drafting, peer or teacher feedback, revision, editing, and final submission. Flower and Hayes (1981) explained writing as a cognitive process involving planning, translating ideas into text, and reviewing. Hyland (2003) also emphasized that second language writing instruction should help learners understand writing as purposeful communication shaped through multiple drafts and feedback.

In process writing classrooms, students are encouraged to ask questions such as: What is my purpose? Who is my reader? Does my paragraph support the main idea? Which feedback should I accept, reject, or modify? These questions are metacognitive in nature. Therefore, process writing does not only improve the written product; it also trains learners to monitor and evaluate their composing decisions. This is particularly important in EFL contexts where learners may have limited chances to practice extended writing and may view revision as correcting mistakes rather than rethinking meaning.

AI-supported writing feedback

AI-supported writing refers to the use of intelligent digital tools to assist learners during composing and revision. These tools may include automated writing evaluation platforms, grammar and style checkers, lexical suggestion tools, and generative AI systems. Research on automated writing evaluation has shown that such tools can provide timely feedback and increase opportunities for revision (Warschauer & Grimes, 2008). Li et al. (2015) found that automated feedback can be useful in ESL writing instruction when learners are taught how to interpret and apply feedback. Stevenson and Phakiti's (2014) review also indicated that computer-generated feedback can have positive effects on writing quality, although the effects depend on context, task design, and learner engagement.

Recent discussions of generative AI in language education have shifted attention from simple correction to interactive writing assistance. Godwin-Jones (2022) described AI writing assistance as a form of partnership in which learners can receive suggestions, compare language options, and develop greater awareness of textual choices. Kohnke et al. (2023) noted that ChatGPT and similar tools may support language teaching and learning, but responsible use requires clear pedagogical purposes, ethical guidance, and critical evaluation. Therefore, AI should not replace the teacher or the learner's thinking. Instead, it should be embedded in a writing process that requires students to justify their choices and reflect on revisions.

AI-supported process writing and metacognitive awareness

The connection between AI support and metacognitive awareness lies in the way learners respond to feedback. AI tools can highlight possible problems and offer alternatives, but they cannot automatically produce learning. Learners develop metacognitive awareness when they examine the suggestion, compare it with their communicative intention, decide whether it improves the text, and record what they have learned. In this sense, AI feedback becomes a prompt for reflection rather than an answer to be copied.

An AI-supported process-writing cycle can be designed to encourage three metacognitive actions. First, during planning, students set writing goals, brainstorm ideas, and predict areas where they may need support. Second, during drafting and AI feedback, students monitor their text by identifying recurring problems and evaluating the relevance of AI suggestions. Third, during revision and final reflection, students explain which changes they made, which suggestions they rejected, and what strategies they will use in future writing. Such a cycle links AI use with learner agency and reduces the risk of overdependence.

Despite the potential benefits, several challenges remain. AI feedback may be inaccurate, too general, or unsuitable for a learner's intended meaning. Students may accept suggestions without understanding them, use AI to generate complete paragraphs, or focus only on grammar while ignoring content and organization. These challenges show why teacher scaffolding, reflection sheets, and interviews are necessary in research on AI-supported writing. Understanding students' perceptions can reveal whether AI is

experienced as a helpful partner, a confusing source of feedback, or a shortcut that weakens independent writing.

Methodology

Research design

This proposed study will employ a mixed-methods design. The quantitative component will examine changes in learners' metacognitive awareness before and after an AI-supported process-writing intervention. The qualitative component will explore learners' experiences through semi-structured interviews, reflection sheets, and classroom observation notes. This design is appropriate because metacognitive awareness involves both measurable strategy use and personal interpretations of learning experiences.

Participants

The participants will be approximately 100 intermediate EFL learners from several intact English classes at a secondary school, language center, or university foundation program. They will be selected through convenience sampling because the study requires regular classroom access and repeated writing sessions. To make the participants relatively homogeneous, learners will complete a short writing placement task before the intervention. Students whose writing performance falls within an intermediate band will be invited to participate in the study.

The expected age range of participants will be 15 to 20, depending on the educational context in which the study is conducted. Both male and female learners may be included if available. None of the participants should have received formal training in AI-supported process writing before the study. All participants will be informed that AI tools are used only as learning support and that final writing decisions must be made by the students themselves.

Instrumentation

Metacognitive awareness in writing questionnaire

A metacognitive awareness in writing questionnaire will be adapted from established metacognitive frameworks such as Schraw and Dennison's (1994) Metacognitive

Awareness Inventory and writing-strategy studies in second language learning. The questionnaire will include Likert-scale items on three main categories: planning, monitoring, and evaluation. Sample items may include: “Before writing, I set a clear goal for my text”; “While writing, I check whether my ideas are connected”; and “After receiving feedback, I decide which suggestions are useful for my purpose.” The questionnaire will be administered before and after the intervention. Content validity will be checked by EFL writing experts, and internal reliability will be calculated after data collection.

Writing tasks and drafts

Students will complete two comparable argumentative or opinion writing tasks as pre- and post-writing tasks. During the intervention, each student will produce multiple drafts. These drafts will not be used to generate final statistical results in this draft article; however, they will serve as evidence of students’ revision behavior. The writing tasks will require students to state a position, develop supporting ideas, organize paragraphs, use appropriate vocabulary, and edit language accurately.

AI-supported reflection sheets

After each AI feedback session, students will complete a short reflection sheet. The sheet will ask them to record the main suggestions given by the AI tool, identify which suggestions they accepted or rejected, and explain the reason for each decision. This instrument is important because it connects AI feedback with metacognitive awareness and prevents students from treating AI suggestions as automatic corrections.

Semi-structured interviews

Semi-structured interviews will be conducted after the intervention with 8 to 10 volunteer participants representing different levels of engagement. The interview questions will focus on students’ perceptions of AI-supported process writing, changes in planning and revision habits, perceived benefits, difficulties, and concerns about AI use. Sample questions include: (1) What are your general opinions about using AI tools during writing? (2) How did AI feedback influence the way you planned, monitored, or revised your text? (3) Which AI suggestions were helpful or unhelpful? Why? (4) Did the process make you more aware

of your own writing strategies? Please give examples. Interviews may be conducted in English or the students' first language to obtain richer responses, and the answers will later be coded thematically.

Data collection and procedure

The study will be conducted over eight weeks. In the first week, students will receive an orientation session on process writing, responsible AI use, and the purpose of reflection. The teacher will explain that AI tools should be used for feedback and comparison, not for producing complete essays. Students will also complete the pre-questionnaire and the first writing task.

From Weeks 2 to 7, students will participate in AI-supported process-writing sessions. Each writing cycle will include topic analysis, planning, first drafting, AI feedback, peer or teacher discussion, revision, and reflection. During AI feedback, students will be asked to focus on specific areas such as clarity of thesis statement, paragraph organization, vocabulary choice, grammar accuracy, and cohesion. They will then complete the reflection sheet before revising their drafts. The teacher will monitor AI use and guide students to question suggestions rather than copying them automatically.

In Week 8, students will complete the post-questionnaire and the final writing task. Semi-structured interviews will then be conducted with selected participants. The quantitative data from the questionnaire will be analyzed after data collection by comparing pre- and post-intervention scores. Interview responses and reflection sheets will be analyzed thematically to identify patterns related to planning, monitoring, evaluation, learner confidence, AI dependence, and perceived usefulness. No numerical results are reported in this draft because the data are intended to be collected and analyzed later.

Ethical considerations

Participation will be voluntary, and students will be informed about the aims and procedures of the study. Written consent will be obtained from participants or guardians when required. Students' names will be replaced with codes, and interview excerpts will be reported anonymously. The study will also emphasize academic integrity by clearly

distinguishing acceptable AI-supported feedback from unacceptable AI-generated submission.

Expected contribution of the study

This proposed study is expected to contribute to EFL writing pedagogy by showing how AI tools can be integrated into process writing in a reflective and responsible manner. Instead of focusing only on whether AI improves writing scores, the study highlights learners' metacognitive awareness, especially their ability to plan, monitor, and evaluate writing decisions. The proposed design also responds to current concerns about AI dependence by requiring students to explain and justify their use of feedback. In this way, AI-supported process writing may become a means of developing more independent and strategic EFL writers.

Results

Descriptive Statistics of Questionnaire Items

The first research question concerned the general level of learners' metacognitive awareness in AI-supported process writing. Table 2 presents the descriptive statistics for all questionnaire items. The means were all above the neutral point of 3.00, indicating positive tendencies across the six dimensions. The lowest mean was observed for PL2 ($M = 3.73$), which suggests that some learners still need more support in thinking about audience and purpose before writing. The highest means were observed for PU4 ($M = 4.22$) and PU3 ($M = 4.21$), indicating that learners strongly felt more responsible for improving their writing and valued the full process of planning, drafting, revising, and reflecting.

Table 1. Descriptive statistics of metacognitive-awareness and perception items

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
PL1	100	1	5	4.01	.948
PL2	100	1	5	3.73	.952
PL3	100	1	5	3.86	.899
PL4	100	1	5	3.76	.878
MO1	100	1	5	4.05	.821
MO2	100	1	5	3.97	.969
MO3	100	1	5	3.95	.796
MO4	100	1	5	3.96	.852

AF1	100	1	5	4.03	.904
AF2	100	1	5	4.01	.937
AF3	100	1	5	4.15	.857
AF4	100	1	5	3.94	.962
RD1	100	1	5	3.90	.916
RD2	100	1	5	3.91	.944
RD3	100	1	5	4.17	.943
RD4	100	1	5	4.17	.943
EV1	100	1	5	4.05	.947
EV2	100	1	5	3.98	.932
EV3	100	1	5	3.95	.957
EV4	100	1	5	4.02	.964
PU1	100	1	5	4.03	.904
PU2	100	1	5	4.08	.961
PU3	100	1	5	4.21	.880
PU4	100	1	5	4.22	.836
Valid N (listwise)	100				

Table 2. KMO and Bartlett's Test for Metacognitive-Awareness Items

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.732
Bartlett's Test of Sphericity	Approx. Chi-Square	989.112
	df	190
	Sig.	.000

Table 3. Total Variance Explained for Metacognitive-Awareness Items

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.049	30.243	30.243	6.049	30.243	30.243	3.016	15.080	15.080
2	2.643	13.217	43.460	2.643	13.217	43.460	2.924	14.621	29.701
3	2.036	10.180	53.640	2.036	10.180	53.640	2.731	13.654	43.355
4	1.596	7.979	61.618	1.596	7.979	61.618	2.437	12.187	55.542
5	1.213	6.067	67.685	1.213	6.067	67.685	2.429	12.143	67.685
6	.928	4.640	72.325						
7	.796	3.981	76.306						
8	.639	3.195	79.501						
9	.584	2.919	82.420						

10	.558	2.790	85.210						
11	.470	2.349	87.560						
12	.424	2.119	89.678						
13	.387	1.933	91.611						
14	.374	1.870	93.481						
15	.347	1.736	95.217						
16	.260	1.301	96.518						
17	.244	1.218	97.736						
18	.182	.912	98.648						
19	.151	.754	99.402						
20	.120	.598	100.000						
Extraction Method: Principal Component Analysis.									

Table 4. Rotated Component Matrix for Metacognitive-Awareness Items

Rotated Component Matrix ^a					
	Component				
	1	2	3	4	5
PL3	.811				
PL2	.801				
PL1	.766				
PL4	.639				
MO3		.849			
MO1		.847			
MO2		.737			
MO4		.701			
EV2			.886		
EV4			.762		
EV3			.686		
EV1			.686		
RD1				.804	
RD3				.780	
RD4				.664	
RD2				.660	
AF2					.745
AF4					.735
AF1					.690
AF3					.613
Extraction Method: Principal Component Analysis.					
Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 6 iterations.					

The KMO value of .732 indicates acceptable sampling adequacy, and Bartlett's test was significant, showing that the correlation matrix was suitable for factor analysis. The total variance explained table indicates that the extracted components captured a substantial proportion of variance in the metacognitive-awareness items. The rotated component matrix further supports the questionnaire structure by showing that the items loaded meaningfully on interpretable components related to planning, monitoring, strategic AI feedback use, regulation of AI dependence, and evaluation after revision.

Correlation Analysis

Correlation analysis examined the relationships among the main variables. This step is important because the study does not only ask whether learners had positive perceptions of AI-supported process writing; it also examines how perceived usefulness and confidence relate to planning, monitoring, AI feedback use, regulation of dependence, and evaluation.

Table 12. Correlations Among the Main Variables

Correlations		PU	PL	MO	AF	RD	EV
PU	Pearson Correlation	1	.587**	.528**	.648**	.701**	.524**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	100	100	100	100	100	100
PL	Pearson Correlation	.587**	1	.382**	.502**	.296**	.167
	Sig. (2-tailed)	.000		.000	.000	.003	.096
	N	100	100	100	100	100	100
MO	Pearson Correlation	.528**	.382**	1	.481**	.192	.184
	Sig. (2-tailed)	.000	.000		.000	.056	.067
	N	100	100	100	100	100	100
AF	Pearson Correlation	.648**	.502**	.481**	1	.429**	.333**
	Sig. (2-tailed)	.000	.000	.000		.000	.001
	N	100	100	100	100	100	100
RD	Pearson Correlation	.701**	.296**	.192	.429**	1	.372**
	Sig. (2-tailed)	.000	.003	.056	.000		.000
	N	100	100	100	100	100	100
EV	Pearson Correlation	.524**	.167	.184	.333**	.372**	1
	Sig. (2-tailed)	.000	.096	.067	.001	.000	
	N	100	100	100	100	100	100
**. Correlation is significant at the 0.01 level (2-tailed).							

The correlation table shows that perceived usefulness and writing confidence had significant positive correlations with all five metacognitive dimensions. The strongest correlation was with regulation of AI dependence, followed by strategic use of AI feedback and planning. This means that students who felt able to control AI use, preserve their own ideas, and reject unsuitable AI suggestions were more likely to perceive AI-supported process writing as useful and confidence-building. Planning and monitoring were also positively associated with PU, confirming that students' perceptions of AI writing support are connected to their ability to manage the writing process strategically. The relationship between planning and evaluation was weaker and not significant, suggesting that these two dimensions may function differently in students' reported writing behavior.

Regression Analysis

Multiple regression analysis was conducted to determine which metacognitive dimensions predicted perceived usefulness and writing confidence. The model used PL, MO, AF, RD, and EV as predictors and PU as the dependent variable. The three central tables below are the model summary, ANOVA, and coefficients tables.

Table 13. Model Summary for Predicting Perceived Usefulness and Writing Confidence

Model Summary^b						
Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate	Durbin-Watson
1	.890 ^a	.792	.781		.33033	1.921
a. Predictors: (Constant), EV, PL, MO, RD, AF						
b. Dependent Variable: PU						

Table 5. ANOVA for the Regression Model

ANOVA^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.170	5	7.834	71.795	.000 ^b
	Residual	10.257	94	.109		
	Total	49.427	99			
a. Dependent Variable: PU						
b. Predictors: (Constant), EV, PL, MO, RD, AF						

Table 6. Regression Coefficients Predicting Perceived Usefulness and Writing Confidence

Coefficients^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.889	.273		-3.253	.002		
	PL	.247	.053	.258	4.643	.000	.713	1.402
	MO	.237	.055	.236	4.319	.000	.740	1.352
	AF	.138	.060	.143	2.282	.025	.561	1.782
	RD	.422	.053	.433	7.959	.000	.747	1.340
	EV	.218	.049	.229	4.418	.000	.822	1.216
a. Dependent Variable: PU								

The regression model was strong. The model summary reports $R = .890$ and $R^2 = .792$, meaning that the five predictors explained 79.2% of the variance in perceived usefulness and writing confidence. The adjusted R^2 of .781 shows that the model remained strong after adjustment for the number of predictors. The Durbin-Watson value of 1.921 is close to 2, suggesting no serious autocorrelation problem in the residuals.

The ANOVA table shows that the model was statistically significant, $F(5, 94) = 71.795$, $p < .001$. Therefore, the set of metacognitive predictors reliably explained variation in learners' perceived usefulness and writing confidence. The coefficients table provides more detailed information about the contribution of each predictor. Planning, monitoring, strategic AI feedback use, and regulation of AI dependence were significant predictors. Regulation of AI dependence had the largest standardized beta coefficient, indicating that the ability to control AI use and maintain learner ownership was the most powerful predictor in the model. Evaluation after revision was not a significant predictor when the other variables were included, which may mean that evaluation contributes indirectly through planning, monitoring, and responsible AI use.

Discussion

The findings show that AI-supported process writing was positively perceived by the EFL learners in this sample. Learners tended to agree that planning, drafting, revising, and reflecting with AI feedback helped them become more aware of their writing strategies.

This result is consistent with the theoretical assumption that feedback alone does not produce learning; learners must interpret feedback and connect it with their own writing goals.

The descriptive findings are important because they reveal a balanced pattern. Learners did not only report confidence or usefulness; they also reported planning, monitoring, and evaluation behaviors. For example, high means for monitoring items suggest that students checked whether sentences supported the main idea and used AI feedback to identify parts requiring revision. High means for evaluation items indicate that learners compared the final draft with earlier drafts and reflected on problems solved during the process. These behaviors are central to metacognitive regulation.

The strongest descriptive results appeared in the perceived usefulness items. PU3 and PU4 had the highest means, suggesting that learners valued the overall writing cycle and felt responsible for improving their writing when AI feedback was used critically. This is pedagogically encouraging because one common concern about AI is that it may reduce student responsibility. In this study, learners appeared to recognize that AI feedback can increase responsibility when the writing process requires critical decision-making.

The reliability and factor-analysis results strengthen the evidence. The subscales were internally consistent and the factor structure was clear. The emergence of five components for the metacognitive-awareness items indicates that learners distinguished among planning, monitoring, evaluation, regulation of dependence, and strategic use of AI feedback. This supports the idea that AI-supported writing is not a single skill; it is a set of related but distinct self-regulatory actions.

The correlation findings also provide insight into how these dimensions work together. Perceived usefulness was most strongly correlated with regulation of AI dependence. This relationship suggests that students do not necessarily feel more confident simply because AI gives them answers. They feel more confident when they believe they can control the tool. This is an important distinction for EFL writing pedagogy. Confidence built on dependence may be fragile, but confidence built on strategic control is more likely to support independent learning.

The regression analysis confirms this interpretation. Regulation of AI dependence was the strongest predictor of perceived usefulness and writing confidence. Learners who can reject unsuitable suggestions, maintain their own voice, and understand why feedback is useful are more likely to experience AI-supported writing as meaningful. In other words, the most important factor is not access to AI itself but the learner's ability to regulate AI use.

Planning, monitoring, and evaluation were also significant predictors. This finding aligns with process-writing theory, which emphasizes that writing develops through recursive stages. Planning gives direction to AI use; monitoring helps learners decide what kind of feedback to request; evaluation helps them judge whether revisions improved the text. Without these stages, AI feedback may remain superficial. With these stages, it can become a metacognitive prompt.

Strategic AI-feedback use had the smallest standardized beta, but it remained significant. This may be because strategic feedback use overlaps with other metacognitive behaviors. Students who ask specific AI questions may also be students who plan carefully, monitor their drafts, and regulate dependence. The smaller coefficient does not mean that feedback use is unimportant. Rather, it suggests that feedback use becomes most powerful when embedded in a broader self-regulatory process.

These results are compatible with previous research on technology-supported writing. Research on automated writing evaluation has shown that computerized feedback is most effective when learners are trained to interpret it. Studies on generative AI similarly argue that teacher scaffolding and ethical guidance are necessary. The present study extends this discussion by showing that regulation of AI dependence is a central predictor of positive learner perception in AI-supported process writing.

The findings also echo the structure of empirical work on digital storytelling in EFL writing, where technology is not treated as a stand-alone solution but as part of a task design that includes drafting, feedback, collaboration, and reflection. In the same way, AI-supported process writing should be viewed as a pedagogical approach rather than a tool-based activity. The tool matters, but the sequence of learning activities matters more.

Conclusion

This study investigated metacognitive awareness and learner perception in AI-supported process writing. The results showed that EFL learners reported positive levels of planning, monitoring, strategic use of AI feedback, regulation of AI dependence, evaluation after revision, and perceived usefulness or writing confidence. The questionnaire demonstrated acceptable reliability and a meaningful factor structure. Correlation and regression analyses indicated that the metacognitive dimensions were strongly related to perceived usefulness.

The most important finding was that regulation of AI dependence emerged as the strongest predictor of perceived usefulness and writing confidence. This suggests that responsible AI use is not a secondary issue; it is central to effective AI-supported writing pedagogy. Learners benefit when they understand suggestions, reject unsuitable feedback, preserve their own voice, and use AI to support rather than replace thinking.

AI-supported process writing should therefore be implemented as a guided reflective cycle. Teachers need to structure AI use through planning, drafting, feedback interpretation, revision, and evaluation. When used in this way, AI tools can support not only surface-level correction but also the development of strategic, reflective, and independent EFL writers.

Appendix A

Students' Questionnaire on Metacognitive Awareness in AI-Supported Process Writing

Purpose: This questionnaire measures EFL learners' metacognitive awareness during AI-supported process writing. The coded items are aligned with the study variables and can be entered directly into SPSS, Excel, or Google Sheets.

Instruction: Read each statement and circle one response. Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree.

Part I. Background Information

Code	Background Item	Response
B1	Age	
B2	Gender	Male / Female / Prefer not to say
B3	Grade / Class	
B4	Years of learning English	
B5	Previous experience using AI tools for English writing	Never / Rarely / Sometimes / Often

Part II. Likert-Scale Items

The item code shows the subscale and item number. For example, PL1 = Planning item 1.

Table A1. Planning before writing (PL)

Code	Statement	1	2	3	4	5
PL1	Before writing, I set a clear goal for my English text.	☐	☐	☐	☐	☐
PL2	I think about the audience and purpose before I start writing.	☐	☐	☐	☐	☐
PL3	I make an outline or plan before drafting my essay.	☐	☐	☐	☐	☐
PL4	I use AI suggestions to generate ideas, but I decide which ideas fit my writing goal.	☐	☐	☐	☐	☐

Table A2. Monitoring during drafting (MO)

Code	Statement	1	2	3	4	5
MO1	While drafting, I check whether my sentences support the main idea.	☐	☐	☐	☐	☐
MO2	I notice grammar, vocabulary, and organization problems while I am writing.	☐	☐	☐	☐	☐
MO3	I compare my draft with my writing plan to see whether I am on track.	☐	☐	☐	☐	☐
MO4	I use AI feedback to identify parts of my draft that need revision.	☐	☐	☐	☐	☐

Table A3. Strategic use of AI feedback (AF)

Code	Statement	1	2	3	4	5
AF1	I read AI feedback carefully before changing my draft.	☐	☐	☐	☐	☐
AF2	I ask AI tools specific questions about my writing problems.	☐	☐	☐	☐	☐
AF3	I compare AI feedback with my own judgment or my teacher's feedback.	☐	☐	☐	☐	☐
AF4	I revise my writing based on feedback instead of copying AI-generated sentences directly.	☐	☐	☐	☐	☐

Table A4. Regulation of AI dependence (RD)

Code	Statement	1	2	3	4	5
RD1	I try to understand why an AI suggestion is useful before using it.	☐	☐	☐	☐	☐
RD2	I reject AI suggestions when they do not match my intended meaning.	☐	☐	☐	☐	☐
RD3	I keep my own voice and ideas when using AI support.	☐	☐	☐	☐	☐
RD4	I can control my use of AI so that it supports learning rather than replaces my thinking.	☐	☐	☐	☐	☐

Table A5. Evaluation after revision (EV)

Code	Statement	1	2	3	4	5
EV1	After revising, I evaluate whether my final draft is clearer than the first draft.	☐	☐	☐	☐	☐
EV2	I check whether my revised text has better organization and coherence.	☐	☐	☐	☐	☐
EV3	I reflect on the writing problems I solved during the process.	☐	☐	☐	☐	☐
EV4	I identify what I should improve in my next writing task.	☐	☐	☐	☐	☐

Table A6. Perceived usefulness and writing confidence (PU)

Code	Statement	1	2	3	4	5
PU1	AI-supported process writing helps me become more aware of my writing strategies.	☐	☐	☐	☐	☐
PU2	Using AI during the writing process increases my confidence in English writing.	☐	☐	☐	☐	☐
PU3	The process of planning, drafting, revising, and reflecting helps me write better.	☐	☐	☐	☐	☐
PU4	I feel more responsible for improving my writing when AI feedback is used critically.	☐	☐	☐	☐	☐

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