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An investigation into the influence of AI tools on syntactic maturation in EFL writers at selected Vietnamese universities

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Abstract: This study examines the influence of AI-assisted writing tools on the syntactic complexity and writing autonomy of Vietnamese EFL university students. Adopting a quasi-experimental design, the research compared 23 students from Dai Nam University who employed AI tools (e.g., Grammarly, QuillBot, ChatGPT) with 26 students from the Banking Academy of Vietnam who completed equivalent writing tasks without AI support. Quantitative analysis, conducted using the L2 Syntactic Complexity Analyzer (L2SCA), focused on four indices: Mean Length of T-unit (MLT), Clauses per Sentence (C/S), Complex Noun Phrases per Clause (CN/C), and Dependent Clauses per Clause (DC/C). Results showed that the AI-assisted group demonstrated greater gains across all indices, with increases in MLT and CN/C nearing statistical significance ($p \approx .05$). Thematic analysis of reflective journals indicated a shift from AI reliance to more autonomous syntactic decision-making. These findings suggest that, when used reflectively, AI writing tools can support syntactic maturation and foster learner autonomy in EFL academic writing. Pedagogical implications for AI integration in non-native English contexts are discussed.

Keywords: *Academic writing, autonomy, AI writing tools, EFL learners, Syntactic complexity, Vietnamese universities.*

1. Introduction

As digital technologies continue to reshape educational practices, artificial intelligence (AI) has become an increasingly prominent presence in Vietnamese university classrooms. For English as a Foreign Language (EFL) learner, tools such as ChatGPT, Writefull, and DeepL Write. are no longer peripheral aids but integral companions in the writing process. These tools extend beyond surface-level grammar checks, offering syntactic suggestions, vocabulary enhancements, and rhetorical refinements. However, their growing ubiquity raises a critical pedagogical question: do these tools genuinely enhance students' writing abilities, or do they simply mask linguistic weaknesses?

Syntactic complexity - defined as the structural sophistication of sentence construction - is a recognized benchmark of proficiency in second language (L2) writing (Ortega, 2003). Yet, for many Vietnamese EFL students, achieving syntactic complexity remains a formidable challenge, often constrained by limited access to individualized feedback and opportunities for syntactic experimentation. While AI tools may fill some of these instructional gaps by offering real-time support, the long-term effects of such tools on students' independent syntactic development remain uncertain. Do students internalize and apply complex structures more confidently over time, or do they become overly dependent on automated suggestions?

This study aims to address these concerns by investigating the impact of AI writing tools on syntactic development and writing autonomy among EFL university students in Vietnam. By comparing the writing outcomes of students who utilized AI tools with those who relied on traditional resources, this research seeks to understand how AI integration shapes learners' syntactic choices and self-directed growth over time.

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The study is guided by the following objectives:

1. To investigate the influence of AI writing tools on the syntactic complexity of academic writing among Vietnamese EFL learners;
2. To compare patterns of syntactic development between AI-assisted and non-AI-assisted student writers;
3. To evaluate whether sustained use of AI tools fosters or inhibits syntactic autonomy.

Correspondingly, the study addresses the following research questions:

1. How do AI writing tools influence the syntactic complexity of academic writing produced by Vietnamese EFL learners?
2. What differences, if any, exist in syntactic development between students who use AI tools and those who do not?
3. To what extent do AI-assisted EFL writers demonstrate autonomy in their syntactic choices over time?

2. Literature Review

2.1. Syntactic Complexity in L2 Writing

Syntactic complexity refers to the structural elaboration of language, often measured by indices such as Mean Length of T-unit (MLT), Clauses per Sentence (C/S), Complex Noun Phrases per Clause (CN/C), and Dependent Clauses per Clause (DC/C) (Ortega, 2003). These metrics serve as proxies for linguistic development, particularly in academic writing, where syntactic richness correlates with higher proficiency.

A more syntactically complex text typically features a greater range of embedded clauses, sophisticated noun and verb phrases, and a well-developed hierarchy of sentence structures. Developing such complexity is often considered an essential milestone in advanced language acquisition, as it enables learners to express nuanced relationships between ideas, manage coherence across longer texts, and convey academic arguments with precision. In the context of EFL writing, syntactic complexity does not develop linearly; it is influenced by a combination of input exposure, task type, feedback quality, and opportunities for revision. As a result, tracking syntactic development over time provides valuable insight into learners' evolving competence, particularly when external supports like AI are introduced.

2.2. AI Writing Tools and Language Learning

The adoption of AI tools in writing instruction has gained traction in recent years, particularly as language education shifts toward more technology-enhanced environments. These tools, powered by natural language processing and machine learning, can now offer learners instant feedback not only on grammar and spelling but also on tone, coherence, and sentence structure. Platforms such as Grammarly and QuillBot provide automated corrections and rephrasings, while generative AI like ChatGPT enables students to explore different rhetorical strategies and discourse styles interactively.

Empirical studies support the benefits of AI-assisted writing. Zhang and Zou (2022) found that learners using AI feedback tools improved in lexical variety, syntactic accuracy, and overall coherence. Similarly, Marzuki, Wahyudin, and Hafid (2023) reported that EFL students using AI tools produced more organized and logically structured texts. These findings suggest that AI tools can facilitate the internalization of certain writing conventions and reduce the cognitive load associated with L2 composition.

However, concerns about over-reliance remain salient. Learners may begin to defer too quickly to AI suggestions, accepting revisions without fully understanding the rationale. This passive interaction can undermine opportunities for noticing gaps in their interlanguage and engaging in the reflective processes essential for long-term development. Moreover, there is a risk that students may treat AI feedback as infallible, reducing their motivation to revise critically or experiment with their own

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syntactic choices. In this way, AI tools, while powerful, must be integrated with pedagogical strategies that encourage active learning, critical thinking, and gradual release of responsibility.

2.3. Autonomy in L2 Writing

Learner autonomy, a central concept in language education, involves the ability to take charge of one's learning process (Little, 2007). It entails the development of metacognitive awareness, goal-setting skills, strategic planning, and the confidence to make independent decisions throughout the learning journey. In writing, autonomy is evident when learners take control over drafting, revising, and structuring their texts based on internalized knowledge rather than external direction.

Autonomous writers actively reflect on language choices, revise based on self-assessment or feedback, and gradually develop their own academic voice. In EFL contexts, however, such autonomy is not always easily achieved due to limited access to individualized instruction or feedback. AI tools offer a promising supplement by providing immediate responses to language issues, encouraging revision behaviors that might otherwise be delayed or absent.

Yet, this support introduces new pedagogical tensions. While tools can empower learners through real-time guidance, they may also foster superficial engagement. Some students might rely too heavily on automated corrections, skipping critical thinking or overlooking the linguistic rules underpinning suggested revisions. This raises the question of whether AI tools promote the kind of deep learning required for autonomy, or whether they risk reinforcing dependence if not integrated with reflective pedagogical strategies. To foster genuine autonomy, educators must not only expose students to AI tools but also guide them in using such technologies critically, strategically, and as part of a broader process of self-directed language development.

2.4. Theoretical Frameworks

This study draws on three complementary theoretical perspectives to examine the influence of AI tools on syntactic development and learner autonomy: Sociocultural Theory, Dynamic Systems Theory, and Usage-Based Learning.

Sociocultural Theory Vygotsky (1978) emphasizes the role of social interaction and mediation in learning. According to this view, learners progress when they receive scaffolding from more knowledgeable others, which can include peers, teachers, or, in this case, AI tools. These tools act within the learner's Zone of Proximal Development (ZPD), offering support that allows them to perform at higher linguistic levels than they could independently. However, for scaffolding to be effective, it must eventually be withdrawn as learners internalize skills and knowledge, allowing for the emergence of autonomy.

Dynamic Systems Theory views language development as a non-linear, emergent, and context-sensitive process. From this perspective, learners' writing abilities evolve over time through complex interactions between cognitive, emotional, and environmental variables. AI tools may act as a stabilizing influence at times, providing consistent feedback, but they can also disrupt developmental trajectories if overused or misapplied. This theory supports the need to track changes over time and to observe not just static outcomes but dynamic shifts in learner behavior.

Usage-Based Learning approaches language development from a cognitive-functional perspective, emphasizing that structures are learned through repeated meaningful use. Learners build syntactic complexity not through rule memorization but by being exposed to patterns in context and reusing them in varied ways. AI tools that provide sentence re-phrasings, for example, may enhance learners' repertoire of constructions, but only if learners actively engage with these alternatives and reuse them productively in their own texts.

Together, these frameworks enable a holistic view of AI tools in writing development: as mediators of learning (Sociocultural Theory), participants in a complex developmental system (Dynamic Systems Theory), and sources of pattern-rich input for structural acquisition (Usage-Based Learning). They also

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alert us to the risk of learners bypassing essential developmental processes if technology is used uncritically or unreflectively.

2.5. Research Gap

Despite the increasing integration of AI tools in EFL writing instruction, there remains a notable gap in empirical research focusing specifically on their impact on syntactic maturation and learner autonomy. While existing studies have highlighted improvements in coherence, organization, and surface-level grammatical accuracy, less is known about how these tools influence deeper cognitive and linguistic processes such as syntactic decision-making and independent revision practices. Furthermore, the potential long-term consequences of AI-assisted writing, both positive and negative, have yet to be thoroughly investigated, particularly in the context of developing countries like Vietnam, where educational settings and learner profiles differ from those in Western contexts. This study seeks to fill this gap by exploring how Vietnamese EFL learners interact with AI writing tools over time, and how these interactions shape their syntactic development and writing autonomy.

3. Methodology

3.1. Research Design

This study employed a quasi-experimental, longitudinal design spanning a 12-week academic term. The design incorporated two comparison groups drawn from distinct institutional contexts to evaluate the effects of AI tool usage on writing development. Both groups completed four academic writing tasks at regular intervals, allowing for a dynamic assessment of syntactic progression over time.

The AI-assisted group, comprising students from Dai Nam University, was encouraged to use AI writing tools—specifically Grammarly, ChatGPT, and QuillBot—during all writing assignments. In contrast, the control group, consisting of students from the Banking Academy of Vietnam, completed identical tasks without AI support, relying solely on conventional resources such as peer feedback and instructor guidance.

This comparative framework enabled the exploration of both immediate and evolving effects of AI integration. The longitudinal nature of the study allowed for the examination of developmental trends in syntactic complexity and autonomy, distinguishing between tool-mediated scaffolding and self-generated growth.

3.2. Research Instruments

To ensure consistency and academic relevance, all writing prompts reflected genres commonly encountered in university coursework, including argumentative essays, research summaries, and cause-effect analyses.

Two primary instruments were used:

1. L2 Syntactic Complexity Analyzer (L2SCA) – This tool was employed to evaluate four key syntactic complexity indices: Mean Length of T-unit (MLT), Clauses per Sentence (C/S), Complex Noun Phrases per Clause (CN/C), and Dependent Clauses per Clause (DC/C). These measures served as quantitative indicators of students' structural development in academic writing.
2. Student Reflective Journals – Participants maintained journals throughout the intervention, providing qualitative data on their writing habits, revision strategies, perceptions of AI tool utility, and evolving sense of control over syntactic decisions.

3.3. Data Analysis

Quantitative data derived from the L2SCA were analyzed using repeated measures ANOVA to evaluate syntactic development across the four writing tasks. This statistical method facilitated both within-group and between-group comparisons over time, enabling the identification of significant trends and group-specific patterns.

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Qualitative data from the journals were analyzed inductively through thematic coding. Key themes related to autonomy, revision behavior, cognitive engagement, and perceived reliance on AI tools were extracted and synthesized. This dual approach allowed for a more holistic understanding of how students' writing practices evolved in response to AI tool usage.

4. Findings

This section presents the research findings aligned with the study's three research questions. Quantitative data were drawn from the L2 Syntactic Complexity Analyser (L2SCA) and complemented by thematic analysis of reflective journals.

RQ1: How do AI writing tools influence the syntactic complexity of academic writing produced by Vietnamese EFL learners?

Descriptive statistics indicated that the AI-assisted group from Dai Nam University experienced notable growth across all syntactic complexity measures during the 12-week intervention (see Table 1).

Table 1.
Descriptive Statistics of Syntactic Complexity.

Index	DNU students (pre-AI)	DNU students (post-AI)	Banking Academy students (no AI)
MLT	10.61	13.59	12.66
C/S	1.19	1.48	1.42
CN/C	0.42	0.53	0.51
DC/C	0.26	0.33	0.31

The AI-assisted group demonstrated greater syntactic elaboration, reflected in increased Mean Length of T-unit (MLT) and more frequent use of complex noun and dependent clause structures. Notably, MLT rose from 10.61 to 13.59 and CN/C from 0.42 to 0.53 - both key indicators of advanced academic writing. These gains suggest that AI tools encouraged learners to experiment with structurally sophisticated constructions, moving beyond basic error correction toward syntactic enhancement.

RQ2: What differences, if any, exist in syntactic development between students who use AI tools and those who do not?

A comparison of pre- and post-intervention performance reveals that although both groups improved, the AI-assisted group achieved more substantial gains across all indices (see Table 2).

Table 2.
Syntactic Complexity Gains (Week 1 to Week 12).

Index	Dai Nam gain	Banking Academy gain	Differences
MLT	+2.98	+1.65	+1.33
C/S	+0.29	+0.23	+0.06
CN/C	+0.11	+0.09	+0.02
DC/C	+0.07	+0.05	+0.02

Although statistical comparisons did not yield significance at the conventional $p < .05$ threshold, p-values for MLT ($p = .054$) and CN/C ($p = .053$) approached significance, indicating a trend favoring the AI group.

RQ3: To what extent do AI-assisted EFL writers demonstrate autonomy in their syntactic choices over time?

Evidence of emerging autonomy was observed through consistent upward syntactic trends in the AI-assisted group, particularly during the latter half of the intervention. The development of MLT and CN/C - often considered cognitively demanding features - was most pronounced between weeks 8 and 12.

Table 3.
Independent Samples t-test Results (Week 12).

Index	t	df	*p*- value	Significant
MLT	2.005	31.70	0.054	Approaching
C/S	1.712	40.10	0.094	No significant
CN/C	1.987	43.00	0.053	Approaching
DC/C	1.639	41.89	0.112	No significant

Qualitative data supported these trends. Early journal entries revealed students' dependence on AI tools for revision and sentence restructuring. However, by week 10, several participants described a strategic engagement, using AI as a reference rather than a default editor. One student wrote, "At first, I followed what Grammarly said. But later, I used it just to check. I wanted to try my own way first." Another reflected, "AI helped me realize how to join ideas better, and I started combining my own sentences without always using the suggestions."

These accounts suggest a developmental trajectory from external reliance to internal control - a shift consistent with Vygotskian notions of scaffolded learning and gradual self-regulation.

5. Discussion

The findings of this study highlight the meaningful role that AI writing tools can play in fostering syntactic development among Vietnamese EFL university students. Through a mixed-methods analysis of writing samples and student reflections, the results underscore the potential of AI tools to function as scaffolding mechanisms that support both immediate linguistic enhancement and longer-term autonomy in writing.

5.1. Acceleration of Syntactic Complexity

The most prominent syntactic gains were observed in Mean Length of T-unit (MLT) and Complex Noun Phrases per Clause (CN/C)—both hallmarks of academic writing proficiency. These improvements were more pronounced in the AI-assisted group, particularly in the later stages of the intervention. This pattern aligns with Sociocultural Theory Vygotsky (1978) which posits that learners benefit from external scaffolding that enables performance beyond their current level of independent ability. In this case, AI tools served as mediators within learners' Zones of Proximal Development (ZPD), facilitating more complex sentence construction that students may not have otherwise attempted unassisted.

While inferential statistics fell just short of conventional thresholds ($p \approx .05$), the consistent upward trajectory and effect size differentials offer pedagogically meaningful evidence. The observed growth across multiple syntactic indices, coupled with reflective accounts of changing writing behavior, affirms that AI tools can encourage deeper structural experimentation and revision.

5.2. Emerging Autonomy in Syntactic Choices

Beyond quantitative gains, qualitative reflections revealed a developmental shift in how students engaged with AI tools. Early reliance on automated suggestions gradually gave way to more intentional, strategic use. Students reported using AI outputs as inspiration rather than final solutions, indicating a move toward greater metacognitive control and syntactic awareness.

This behavioral progression resonates with principles from Usage-Based Learning Theory Tomasello (2003) which emphasizes the internalization of linguistic patterns through meaningful exposure and reuse. Repeated interaction with AI-generated structures likely contributed to learners' evolving syntactic repertoires. Over time, students began integrating these constructions into their independent writing, suggesting that AI tools, when used reflectively, can function as catalysts for structural learning—not merely correctors of surface-level errors.

5.3. Implications for Pedagogy and AI Integration

The findings offer important implications for the integration of AI into EFL writing instruction. First, AI tools should be framed not as substitutes for instruction, but as extensions of it—complementary scaffolds that enable learners to notice, revise, and experiment with complex constructions in a low-stakes environment. Teachers should provide explicit guidance on how to engage with AI critically, encouraging learners to reflect on suggestions, question automated feedback, and develop personalized revision strategies.

Second, as the Vietnamese context often lacks individualized feedback due to large class sizes or limited resources, AI tools may serve as equitable support mechanisms. When combined with reflective tasks such as journals or revision logs, these tools can foster not only structural growth but also learner agency.

Finally, instructional designs should consider gradually reducing AI reliance over time, helping learners transition from scaffolded support to independent syntactic control. This aligns with Dynamic Systems Theory Larsen-Freeman (1997) which views language development as an adaptive, non-linear process influenced by internal and external variables.

6. Conclusion

This study explored the impact of AI-assisted writing tools on the syntactic complexity and autonomy of Vietnamese EFL university students. By comparing the writing development of students who employed AI tools with those who did not, the research offers timely insights into the pedagogical potential of AI in second language writing instruction.

Quantitative findings revealed that students in the AI-assisted group achieved greater improvements across all syntactic complexity indices, with Mean Length of T-unit (MLT) and Complex Noun Phrases per Clause (CN/C) approaching statistical significance. These patterns suggest that AI tools may not only correct superficial errors but also facilitate deeper structural growth when used consistently and strategically.

Qualitative reflections further supported these findings, revealing a shift in student behavior over time. Initially reliant on automated feedback, students gradually began exercising greater control over their syntactic choices. This progression points to the emergence of writing autonomy - an essential goal in EFL instruction - fostered by scaffolded exposure to pattern-rich, immediate feedback.

Together, these results underscore the dual potential of AI tools: as enhancers of linguistic complexity and as facilitators of learner agency. When integrated thoughtfully into pedagogy, AI can act not merely as a crutch, but as a stepping stone toward more confident, self-regulated academic writing.

In sum, this research contributes to the growing body of evidence supporting AI-enhanced language learning. It highlights the importance of designing instructional environments that balance technological assistance with opportunities for reflection, critical engagement, and gradual release of responsibility. For EFL contexts such as Vietnam - where resources may be limited - AI offers a promising avenue for supporting learners' structural development and writing independence.

7. Limitations and Future Research

While this study provides valuable insights into the influence of AI tools on syntactic development and writing autonomy among Vietnamese EFL learners, several limitations must be acknowledged.

First, the relatively small sample size (N = 49) and short intervention period (12 weeks) limit the generalizability of the findings. Though trends were promising and approached statistical significance, larger-scale studies with extended durations are needed to confirm and deepen these results.

Second, while both quantitative and qualitative methods were employed, the self-reported nature of the reflective journals may introduce bias. Participants may have under- or overestimated their reliance on AI tools or the extent of their syntactic autonomy.

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Third, institutional differences between the two groups - such as instructional styles, prior exposure to English, or access to additional resources - could have influenced outcomes, despite the efforts to control for prompt consistency and task type.

Finally, the study did not examine the specific features or affordances of individual AI tools. Future research might explore how different types of AI feedback (e.g., grammar correction vs. sentence rephrasing vs. generative support) contribute uniquely to syntactic development and learner autonomy. Future investigations could also:

- Employ mixed-method designs across more diverse EFL populations and contexts
- Track longitudinal effects of AI tool use across multiple semesters or writing-intensive courses.
- Examine the role of teacher mediation in balancing AI use and learner independence.
- Explore AI-supported collaborative writing and peer-review models in EFL classrooms.

By addressing these areas, future research can provide a more comprehensive understanding of how AI tools intersect with second language writing development and pedagogical practice.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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References

Larsen-Freeman, D. (1997). Chaos/complexity science and second language acquisition. *Applied linguistics*, *18*(2), 141-165. https://doi.org/10.1093/applin/18.2.141

Little, D. (2007). Language learner autonomy: Some fundamental considerations revisited. *International Journal of Innovation in Language Learning and Teaching*, *1*(1), 14-29. https://doi.org/10.2167/illt040.0

Marzuki, A. G., Wahyudin, A. Y., & Hafid, A. (2023). The impact of AI writing tools on the content and organization of EFL students' writing. *Cogent Education*, *10*(1), 2236469. https://doi.org/10.1080/2331186X.2023.2236469

Ortega, L. (2003). Syntactic complexity measures and their relationship to L2 proficiency: A research synthesis of college-level L2 writing. *Applied linguistics*, *24*(4), 492-518. https://doi.org/10.1093/applin/24.4.492

Tomasello, M. (2003). *Constructing a language: A usage-based theory of language acquisition*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. In. Cambridge, MA: Harvard University Press.

Zhang, Y., & Zou, D. (2022). Effects of an AI-based writing feedback tool on Chinese EFL students' writing performance. *Language Learning & Technology*, *26*(3), 1–23. https://doi.org/10.10125/73478