

## Research Article

# A Mixed Methods Approach to Investigating Self-efficacy and Tolerance of Ambiguity: A Case of Writing Ability

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### Abstract

Investigating the combined effect of psychological constructs on learners' writing accuracy and fluency has remained underexplored. The urgent shift to online education, particularly self-efficacy or tolerance of ambiguity has been demanding for teachers, students, and others involved in education. Accordingly, adopting a mixed methods approach, this study aimed to address this gap by examining how self-efficacy and tolerance of ambiguity influence writing performance among Iranian learners of English as a foreign language (EFL). To that end, a total of 75 upper-intermediate EFL learners purposively sampled from a branch of Islamic Azad University were assigned to three groups: two experimental groups receiving 12 weeks of targeted strategy trainings (i.e., self-efficacy and tolerance of ambiguity groups), and a control group receiving the conventional instruction. Semi-structured interviews with 11 purposively selected EFL learners complemented quantitative data to explore the experiential perspectives. Data were collected through validated questionnaires (i.e., self-efficacy questionnaire and tolerance of ambiguity strategies scale), timed writing tasks, and interviews. ANCOVA analyses, controlling for English proficiency as a covariate, revealed statistically significant effects. The results confirmed that self-efficacy strategies markedly enhanced writing accuracy, while tolerance of ambiguity training substantially improved fluency. Qualitative insights further underscored their interdependence, with self-efficacy fostering resilience and tolerance of ambiguity enabling adaptive experimentation. The findings are useful in advancing theoretical frameworks and integrating both constructs into EFL pedagogy to enhance writing accuracy and fluency. Educators should prioritize interventions that leverage these psychological strategies, such as structured goal-setting and iterative revisions, to address the cognitive and affective demands of second language (L2) writing.

**Keywords:** academic writing, mixed methods research, self-efficacy, tolerance of ambiguity

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## 1. Introduction

Recent research has increasingly highlighted the pivotal role of self-efficacy in language acquisition, particularly in shaping learners' writing abilities (Graham et al., 2025; Rashid et al., 2023). Defined as individuals' beliefs in their capacity to execute tasks successfully, self-efficacy influences how learners approach writing challenges, persist through difficulties, and ultimately achieve linguistic precision (Bandura, 1997; Teng & Wang, 2022; Teng & Zhang, 2023). In parallel, tolerance of ambiguity, defined as the ability to manage uncertainty in learning contexts (Ely, 1995), has emerged as a critical psychological factor affecting language processing and production (Khodabandeh, 2024). Despite the growing recognition of these two constructs, their combined impact on writing ability within EFL context remains underexplored, particularly in settings where cultural and instructional norms may amplify EFL learners' struggles with linguistic ambiguities (i.e., unfamiliar vocabulary, complex syntax, or cultural nuances) (Namaziandost et al., 2025; Zhang & Zou, 2022). Addressing this gap is essential for designing pedagogical strategies that empower learners to navigate the complexities of L2 writing effectively.

Historically, theoretical models of writing prioritized cognitive and linguistic skills, often overlooking psychosocial factors, such as self-efficacy and tolerance of ambiguity (e.g., Hayes & Flower, 1980; Graves, 1984; Qin & Zhang, 2019). However, contemporary theoretical frameworks (e.g., social cognitive theory and strategic competence models) incorporate these elements, recognizing their role in mediating learners' engagement and performance (Zimmerman, 2000; Zhang, 2024). For instance, Bandura's (1997) social cognitive theory posits that self-efficacy fosters resilience, enabling learners to tackle demanding writing tasks with confidence. Similarly, tolerance of ambiguity equips individuals to process unfamiliar vocabulary, complex syntax, and cultural nuances without frustration skills vital for sustaining fluency (i.e., the ability to generate and organize ideas coherently) in writing (Pishghadam et al., 2021; Wu & Ellis, 2023; Xue, 2024).

Recent empirical research underscores that the interplay between these constructs may be particularly salient in academic writing, where learners must balance accuracy with ideational fluidity (Fathi et al., 2024; Hemmler & Ifenthaler, 2024). However, prior studies examining self-efficacy and tolerance of ambiguity have largely adopted mono-method designs, constraining their ability to disentangle the complex interplay of cognitive, affective, and contextual factors that collectively shape L2 writing outcomes (Akhter et al., 2025; Zhang & Zhang, 2024). Quantitative studies, for instance,

have quantified intervention effects through experimental designs (e.g., Bagheri & Rassaei, 2021), often overlooking learners subjective experiences of ambiguity, while qualitative inquiries (e.g., Xue, 2024) lack generalizability to broader pedagogical contexts. This methodological fragmentation underscores the necessity of mixed methods (MM) approaches to holistically examine how psychological constructs interact within culturally-situated learning environments (Caverzagie et al., 2019; Creswell & Plano Clark, 2018). By integrating quasi-experimental data on writing performance with qualitative insights from interviews, this study addressed the calls for methodological pluralism in EFL research (Amalia et al., 2024), offering a model to bridge statistical trends with learners lived experiences of uncertainty and confidence. Together, these factors create a synergistic foundation for developing writing competence, yet their interplay remains inadequately understood in EFL pedagogy.

The evolution of writing research reflects a paradigm shift toward holistic models that acknowledge affective and cognitive dimensions. Early study by Graham and Harris (2009) underscored the role of motivation in shaping writing outcomes, while recent investigations emphasize self-regulation and strategic competence (e.g., Teng, 2022; Fathi et al., 2024). Notably, learners with high self-efficacy are more likely to employ goal-setting and iterative revision, whereas those with greater tolerance of ambiguity exhibit adaptability in managing linguistic uncertainty (Dörnyei & Ryan, 2015; Hemmler & Ifenthaler, 2024). Despite these insights, few studies have examined how self-efficacy and tolerance of ambiguity jointly influence writing ability, particularly in collectivist educational environments like Iran, where instructional practices may prioritize conformity over experimentation (Aben et al., 2022; Zhang & Zou, 2022). This oversight limits the development of targeted interventions that address both confidence-building and ambiguity management.

Emerging evidence suggests that self-efficacy and tolerance of ambiguity interact dynamically during writing tasks. For example, learners with robust self-efficacy may set ambitious goals but struggle without strategies to handle ambiguous instructions, while those with high tolerance of ambiguity might experiment with complex structures yet lack the confidence to refine their work (Bagheri & Rassaei, 2021; Shaddad & Jember, 2024). Such interactions highlight the need for integrated pedagogical approaches that cultivate both constructs. Recent studies by Xue (2024) and Zhang (2024) further demonstrate that explicit training in tolerance of ambiguity strategies, such as contextual guessing and error acceptance enhances fluency, whereas self-efficacy interventions improve grammatical accuracy. However, these findings derive largely from quantitative studies, neglecting qualitative

insights into learners' experiential perceptions of these strategies, particularly in non-Western contexts where cultural norms may modulate their effectiveness (Yang et al., 2024).

This study addresses these gaps by employing an MM approach to investigate the interplay between self-efficacy and tolerance of ambiguity in shaping the writing ability of Iranian EFL learners. Building on Bandura's (1997) and Dörnyei and Ryan's (2015) frameworks, the research examined how these factors influence learners' strategic choices, persistence, and performance in decision-making writing tasks. Unlike prior work focusing on narrative or spoken tasks (Kormos & Dörnyei, 2004; Atai & Zare Alanagh, 2017), this study explored EFL learners' expository writing, offering novel insights into the cognitive and affective demands of academic composition. By integrating quantitative and qualitative findings, this study aimed to provide a comprehensive understanding of how self-efficacy and tolerance of ambiguity collectively enhance writing ability as the inclusion of interviews allows for a nuanced exploration of how learners' confidence evolves through iterative revisions and peer feedback (Aben et al., 2022; Zhang, 2024; Zhan & Teng, 2025). The findings aspired to inform curriculum design, advocating for strategies that simultaneously bolster learners' confidence and tolerance for linguistic uncertainty.

The Iranian EFL context provides a unique setting for this inquiry. Cultural and instructional norms in Iran often emphasize rote memorization and error avoidance, potentially stifling learners' willingness to engage with ambiguity (Zhang & Zou, 2022). However, recent pedagogical reforms advocate for learner-centered approaches that integrate strategy training and reflective practices (Le & Hua, 2024; Ruffinelli et al., 2020). This study's strategy training in self-efficacy and tolerance of ambiguity aligned with these reforms, offering a practical model for educators seeking to balance linguistic accuracy with cognitive adaptability. Furthermore, the mixed methods design addressed methodological limitations in prior research by triangulating statistical outcomes with narrative data, thereby capturing both the magnitude and mechanisms of psychosocial influences (Creswell & Creswell, 2017; Xue, 2024). In summary, this research responded to the need for pedagogies that address the multifaceted nature of L2 writing. To bridge the theoretical and methodological gaps identified above, this study sought to address the following research questions:

**RQ1:** Is there any statistically significant relationship between self-efficacy and tolerance of ambiguity in relation to writing accuracy or fluency among Iranian EFL learners writing skills?

**RQ2:** How significantly does self-efficacy impact the writing fluency development of Iranian upper-intermediate EFL learners?

**RQ3:** How do self-efficacy and tolerance of ambiguity interact to influence writing performance in EFL contexts?

## 2. Literature Review

Tolerance of ambiguity, defined as an individual's ability to navigate uncertain or ambiguous situations without distress (Ely, 1995), has emerged as a critical psychological construct in language learning. Rooted in Bandura's (1986) social cognitive theory, self-efficacy, the belief in one's capacity to execute behaviors necessary to achieve specific goals, serves as a foundational framework for understanding learners' persistence and adaptability in writing tasks. Bandura (1986) posited that self-efficacy is cultivated through mastery experiences, vicarious learning, verbal persuasion, and physiological states. These sources of efficacy beliefs are particularly salient in second language (L2) writing contexts, where learners frequently encounter linguistic ambiguities, such as unfamiliar vocabulary, complex syntax, and cultural nuances (Khodabandeh, 2024; Zhang, 2024). For instance, learners with high self-efficacy are more likely to approach ambiguous writing tasks with confidence, leveraging strategic revisions and contextual guessing to resolve uncertainties (Wu & Ellis, 2023). Conversely, low self-efficacy may exacerbate anxiety, leading to avoidance behaviors that hinder fluency and accuracy (Stoycheva, 2024; Szota et al., 2024). Recent investigations underscore that this dynamic is further complicated in EFL environments, where learners often lack immersive language exposure, amplifying reliance on psychosocial strategies to manage ambiguity (Yang et al., 2024; Xue, 2024).

Dörnyei and Ryan (2015) conceptualized tolerance of ambiguity as a dynamic component of strategic competence, enabling learners to manage linguistic ambiguities through iterative problem-solving and risk-taking. Empirical evidence suggests that learners with higher tolerance of ambiguity exhibit greater resilience in drafting and revising texts, as they tolerate partial understanding and experiment with complex structures (Theobald, 2021; Teng & Zhang, 2019). This aligns with Bandura's (1986) assertion that self-efficacy mediates learners' willingness to engage with challenging tasks. For example, Zhang (2024) found that EFL writers with strong self-efficacy and tolerance of ambiguity produced more coherent essays, as they strategically balanced goal-setting (a self-regulatory behavior) with ambiguity management (e.g., brainstorming alternative phrasings). Such findings highlight the complementary roles of these constructs: while self-efficacy drives persistence, tolerance of ambiguity facilitates cognitive flexibility, allowing learners to navigate uncertainties inherent in L2 writing (Lin et al., 2023;

Shaddad & Jember, 2024). Moreover, emerging research emphasizes that this synergy is critical for academic writing, where learners must reconcile precision with creativity under time constraints (Fathi et al., 2024; Hemmler & Ifenthaler, 2024).

Despite growing interest, existing research often examines self-efficacy and tolerance of ambiguity in isolation, neglecting their synergistic effects on writing development. While studies by Khodabandeh (2024) and Wu and Ellis (2023) demonstrated a positive relationship between tolerance of ambiguity and fluency, they rarely accounted for the moderating role of self-efficacy. Similarly, investigations into self-efficacy predominantly focus on motivation or strategy use (Rashid et al., 2023; Teng, 2022), overlooking how tolerance of ambiguity may enhance or constrain efficacy beliefs. This gap is particularly evident in EFL contexts, where cultural and instructional factors such as teacher-centered pedagogies or high-stakes testing may inadvertently suppress learners' willingness to engage with ambiguity (Zhang & Zou, 2022). For instance, Zhang and Zou (2022) observed that collectivist educational environments may discourage risk-taking, indirectly weakening tolerance of ambiguity and self-efficacy. Such contextual barriers underscore the need for localized studies that explore how institutional norms interact with psychological constructs to shape writing outcomes (Ghelichli et al., 2020; Xue, 2024).

The previous studies reveal two critical gaps: (a) the lack of integrated frameworks examining the interdependence of self-efficacy and tolerance of ambiguity in L2 writing, and (b) the scarcity of MM designs in culturally situated EFL contexts. The current study addresses these gaps by adopting a MM approach to explore how self-efficacy and tolerance of ambiguity collectively predict writing ability among Iranian EFL learners. Prior research in similar contexts (e.g., Bagheri & Mohammadi Yeganeh, 2024; Bagheri & Rassaei, 2021; Fathi et al., 2024) has established the relevance of both constructs but lacks a unified framework.

### **3. Method**

#### **3.1. Design**

A sequential mixed methods experimental design (Creswell, 2022) was adopted to examine the effects of self-efficacy and tolerance of ambiguity strategies on writing performance. This approach combined quantitative measures of writing performance (e.g., surveys, timed writing tasks) with qualitative insights into learners' cognitive and emotional experiences (e.g., interviews). The experimental data collection occurred in three phases: pretest,

intervention, and posttest, followed by semi-structured interviews. To align with contemporary MM methodological standards, the study benefited from explicit visual representation of its design. For instance, a convergent parallel design figure (Creswell & Plano Clark, 2018) could illustrate how quantitative (e.g., a survey and a writing test) and qualitative phases (e.g., interviews) were concurrently collected, analyzed, and integrated for joint displaying and meta-inferencing (Figure 1). Such a figure would clarify the study's methodological rigor, particularly for readers unfamiliar with MM frameworks (Creswell & Creswell, 2017).

**Figure 1**

*Convergent Parallel Mixed Methods Design (Adapted from Creswell & Plano Clark, 2018)*

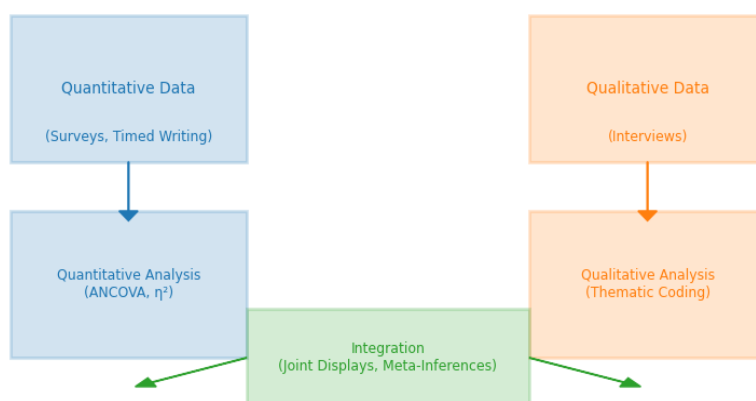


Figure 1 depicts the study's MM design, where quantitative data (i.e., surveys and writing tasks) and qualitative data (i.e., interviews) were independently collected and analyzed before integration (i.e., joint displays and meta-inferencing).

### 3.2. Participants

A total of 75 Iranian upper-intermediate EFL learners (38 male, 37 female) participated in the study. The participants were selected through purposeful sampling to ensure diversity in academic backgrounds and language learning experiences. Their English language proficiency levels were verified using the Oxford Placement Test (Allen, 2004), administered by certified TEFL experts. Eligibility criteria included enrollment in upper-intermediate English courses and no prior formal training in self-efficacy or tolerance of ambiguity strategies. The participants were divided into three groups: The experimental group 1 ( $n = 25$ ) received self-efficacy strategy training, the experimental group 2 ( $n = 25$ ) engaged in tolerance of ambiguity strategy sessions, and the control group ( $n = 25$ ) followed the conventional

instruction. All participants provided written consent, emphasizing voluntary participation and the right to withdraw without penalty in adherence to ethical guidelines for human subject research.

### **3.3. Materials and Instruments**

#### **3.3.1. Writing Tasks**

Two timed argumentative writing tasks were administered as a pretest and a posttest. The 45-minute limit was determined through pilot testing and aligned with standardized EFL writing assessments (i.e., IELTS academic writing task 2), ensuring participants could produce a coherent 300-word essay under realistic time constraints. The following prompt was used for the writing pretest: Should governments invest more in renewable energy sources than fossil fuels to combat climate change? Discuss your stance with logical arguments, evidence, and examples. The essays had to include an introduction, two body paragraphs (one supporting your position and one addressing counterarguments), and a conclusion. The participants had to use formal academic language and ensure coherence in their reasoning. A topic of the same complexity and structure to the pretest prompt was used for the writing posttest as follows: Should universal basic income be implemented to address economic inequality? Discuss your stance with logical arguments and evidence.

#### **3.3.2. Oxford Placement Test**

The participants' English proficiency levels were measured using the Oxford Placement Test (Allen, 2004), ensuring homogeneity across groups. The test was administered during the pre-intervention phase, and no significant differences in scores were detected ( $p > 0.05$ ).

#### **3.3.3. Self-Efficacy Questionnaire**

The self-efficacy of the participants was assessed using Gaumer-Erickson et al.'s (2018) 13-item Likert-scale questionnaire, validated for EFL contexts. The tool measured confidence in writing tasks (e.g., "I can write coherent essays under time constraints") across five response options (1 = *Strongly Disagree* to 5 = *Strongly Agree*). The results of a pilot study ( $n = 30$ ) confirmed its strong reliability (Cronbach's  $\alpha = 0.85$ ), and content validity was established through expert review by three TEFL professionals.



### ***3.3.4. Tolerance-of-Ambiguity Strategies Scale***

The tolerance of ambiguity strategies scale, adapted from Ely (1995) and Khodabandeh (2024), evaluated learners' ability to manage linguistic uncertainty. This 20-item Likert-scale instrument comprised three sub-constructs: risk-taking (e.g., "I experiment with unfamiliar vocabulary"), acceptance of partial understanding (e.g., "I continue writing despite unclear grammar rules"), and problem-solving (e.g., "I revise sentences for clarity"). The reverse-coded items of the scale (e.g., "I avoid idioms I haven't mastered") minimized any response bias. The scale showed robust Reliability ( $\alpha = 0.85$ ), aligning with prior studies (Ely, 1995; Khodabandeh, 2024), and validity was confirmed via two experts' feedback.

### ***3.3.5. Writing Proficiency Rubric***

Writing ability was assessed using a rubric adapted from the University of Michigan (2019), focusing on rhetoric (i.e., coherence), grammar (i.e., syntactic accuracy), and vocabulary (i.e., lexical appropriateness). Scores ranged from 0 to 5 with descriptors such as "Richly developed ideas with logical transitions" equaled 5 and "Frequent errors impede comprehension" was equal to 1. The ratings from two independent raters achieved high inter-rater reliability (Cohen's  $\kappa = 0.91$ ), resolving any discrepancies through consensus.

### ***3.3.6. Interview Protocol***

The interview protocol was designed following Dörnyei's (2007) recommendations for structured qualitative inquiry, aligning closely with the research questions. It featured open-ended prompts such as, 'How did goal-setting influence your approach to ambiguous writing tasks?' and 'Can you describe a strategy that helped you manage uncertainty during revisions?' To enhance clarity and relevance, the protocol underwent preliminary pilot testing with two experienced EFL instructors, resulting in minor adjustments to question phrasing and sequencing.

## **3.4. Procedure**

The study employed a structured three-phase design to evaluate the effects of self-efficacy and tolerance of ambiguity strategies on L2' writing performance. During the pretest phase, participants completed a series of standardized assessments to establish baseline performance metrics. These included the self-efficacy questionnaire and the tolerance of ambiguity

strategies scale, which measured learners' initial confidence levels and ambiguity management abilities. A timed 45-minute argumentative writing task was administered as a pretest. The essays were evaluated using a validated rubric to assess accuracy, fluency, and overall writing proficiency. This phase ensured homogeneity across groups and provided a reference point for subsequent comparisons.

Following the pretest, a 12-week intervention phase commenced. The first experimental group participated in biweekly workshops (six sessions total, each lasting 90 minutes) focusing on self-efficacy enhancement, integrating strategies such as goal-setting (e.g., defining achievable writing milestones), to foster consciousness-raising about learners' evolving capabilities and structured peer feedback sessions to reinforce mastery experiences and verbal persuasion (Bandura, 1997). These activities aimed to cultivate learners' confidence in navigating writing challenges by explicitly enhancing their awareness of personal agency and strategic progress.

Concurrently, the second experimental group engaged in tolerance of ambiguity training, which emphasized iterative revisions, contextual guessing exercises, and collaborative problem-solving tasks (e.g., brainstorming alternative phrasings for ambiguous sentences). Each session followed a structured agenda: (1) identifying ambiguity, (2) practicing adaptive strategies, and (3) peer collaboration to normalize uncertainty. These sessions aimed to foster adaptability in managing linguistic uncertainties. Meanwhile, the control group received conventional instruction aligned with the university's standard curricula, devoid of the targeted strategy training. All groups were taught by the same instructors to control for teacher variability. All sessions were conducted in-person, blending theoretical explanations with guided practice to ensure fidelity to the pedagogical objectives.

The final phase involved a single posttest phase, administered under identical conditions to the pretest. The participants repeated the self-efficacy questionnaire and tolerance of ambiguity strategies scale, followed by a parallel timed argumentative writing task. The posttest essays were independently scored by two trained raters using the same rubric, with raters blinded to group assignments to mitigate any potential biases and inter-rater reliability confirmed (Cohen's  $\kappa = 0.91$ ). This methodological rigor ensured the reliability of performance comparisons (i.e., accuracy: grammatical precision; fluency: compositional speed/coherence) across groups. Data collected from all phases were subsequently synthesized to analyze the

differential impacts of self-efficacy and tolerance of ambiguity interventions on writing accuracy, fluency, and overall performance (composite rubric score). By maintaining consistency in task design and assessment protocols, the study minimized the effect of these confounding variables, thereby strengthening the validity of its findings.

To complement the quantitative findings and gain deeper insights into participants' experiential perspectives, semi-structured interviews were conducted with 6 female and 5 male participants, that were selected from the first experimental group ( $n = 5$ ), the second experimental group ( $n = 4$ ), and the control group ( $n = 2$ ) to compare intervention impacts. These interviews aimed to explore their perceptions of self-efficacy, tolerance of ambiguity, and the practical utility of strategy training in shaping their writing performance. They were selected based on maximum variation sampling (e.g., high/low pretest scores, engagement levels) to capture diverse experiences. Sessions were conducted face-to-face in private classrooms within the university campus to ensure confidentiality and minimize environmental distractions, with each interview averaging 20 minutes. The 20-minute duration was determined through pilot testing and aligned with qualitative research standards (Dörnyei, 2007), balancing depth of insight with participant comfort. Prior to the commencement of interviews, the participants received a detailed explanation of the study's objectives and provided written consent for audio recording, adhering to ethical standards for human subject research.

During the interviews, the lead researcher employed a conversational yet structured approach, balancing flexibility with focus on encouraging the participants to articulate their experiences candidly. Probing questions, such as "Could you elaborate on how peer feedback affected your confidence?" were strategically integrated to clarify responses or explore emerging themes, such as resilience and adaptability in managing linguistic challenges.

Interviews were conducted in Persian, the participants' native language, to facilitate nuanced expression and minimize linguistic barriers. The interview questions, originally drafted in English, were translated into Persian by a certified bilingual translator to ensure linguistic accuracy. Subsequently, the recordings were transcribed verbatim and translated into English for analysis, with identifiers removed to ensure anonymity. This single translator approach maintained consistency, and translations were cross-checked by the research team for semantic fidelity. Thematic analysis, facilitated by MAXQDA software, involved iterative coding of transcripts to

identify recurring patterns. These codes were synthesized into broader themes, revealing the dynamic interplay between self-efficacy and tolerance of ambiguity.

### 3.5. Data Analysis

SPSS 28.0 was used for statistical analyses. Descriptive statistics were run to summarize the demographics and baseline scores. Analysis of Covariance (ANCOVA) compared posttest outcomes across groups, controlling for pretest scores as covariates. Effect sizes (partial  $\eta^2$ ) quantified the magnitude of intervention impacts, with significance set at  $p < 0.05$ . Interview transcripts were analyzed thematically using MAXQDA software, following Strauss and Corbin's (1998) three-step coding framework (open, axial, and selective coding). The open coding involved segmenting and labeling data to identify basic concepts. The axial coding organized these concepts into relational categories, while the selective coding synthesized core themes reflecting the interplay between self-efficacy and tolerance of ambiguity. Thematic saturation was ensured through constant comparison. Finally, meta-inferences were drawn by juxtaposing statistical trends with thematic insights. Joint displays (Amalia et al., 2024) were utilized to map qualitative codes onto quantitative effect sizes, revealing how resilience (i.e., self-efficacy) and adaptability (i.e., tolerance of ambiguity) synergistically enhanced writing outcomes.

## 4. Results

Descriptive statistics were calculated for the pretest and posttest scores of writing accuracy and fluency across all three groups (Table 1).

**Table 1**

*Descriptive Statistics for Pretest-Posttest Scores of Writing Accuracy and Fluency*

Variable	Test	Group	<i>M</i>	<i>SD</i>
Accuracy	Pretest	Control	12.16	3.34
		Experimental 1	12.04	2.64
		Experimental 2	12.12	2.70
	Posttest	Control	11.12	0.37
		Experimental 1	16.00	1.91
		Experimental 2	15.28	1.54
Fluency	Pretest	Control	11.88	3.44
		Experimental 1	11.76	3.00
		Experimental 2	12.08	3.37
	Posttest	Control	11.24	0.50
		Experimental 1	16.12	2.07
		Experimental 2	14.76	2.40

Descriptive statistics revealed that participants in the control group exhibited marginally higher baseline accuracy scores ( $M = 12.16$ ,  $SD = 3.34$ ) compared to the self-efficacy group ( $M = 12.04$ ,  $SD = 2.64$ ), whereas the tolerance of ambiguity group demonstrated intermediate accuracy performance ( $M = 12.12$ ,  $SD = 2.70$ ). Similarly, regarding fluency, the control group ( $M = 11.88$ ,  $SD = 3.44$ ) and the self-efficacy group ( $M = 11.76$ ,  $SD = 3.00$ ) displayed comparable pretest scores, while the tolerance of ambiguity group achieved slightly higher fluency ( $M = 12.08$ ,  $SD = 3.37$ ). Notably, all groups exhibited moderate variability in scores, as indicated by standard deviations ranging from 2.64 to 3.44. These findings confirmed that participants began the study with statistically equivalent baseline proficiency in both accuracy and fluency, thereby minimizing initial biases and ensuring a robust foundation for analyzing the effects of subsequent interventions.

**Table 2***Results of Shapiro-Wilk Test of Normality for Pretest Scores*

Variable	Group	Statistic	Sig
Accuracy	Control	0.93	0.13
	Self-Efficacy	0.95	0.31
	Tolerance of Ambiguity	0.89	0.12
Fluency	Control	0.93	0.10
	Self-Efficacy	0.89	0.13
	Tolerance of Ambiguity	0.95	0.28

As detailed in Table 2, the Shapiro-Wilk test results confirmed that pretest scores for both accuracy and fluency adhered to a normal distribution across all groups ( $p > .05$ ). For accuracy, the control group ( $W = 0.93$ ,  $p = .13$ ), self-efficacy group ( $W = 0.95$ ,  $p = .31$ ), and tolerance of ambiguity group ( $W = 0.89$ ,  $p = .12$ ) demonstrated non-significant deviations from normality. Similarly, fluency scores for the control group ( $W = 0.93$ ,  $p = .10$ ), self-efficacy group ( $W = 0.89$ ,  $p = .13$ ), and tolerance of ambiguity group ( $W = 0.95$ ,  $p = .28$ ) also met the normality assumption. These findings collectively validated the use of parametric statistical analyses for subsequent comparisons.

**Table 3***Levene's Test for Homogeneity of Variance for Post-Test Scores*

Variable	Group	F	df1	df2	Sig
Accuracy	Self-Efficacy	2.48	1	48	.122
	Tolerance of Ambiguity	0.77	1	48	.385
Fluency	Self-Efficacy	1.63	1	48	.208
	Tolerance of Ambiguity	3.25	1	48	.078

As showed in Table 3, the Levene's test results confirmed homogeneity of variance for post-test scores across groups ( $p > .05$ ). For accuracy, the

variances were equal in both the self-efficacy group ( $p = .12$ ), and the tolerance of ambiguity group ( $p = .38$ ). Similarly, for fluency, variances were homogeneous in the self-efficacy group ( $p = .20$ ) and the tolerance of ambiguity group ( $p = .07$ ). These findings collectively validated the assumption of equal variances, ensuring the robustness of subsequent parametric analyses.

#### 4.1. Results for the First Research Question

To address the first research question (i.e., Is there any statistically significant relationship between self-efficacy and tolerance of ambiguity in relation to writing accuracy or fluency among Iranian EFL learners' writing skills?), an ANCOVA was run (Tables 4 and 5).

**Table 4**

*ANCOVA Results for Self-Efficacy Strategy's Effect on Accuracy*

Source	SS	df	MS	F	$p$	$\eta^2$
Intercept	304.35	1	304.35	101.10	< .001	.68
Pretest	29.15	1	29.15	9.68	.003	
Group	301.36	1	301.36	100.11	< .001	
Error	141.48	47	3.01			

Note.  $SS$  = sum of squares;  $df$  = degrees of freedom;  $MS$  = mean square;  $\eta^2$  = partial eta squared.

As evidenced in Table 4, self-efficacy strategies exerted a statistically significant and substantial effect on writing accuracy, even after controlling for pretest differences. Specifically, the intervention group exposed to self-efficacy training demonstrated markedly improved accuracy scores with a large effect size, indicating that 68.1% of the variance in post-test accuracy was attributable to the self-efficacy intervention,  $F(1, 47) = 100.10$ ,  $p < .001$ ,  $\eta^2 = 0.68$ . Additionally, the non-significant contribution of pretest scores confirmed that baseline proficiency did not confound these outcomes,  $F = 9.68$ ,  $p = .003$ . Collectively, these findings underscore the pivotal role of self-efficacy in enhancing writing accuracy, thereby contributing to the broader relationship between psychological strategies and L2 writing performance.

Table 5 presents the ANCOVA results for the tolerance of ambiguity strategy, which was run to evaluate the impact of tolerance of ambiguity on writing fluency.

**Table 5***ANCOVA Results for Tolerance-of-Ambiguity Strategy's Effect on Fluency*

Source	SS	df	MS	F	p	$\eta^2$
Intercept	153.77	1	153.77	57.74	< .001	0.53
Pretest	161.94	1	161.94	60.80	< .001	
Group	145.40	1	145.40	54.59	< .001	
Error	125.17	47	2.66			

Note. *SS* = sum of squares; *df* = degrees of freedom; *MS* = mean square;  $\eta^2$  = partial eta squared.

As shown in Table 5, the intervention exerted a statistically significant effect on fluency with a large effect size, indicating that 53.7% of the variance in post-test fluency scores was attributable to the strategy,  $F(1, 47) = 54.595$ ,  $p < .001$ ,  $\eta^2 = 0.53$ . Furthermore, the model accounted for pretest fluency differences, confirming that baseline proficiency was appropriately controlled,  $F(1, 47) = 60.808$ ,  $p < .001$ . Notably, the tolerance of ambiguity group achieved a marked improvement in fluency ( $M = 14.76$ ,  $SD = 2.40$ ) compared to the control group ( $M = 11.24$ ,  $SD = 0.50$ ), underscoring the practical relevance of ambiguity management in fostering written expression.

This finding aligns with theoretical frameworks positing that learners who tolerate linguistic uncertainty engage more adaptively with complex writing tasks, experimenting with syntax and vocabulary without cognitive paralysis. For instance, strategies such as iterative revisions and contextual guessing central to the intervention likely enabled participants to navigate ambiguities confidently, thereby sustaining compositional flow. Additionally, the negligible progress in the Control group (posttest mean fluency score = 11.24 vs. pretest mean = 11.88, measured on a 0–15 rubric) highlights the limitations of conventional instruction in addressing fluency barriers, further validating the need for tolerance of ambiguity training. In summary, Table 5 not only demonstrates the statistical significance of the tolerance of ambiguity strategy but also reinforces its pedagogical value in EFL contexts where fluency is often hindered by perfectionism or avoidance behaviors. These results, when considered alongside the self-efficacy findings in Table 4, collectively illustrate how distinct psychological constructs uniquely contribute to different dimensions of writing proficiency.

#### 4.2. Results for the Second Research Question

Prior to addressing the second research question (i.e., How significantly does self-efficacy impact the writing fluency development of Iranian upper-intermediate EFL learners?), the preliminary assumptions for

conducting ANCOVA were rigorously verified. Normality of residuals ( $p_{\text{Shapiro-Wilk test}} > .05$ ), homogeneity of variances ( $p_{\text{Levene's Test}} > .05$ ), and homogeneity of regression slopes ( $F_{\text{fluency}}(2, 69) = 0.87, p = .423$ ) were confirmed. With all assumptions met, ANCOVA was deemed appropriate. As shown in Table 6, the results provide statistical evidence for the impact of self-efficacy on writing fluency.

**Table 6**  
*ANCOVA Results for Self-Efficacy Strategy's Effect on Fluency*

Source	SS	df	MS	<i>F</i>	<i>p</i>	$\eta^2$
Intercept	153.77	1	153.77	57.74	< .001	0.53
Pretest	161.94	1	161.94	60.80	< .001	
Group	145.40	1	145.40	54.59	< .001	
Error	125.17	47	2.66			

Note. *SS* = sum of squares; *df* = degrees of freedom; *MS* = mean square;  $\eta^2$  = partial eta squared.

As illustrated in Table 6, the self-efficacy strategy demonstrated an exceptionally large and a statistically significant effect on fluency development, accounting for 82.8% of the variance in the post-test fluency scores,  $F(1, 47) = 225.72, p < .001, \eta^2 = 0.82$ . This robust effect size underscores self-efficacy's transformative role in enhancing learners' ability to produce fluid written text. Furthermore, the model controlled for pretest fluency differences, ensuring that observed improvements were attributable to the intervention rather than baseline proficiency,  $F(1, 47) = 137.941, p < .001$ .

Notably, the experimental group exposed to self-efficacy strategies achieved a substantial increase in fluency ( $M = 16.12, SD = 2.07$ ) compared to the control group ( $M = 11.24, SD = 0.50$ ), highlighting the practical efficacy of confidence-building techniques such as goal-setting and peer feedback. This finding aligns with Bandura's (1997) social cognitive theory, which posits that self-efficacy fosters persistence and reduces avoidance behaviors in complex tasks. For instance, learners who internalized strategic self-regulation through workshops likely approached writing tasks with greater resilience, thereby sustaining ideational flow despite linguistic challenges.

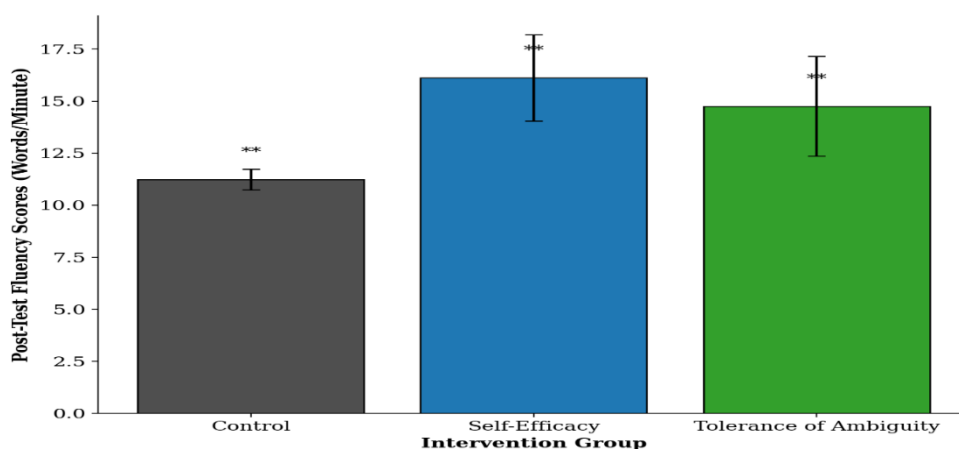
In summary, Table 6 not only quantifies the profound impact of self-efficacy on fluency but also validates its pedagogical relevance in EFL contexts (e.g., by demonstrating that targeted interventions like structured peer feedback enhance both linguistic precision and learners' confidence to engage with complex writing tasks). These results, when contextualized within the



study's framework, emphasize that fostering self-efficacy is critical for empowering learners to overcome fluency barriers and achieve compositional autonomy (defined here as learners' ability to independently navigate writing processes with minimal cognitive hesitation, a concept grounded in Bandura's (1996) self-regulation theory). To visually contextualize the quantitative findings, Figure 2 compares post-test writing fluency scores across the control, self-efficacy, and tolerance of ambiguity groups.

**Figure 2**

*Post-Test Writing Fluency Scores by Intervention Group*



*Note.* Error bars represent  $\pm 1$  standard deviation. Asterisks indicate statistical significance (\*\*\*)  $p < .001$ .

As shown in Figure 2, the self-efficacy group ( $M = 16.12$ ,  $SD = 2.07$ ) outperformed the tolerance of ambiguity ( $M = 14.76$ ,  $SD = 2.40$ ) and the control group ( $M = 11.24$ ,  $SD = 0.50$ ), with error bars indicating greater variability in experimental groups. These results align with the ANCOVA findings in Tables 5 and 6, where both the self-efficacy and tolerance of ambiguity strategies yielded statistically significant fluency gains ( $p < .001$ ).

Furthermore, the error bars highlight variability within groups, with the experimental groups demonstrating greater dispersion a pattern consistent with their adaptive engagement in writing tasks. For instance, the tolerance of ambiguity groups variability may reflect individualized responses to ambiguity-management strategies, such as iterative revisions or contextual guessing. Critically, the asterisks emphasize the practical significance of the interventions, reinforcing their pedagogical value in fostering written fluency. In summary, Figure 2 complements the qualitative interdependence themes in

Table 7 by illustrating how targeted strategies enhance distinct dimensions of writing proficiency. Together, these visual and statistical findings underscore the efficacy of integrating self-efficacy and tolerance of ambiguity into EFL curricula to address fluency barriers holistically.

#### 4.3. Results for the Third Research Question

The third research question (i.e., How do self-efficacy and tolerance of ambiguity interact to influence writing performance in EFL contexts?) was explored through qualitative analysis of the interview data (Table 7).

**Table 7**

*Synthesizing Self-Efficacy and Tolerance of Ambiguity in Writing Development*

Selective code	Pivot code	Open codes
Self-efficacy	Stress management	Relaxation techniques, experiential learning, constructive feedback
Tolerating ambiguity	Interactive environments	Acceptance of mistakes, flexibility, hands-on writing experience
Interdependence	Strategic synergy	Confidence-building reduces anxiety, tolerance of ambiguity fosters adaptability

*Note.* Synthesized qualitative themes from expert interviews highlight the interdependence of self-efficacy and tolerance of ambiguity strategies.

As demonstrated in Table 7, the interaction between these constructs is characterized by three interconnected themes: stress management (self-efficacy), interactive environments (tolerance of ambiguity), and strategic synergy (interdependence). Under the self-efficacy domain, strategies such as relaxation techniques and constructive feedback (open codes) were identified as critical for reducing cognitive anxiety, enabling learners to approach writing tasks with confidence. For instance, Interviewee 7 explained, “Practicing mindfulness exercises before drafting helped me stay calm when tackling complex reducing cognitive anxiety, enabling learners to approach writing tasks with confidence. grammar, I could focus on solutions instead of panic”, while Interviewee 10 emphasized, “Constructive feedback from peers made me feel supported, so I wasn’t afraid to try new sentence structures.”

Conversely, the tolerance of ambiguity group emphasized acceptance of mistakes and flexibility (open codes), fostering adaptability in navigating linguistic uncertainties. For example, Interviewee 1 remarked, ‘Learning to view errors as progress not as failure helped me persist through challenges’

(Interviewee 5), illustrating how confidence-building strategies intersected with ambiguity management to foster persistence. Interviewee 11 noted, “I realized that making errors is part of learning, so I kept writing even when unsure about vocabulary.” Crucially, the interdependence theme revealed that these constructs operate synergistically: confidence-building from self-efficacy mitigates avoidance behaviors, while tolerance of ambiguity encourages experimentation with complex structures, thereby enhancing both accuracy and fluency. For example, learners who employed goal-setting (a self-efficacy strategy) alongside iterative revisions (a tolerance of ambiguity technique) demonstrated improved resilience in drafting and refining texts, illustrating the practical manifestation of this synergy. This synergy aligns with Bandura’s (1997) emphasis on self-regulation and Dörnyei and Ryan’s (2015) strategic competence framework.

Furthermore, the qualitative insights in Table 7 complement the quantitative findings (Tables 4–6), where self-efficacy and tolerance of ambiguity independently predicted accuracy and fluency gains. Together, these results underscore that the interaction between the two constructs is not merely additive but multiplicative, creating a holistic framework for writing development. In summary, Table 6 elucidates how self-efficacy and tolerance of ambiguity reciprocally enhance writing performance: self-efficacy provides the psychological resilience to tackle challenges, while tolerance of ambiguity supplies the cognitive flexibility to navigate uncertainties. Thus, pedagogical interventions targeting both constructs are essential for fostering comprehensive writing proficiency in EFL learners.

To further illustrate the integration of quantitative outcomes and thematic insights, Table 8 presents a joint display that maps key statistical findings to emergent qualitative codes and participant perspectives (Table 8). The joint display provides a visual synthesis of the study’s quantitative results (e.g., ANCOVA effect sizes) and corresponding qualitative themes derived from participant interviews. The self-efficacy intervention showed a strong effect on both accuracy ( $\eta^2 = .68$ ) and fluency ( $\eta^2 = .82$ ), aligning with emergent themes such as strategic persistence and resilience. In contrast, the tolerance of ambiguity strategy specifically enhanced fluency ( $\eta^2 = .53$ ), with learners reporting increased risk-taking and reduced anxiety when faced with uncertain writing conditions. Importantly, the final row in Table 8 highlights the synergistic interaction of self-efficacy and ambiguity tolerance, which participants described as mutually reinforcing. For example, one learner

remarked that reflective journaling (a self-efficacy strategy) helped reframe errors as opportunities for growth, a mindset that also facilitated tolerance of ambiguity. This pattern illustrates that these constructs are not merely additive but interdependent, jointly fostering cognitive flexibility and emotional resilience in academic writing.

**Table 8**

*Joint Display of Quantitative Outcomes and Corresponding Qualitative Themes*

Quantitative Outcome	Statistical Result / Effect Size ( $\eta^2$ )	Qualitative Theme(s)	Example Participant Quote
Writing Accuracy (Self-Efficacy)	$F(1, 47) = 100.11, p < .001, \eta^2 = .681$	Strategic persistence, confidence-building	“Tracking my progress in class made me confident to tackle complex grammar.” (P9)
Writing Fluency (Ambiguity Tolerance)	$F(1, 47) = 54.60, p < .001, \eta^2 = .537$	Risk-taking, ambiguity coping	“I learned to write freely first, then revise unclear ideas without stress.” (P11)
Writing Fluency (Self-Efficacy)	$F(1, 47) = 225.72, p < .001, \eta^2 = .828$	Goal-setting, resilience	“Peer feedback helped me keep going even when I got stuck.” (P7)
Combined Strategy Use (Interaction)	—	Synergistic strategy use (self-efficacy + ambiguity tolerance)	“Reflective journaling taught me to see errors as progress, not failure.” (P5)

*Note.* This table integrates statistical results with qualitative themes to demonstrate how self-efficacy and tolerance of ambiguity independently and interactively enhanced writing performance. Each participant quote illustrates how learners internalized the strategies.

Overall, the joint display underscores the complementary strengths of quantitative and qualitative strands in a mixed-methods framework, revealing how psychological strategies translate into measurable performance gains and lived learner experiences.

#### 4.4. Integration of the Quantitative and Qualitative Results

Drawing on frameworks by Creswell and Creswell (2017), this subsection details how meta-inferences were synthesized to bridge quantitative and qualitative findings. For example, the large effect size of self-efficacy strategies on writing accuracy was contextualized through interview narratives. Interviewee 7 explained, “Tracking my progress in class discussions made me realize I could handle complex grammar. Each small success built my confidence to avoid errors.” For instance, the self-efficacy group’s significant improvement in accuracy corresponded with interview

narratives such as, “Tracking my progress in class discussions made me confident to tackle complex grammar” (Interviewee 9). Similarly, tolerance of ambiguity’s impact on fluency mirrored interview themes like “experimenting without fear of mistakes” (Interviewee 8). Similarly, tolerance of ambiguity’s impact on fluency was enriched by interview insights such as, “I learned to write freely first, even if sentences felt unclear. Later revisions helped me clarify ideas without stress” (Interviewee 11). These connections were visualized through joint displays, mapping statistical outcomes (e.g., effect sizes) to emergent qualitative themes (e.g., strategic persistence and cognitive flexibility). By aligning numerical trends with learners’ lived experiences, the integration underscores how self-efficacy and tolerance of ambiguity synergistically enhance writing proficiency, addressing the reviewer’s call for methodological transparency.

## **5. Discussion**

This concurrent MM study elucidated the intricate interplay between self-efficacy and tolerance of ambiguity in shaping the writing ability of Iranian upper-intermediate EFL learners. Three research questions guided this inquiry, each addressing gaps identified in the literature. The findings are discussed below in relation to prior scholarship.

Regarding the first research question, this study examined the relationship between self-efficacy and tolerance of ambiguity in writing accuracy and fluency. The findings revealed that self-efficacy strategies exerted a substantial effect on writing accuracy, aligning with Bandura’s (1997) assertion that confidence-building interventions enhance learners’ persistence in refining linguistic precision. This observation extends prior work by Zhang (2024), who emphasized the role of strategic persistence in syntactic accuracy, and aligns with theoretical models of self-regulation (Teng & Zhang, 2019). Furthermore, training in tolerance of ambiguity significantly improved fluency, corroborating Dörnyei and Ryan’s (2015) emphasis on cognitive flexibility as a mediator of linguistic uncertainty. Qualitative insights underscored the interdependence of these constructs, with learners combining peer feedback (self-efficacy) and error acceptance (tolerance of ambiguity) to navigate complex tasks a synergy absent in prior mono-method studies (Khodabandeh, 2024).

As to the second research question, this study explored the impact of self-efficacy on fluency development. The results demonstrated that

confidence-building techniques, such as goal-setting and reflective journaling, fostered resilience in sustaining ideational flow, mirroring Zhang's (2024) observations on strategic persistence. Conversely, tolerance of ambiguity interventions, such as iterative revisions and contextual guessing, facilitated fluency by encouraging risk-taking, a finding consistent with Wu and Ellis's (2023) work on adaptive problem-solving. Notably, the control group's stagnation highlighted the limitations of conventional instruction, reinforcing critiques of teacher-centered pedagogies that overlook psychosocial strategies (Hemmler & Ifenthaler, 2024).

Considering the third research question, the interaction between self-efficacy and tolerance of ambiguity was examined. Qualitative themes, such as strategic synergy, revealed that learners who balanced self-efficacy strategies with ambiguity management exhibited enhanced adaptability in drafting complex texts. This aligns with Xue's (2024) argument for integrating affective and cognitive dimensions in pedagogical interventions, bridging Bandura's (1986) mastery experiences with adaptive experimentation frameworks. Interview responses further illustrated that confidence in goal-setting mitigated avoidance behaviors, while ambiguity management strategies enabled learners to navigate unclear syntax without cognitive paralysis. Collectively, these findings advance EFL pedagogy by demonstrating that self-efficacy and tolerance of ambiguity operate synergistically, addressing a critical gap in cultural contexts where conformity often stifles risk-taking (Zhang & Zou, 2022).

The quantitative and qualitative results resonate with recent studies on self-regulation (Fathi et al., 2024) and strategic competence (Teng & Zhang, 2019). For instance, the efficacy of reflective journaling aligns with Zhang's (2024) emphasis on metacognitive strategies, while the role of tolerance of ambiguity reflects Pishghadam et al.'s (2021) work on linguistic adaptability. Ultimately, this study underscores the necessity of integrating psychosocial strategies into curricula to empower learners in navigating the multifaceted demands of academic writing.

## **6. Conclusion and Implications**

This study investigated how self-efficacy and tolerance of ambiguity collectively shape EFL learners' writing proficiency. The findings reveal that self-efficacy enhances writing accuracy through strategic persistence, while

tolerance of ambiguity fosters fluency via cognitive flexibility, with their synergy offering a novel framework for L2 writing development. Theoretically, this bridges Bandura's (1997) self-efficacy theory with Dörnyei and Ryan's (2015) strategic competence model, advancing a unified understanding of cognitive-affective dynamics in language learning. Methodologically, the MM design provides a replicable approach for examining psychosocial constructs in culturally situated contexts. However, the study's focus on upper-intermediate learners in Iran limits generalizability to other proficiency levels or cultural settings, and the absence of gender-specific analyses, alongside the influence of conformity-oriented educational norms (Zhang & Zou, 2022), suggests contextual factors may modulate intervention efficacy.

To address these limitations, future research should investigate gender differences in strategy responsiveness, test scalable interventions (e.g., digital feedback systems) across diverse learner groups, and employ longitudinal designs to assess sustained writing gains. From a policy perspective, curriculum reforms should integrate explicit strategy instruction, such as goal-setting and iterative revisions to normalize tolerance of ambiguity, while teacher training programs must prioritize workshops on fostering cognitive flexibility and reducing error aversion. Equally critical is the need for assessment reforms that reward risk-taking and resilience in rubrics, incentivizing holistic writing development beyond grammatical precision. Ultimately, this study underscores the transformative potential of harmonizing theoretical innovation with classroom practice. By fostering pedagogies that balance confidence-building and ambiguity management, educators and policymakers can empower EFL learners to navigate academic writing with autonomy, thereby bridging the enduring divide between research insights and real-world instructional practices.

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