Asia Pacific Journal of Advanced Education and Technology
Volume 5, Issue 1, March 2026 / P- ISSN 2815 – 245X / E – ISSN 2815 – 2468 / www.apjaet.com

Analyzing the Relationship Between College Freshmen's Punctuation Literacy and their Use of AI Writing Tools

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DOI: https://doi.org/10.54476/apjaet/20062

Abstract

This study examined the relationship between college freshmen's punctuation literacy and their use of AI writing tools, drawing on data from 168 first-year students enrolled in Reading and Writing courses. Using a sequential exploratory mixed-method design, the research analyzed students' error patterns, revision practices, and perceptions of AI-assisted writing. Results showed that semicolons, colons, commas, and apostrophes were the most challenging punctuation marks, with difficulties largely stemming from rule confusion, cognitive overload, informal digital writing habits, and limited prior instruction. Quantitative findings revealed a weak but significant negative correlation between punctuation literacy and AI tool usage ($r = –.284$, $p < .05$), suggesting that higher dependence on AI is associated with lower independent mastery of punctuation rules. Qualitative data further indicated that while AI tools enhance efficiency and surface-level accuracy, overreliance reduces mindfulness and cognitive engagement during revision. Students primarily used AI applications such as Grammarly, Quill Bot, and ChatGPT for editing, often prioritizing automated corrections over reflective learning. The study highlights the need for balanced pedagogy that integrates explicit punctuation instruction, guided editing strategies, and responsible AI use to strengthen both mechanical accuracy and autonomous writing skills.

Keywords: AI writing tools, cognitive engagement, punctuation literacy, revision practices, writing proficiency

Introduction

In higher education today, the increasing reliance on writing technologies coexists with persistent difficulties in students' mastery of basic writing conventions, particularly punctuation. In academic writing, college freshmen face persistent challenges in mastering punctuation, a fundamental yet often overlooked aspect of written communication. Punctuation plays a critical role in shaping meaning, enhancing clarity, and supporting reader comprehension, and its correct use has been shown to positively influence writing proficiency among tertiary students (Suliman, 2019). For Filipino college freshmen enrolled in Reading and Writing courses, punctuation mastery is

especially important, as academic tasks such as essays, reflection papers, and concept papers demand precision in language and expression.

Punctuation literacy in this study is understood as a learner's ability to use punctuation marks appropriately and effectively in written communication, including correct usage, awareness of error patterns, and self-regulation during revision. Despite its importance, punctuation difficulties persist among first-year students, particularly with marks such as semicolons, colons, and apostrophes. These challenges raise concerns about students' preparedness for formal academic writing and suggest gaps in instruction and practice.

The increasing use of AI writing tools such as Grammarly, QuillBot, and ChatGPT has further transformed students' writing practices. These tools provide real-time feedback on grammar, punctuation, and style, improving efficiency and surface-level accuracy. However, their growing use raises important pedagogical questions: Do AI tools support the development of genuine punctuation literacy, or do they foster reliance that weakens cognitive engagement and independent learning? While AI offers immediate correction and guidance, excessive dependence may reduce opportunities for reflection and rule internalization.

Despite the rapid integration of AI in higher education, research gaps remain. Studies on punctuation among Filipino college students often emphasize error types but overlook revision behaviors, while research on AI writing tools rarely examines their impact on foundational skills such as punctuation. Addressing these gaps, the present study investigates the relationship between college freshmen's punctuation literacy and their use of AI writing tools, aiming to inform balanced pedagogical approaches that integrate technological support with explicit instruction and reflective writing practice.

Punctuation Literacy in Academic Writing

In this study, punctuation literacy is defined as a learner's ability to use punctuation marks accurately and effectively in written communication, including correct usage, awareness of error patterns, and self-regulation strategies during revision and editing, as grounded in writing mechanics and error-analysis frameworks (Graham & Perin, 2007; Sandrawati, 2021; Education Victoria, 2020). Punctuation plays a vital role in written communication by guiding readers in interpreting meaning, establishing relationships among ideas, and identifying sentence boundaries and emphasis (Truss, 2003). Often described as the "invisible framework" of writing, punctuation supports clarity, coherence, and logical flow. Crystal (2019) emphasizes that punctuation provides rhythm and structure to language, ensuring both grammatical accuracy and communicative intent. When punctuation is misused, readability suffers, and the credibility of academic writing is weakened—an issue particularly significant for college students transitioning to formal and analytical writing.

Despite its importance, punctuation remains one of the most neglected areas of writing instruction. Graham and Perin (2007) observe that many college students struggle with punctuation due to limited exposure to explicit grammar instruction in earlier schooling. Instruction in contemporary classrooms often prioritizes content development and higher-order skills such as argumentation and organization, while lower-order conventions like punctuation and capitalization receive minimal attention. This imbalance contributes to uneven mastery of fundamental writing mechanics among college entrants.

Empirical research supports these concerns. Lunsford and Connors (2015) identified punctuation errors as among the most frequent issues in freshman composition, particularly with commas, apostrophes, and semicolons. These marks require nuanced syntactic understanding, suggesting that punctuation competence involves cognitive processing, rule internalization, and sustained practice rather than mechanical application alone. Without such competence, students may struggle to express complex ideas clearly and persuasively.

Studies further show that punctuation difficulties vary across writing contexts and instructional emphasis. The study of Sülükçü and Kırboğa (2020) reported high error rates with dashes among Turkish freshmen, and similar patterns of comma and period misuse were found among Iraqi and Nigerian learners (Kartika et al., 2022; Gezmiş, 2023). These differences suggest that punctuation difficulty is shaped by task type, frequency of use, and instructional focus. Less frequently taught punctuation marks, such as semicolons and colons, may reflect deeper conceptual misunderstandings when misused, underscoring the need for explicit and contextualized instruction.

AI Writing Tools in Education

The rise of AI writing tools such as Grammarly, ProWritingAid, and ChatGPT has transformed students' writing practices by providing instant feedback on grammar, punctuation, and style (Godwin-Jones, 2022). Using natural language processing and machine learning, these tools analyze sentence structure and offer suggestions that appeal to students seeking efficiency and accuracy.

Research indicates that AI tools can support writing development by promoting self-correction and learner autonomy (Bii, 2018; Kumar, 2023). Individualized feedback helps students recognize recurring errors and build metalinguistic awareness, particularly among novice writers. However, concerns remain. Xu and Zhang (2021) warn that excessive reliance on AI may lead to surface-level learning, reducing critical engagement and internalization of grammatical rules. Additionally, AI tools may misinterpret context, reinforcing the need for reflective rather than passive use.

Relationship Between AI Usage and Writing Proficiency

Research on AI writing tools and writing proficiency presents mixed findings. Chien (2023) reported improvements in surface-level accuracy but reduced deep cognitive engagement, while Sun and Teng (2022) found that the effectiveness of AI feedback depends on learners' reflective engagement. Despite growing interest in AI-assisted writing, few studies isolate punctuation literacy as a distinct component of proficiency. Given punctuation's critical role in meaning and clarity, this gap warrants focused investigation. The present study addresses this need by examining the relationship between college freshmen's punctuation literacy and their use of AI writing tools, contributing insights into technology-mediated writing development.

Theoretical Framework

This study is grounded in Vygotsky's (1978) Sociocultural Theory of Learning, which explains that knowledge is co-constructed through interactions with tools, peers, and the learning environment; in this context, AI writing tools act as mediational artifacts that support learners within their zone of proximal

development (ZPD) yet may also constrain the development of independent punctuation mastery when overused. Complementing this sociocultural lens, Cognitive Load Theory (Paas et al. (2022) provides the cognitive foundation for understanding how AI tools influence the mental processes involved in writing: while automated feedback can reduce extraneous cognitive load and free students to focus on meaning-making, it may simultaneously diminish germane cognitive processing that is essential for deeply learning and retaining punctuation rules. These theories inform the study's theoretical framework, which models AI writing tool usage as an independent variable affecting punctuation literacy through mediating mechanisms such as writing habits, cognitive engagement, and self-regulation during revision and editing.

Objectives of the Study

This study aims to:

1. Identify the specific punctuation marks that college freshmen find most challenging in their writing.
2. Determine the factors that contribute to the punctuation errors committed by college freshmen in the Reading and Writing course.
3. Examine how college freshmen approach revising and editing their written outputs for punctuation accuracy.
4. Describe the AI writing tool usage of college freshmen.
5. Analyze the relationship between college freshmen's punctuation literacy and their use of AI writing tools.

Methodology

This study utilized a sequential exploratory mixed-method design to investigate the relationship between college freshmen's punctuation literacy and their use of AI writing tools. The participants consisted of 168 freshmen from two private schools in Manila, enrolled in a Reading and Written course. The research instrument comprised three parts: (1) Punctuation Literacy, (2) AI Writing Tool Usage, and (3) Qualitative Responses that explored learners' experiences, revision habits, and perceptions of AI through standardized and open-ended questions. Each research question has both quantitative and qualitative data to ensure and confirm the results. The questionnaire underwent face and content validation by experts in linguistics, language education, and educational technology to ensure clarity and construct validity, and was distributed via Google Form. Quantitative data were analyzed using descriptive statistics and Pearson correlation to examine the relationship between punctuation literacy and AI tool usage, while the qualitative data were examined thematically following Braun and Clarke's (2006) framework. All ethical protocols were observed, including voluntary participation, confidentiality, and approval from the institutional Research Ethics Committee prior to data collection.

Results and Discussion

1. Specific punctuation marks do college freshmen find most challenging in their writing

As shown in Table 1, the semicolon (64.3%) was the punctuation mark most frequently identified as difficult by college freshmen, followed by the colon (42.3%), comma (19.6%), and apostrophe (17.3%). Other punctuation marks, including parentheses, quotation marks, periods, exclamation marks, question marks, and dashes, were reported as less problematic. These results suggest that students experience greater difficulty with mid-sentence punctuation requiring advanced grammatical understanding, particularly marks used to connect clauses or organize complex sentence structures.

Table 1
Specific punctuation marks do college freshmen find most challenging in their writing

Rank	Punctuation Mark	Frequency	Percentage (%)
1	Semicolon (;)	108	64.3%
2	Colon (:)	71	42.3%
3	Comma (,)	33	19.6%
4	Apostrophe (’)	29	17.3%
5	Parentheses (( ))	28	16.7%
6	Quotation Marks (“ ”)	26	15.5%
7	Period / Full Stop (.)	16	9.5%
8	Exclamation Mark (!)	14	8.3%
9	Question Mark (?)	11	6.5%
10	Others (e.g., Em dash, En dash, Hyphen)	10	6.0%

The prominence of the semicolon as the most challenging punctuation mark aligns with the findings of Sülükçü and Kırboğa (2020), who reported that first-year university students frequently misunderstood semicolon usage, often substituting commas due to confusion about grammatical functions. This pattern indicates that difficulties with semicolons persist across linguistic and cultural contexts, reflecting a broader instructional gap in punctuation mastery.

However, contrasting findings were reported by Bautista et al. (2025), who found that comma misuse and missing end punctuation were the most common errors in persuasive writing among Filipino students, while semicolon errors were less frequent. This difference may be attributed to genre-specific demands and the higher frequency of commas and periods in persuasive texts.

Overall, these studies suggest that punctuation difficulties vary according to writing context and instructional emphasis. While semicolons are widely perceived as complex, effective punctuation instruction requires explicit, contextualized teaching and sustained practice, including strategies such as peer correction and self-correction (Kartika et al., 2023).

2. Challenges in the Use of Punctuation Marks

The quantitative data revealed in Table 1 are reinforced by the qualitative results presented in Table 2. The theme *Understanding Punctuation Rules* (132 responses) revealed that students experience confusion and uncertainty in the application and placement of semicolons, colons, commas, and apostrophes. Respondents frequently cited difficulty recalling rules and distinguishing between similar marks, as reflected in statements such as *“Semicolon and colon rules are hard”* and *“I forget the right punctuation.”* These insights suggest that students’ struggles with punctuation arise more from rule-based confusion and cognitive processing gaps than from mere carelessness.

Table 2
Challenges in the Use of Punctuation Marks

Theme	Description	Number of Responses Mentioning Theme	Sample Codes (Illustrative Phrases)
Understanding Punctuation Rules	Respondents described difficulty understanding punctuation rules, especially for marks that require nuanced grammatical understanding. They cited confusion in proper placement, rule recall, and distinguishing between similar marks.	132	"Confused where to put commas"; "Semicolon and colon rules are hard"; "I forget the right punctuation"; "Not sure when to use apostrophe"; "Punctuation depends on sentence flow."

Jimenez et al. (2024) confirmed that students in higher education institutions (HEIs) often find it difficult to use punctuation marks correctly, particularly in deciding when to apply commas, periods, and other marks. Both datasets underscore the need for targeted instruction that strengthens students' grammatical reasoning and promotes the contextual use of punctuation in academic writing. Similarly, Kartika et al. (2023) recommend the use of peer correction, self-correction, increased practice, and explicit instruction to address punctuation errors effectively.

3. Factors contribute to the punctuation errors committed by college freshmen in the Reading and Writing course

Table 3
Factors Contributing to the Punctuation Errors Committed by College Freshmen in the Reading and Writing Course

Primary Reason	Frequency
Forgetting rules	45
Not paying attention due to focusing on content	43
Influence of informal/social-media writing	40
Rushing while writing	23
Prior instruction lacked emphasis on punctuation	1

As shown in Table 3, the most common factors contributing to punctuation errors among college freshmen were forgetting punctuation rules, prioritizing content over writing mechanics, and the influence of informal or social media writing. Less frequent factors included rushing during writing tasks and limited emphasis on punctuation in prior instruction. These findings suggest that punctuation errors stem from both cognitive and contextual influences. Cognitively, students tend to overlook grammatical rules when focusing on idea development and coherence. Contextually, frequent exposure to informal digital communication promotes writing habits that disregard formal punctuation conventions.

These results are supported by Bautista et al. (2025), who found that punctuation errors were the most common mechanical mistakes in junior high school students' Facebook posts. Their findings indicate that punctuation difficulties begin early and persist in higher education due to unstructured writing practices. Together, these studies highlight the need for targeted interventions in reading and writing courses

to strengthen punctuation instruction and support the development of accurate and proficient academic writing skills.

4. Methods for Checking Punctuation when Revising and Editing Written Outputs

The qualitative findings in Table 4 complement the quantitative results by showing how punctuation difficulties manifest in students' revision practices. The theme Checking and Revising Strategies revealed that students use a combination of manual and AI-assisted methods when editing their writing. Many rely on tools such as Grammarly, QuillBot, and Google to identify and correct punctuation errors, while others use manual proofreading or read their work aloud. However, excessive reliance on AI tools often leads to surface-level corrections without promoting deeper understanding or internalization of punctuation rules.

Table 4
Methods for checking punctuation when revising and editing written outputs

Theme	Description	Number of Responses Mentioning Theme	Sample Codes (Illustrative Phrases)
Checking and Revising Strategies	Students reported using both manual and AI-assisted approaches to check punctuation. Many rely on Grammarly, Quill Bot, or Google, while others prefer rereading aloud or peer review for error detection.	152	"I use Grammarly to check my work"; "I search punctuation rules on Google"; "I read my essay aloud to hear mistakes"; "AI helps fix errors quickly."

These findings align with previous research on AI-assisted writing. Marzuki et al. (2023) reported that while AI tools improve grammar and punctuation accuracy, overdependence may weaken independent writing skills. Similarly, Amani and Bisriyah (2025) found that students frequently use AI tools for editing but engage minimally with rule learning or mechanical revision. Bensalem et al. (2024) further noted that students themselves recognize the limitations of overreliance on digital tools.

Overall, these results suggest that punctuation difficulties among college freshmen stem from rule forgetfulness, a focus on content over mechanics, informal writing habits, and partial dependence on automated tools. Addressing these challenges requires explicit punctuation instruction, guided revision practices, and reflective use of AI in academic writing contexts.

5. College freshmen approach revising and editing their written outputs for punctuation accuracy

As shown in Table 5, college freshmen adopt a variety of strategies when revising and editing their written outputs for punctuation accuracy. The most frequently reported approach was the use of AI and online grammar checkers such as Grammarly, QuillBot, Google Docs, and ChatGPT (46.4%). This was followed by reading work aloud to detect punctuation and flow errors (25.0%), manual self-review or re-reading (15.5%), and searching punctuation rules online (8.9%). A small proportion of students (4.2%) were admitted to minimal or no revision, often citing time constraints or overreliance on AI tools. These results

suggest that while most freshmen engage in some form of revision, their approaches are primarily surface-level and technology-assisted, reflecting a preference for efficiency and automated accuracy over deeper grammatical understanding.

Table 5
College Students' Approach in Revising and Editing Written Outputs for Punctuation Accuracy

Rank	Revision / Editing Approach	Frequency	Percentage (%)
1	Use of AI and online grammar checkers (e.g., Grammarly, QuillBot, Google Docs, ChatGPT)	78	46.4%
2	Reading work aloud to detect punctuation and flow errors	42	25.0%
3	Manual self-review or re-reading to check punctuation	26	15.5%
4	Searching punctuation rules online (e.g., Google, reference websites)	15	8.9%
5	Minimal or no revision due to time constraints or overreliance on tools	7	4.2%

A study by Ekizoğlu and Demir (2025) confirm that the AI-assisted feedback group exhibited notable gains in grammar, vocabulary, and coherence, outperforming their peers with teacher-only feedback. These findings suggest that AI-driven feedback can effectively supplement writing instruction; however, the researchers acknowledged that it is important to acknowledge that AI tools are not a replacement for human feedback but rather a complementary resource. The AI handled micro-level issues like grammar and punctuation literacy and provided extensive feedback on those, but only the teacher can provide strategies on higher-order concerns (idea development, argumentation, organization) that the AI might not fully address. Therefore, educators should promote a balanced approach by encouraging students to rely on their own writing skills while using Grammarly as a supplementary tool (Polancos et al, 2025; Epe et al 2024).

6. Use of AI Writing Tools That Affects Mindfulness in Writing

Table 6
Use of AI Writing Tools That Affects Mindfulness in Writing

Theme	Description	Number of Responses Mentioning Theme	Sample Codes (Illustrative Phrases)
Mindfulness and AI Impact	Participants expressed mixed views on how AI influences their awareness of punctuation. Some said AI helps them notice errors, while others admitted becoming overly dependent on it, reducing active learning.	109	"AI helps me learn punctuation faster"; "Sometimes I rely too much on AI"; "It makes me less careful"; "AI suggestions make me aware of mistakes, but I don't always understand why.

The qualitative data presented in Table 6 provide further insight into students' experiences with AI-assisted writing tools. The theme *Mindfulness and AI Impact* (109 responses) revealed mixed perceptions about how AI affects students' awareness of punctuation. Some participants indicated that AI tools enhanced their mindfulness by providing immediate feedback and highlighting overlooked errors (e.g., *"AI helps me learn punctuation faster"*). However, others acknowledged that constant dependence on AI reduced active learning and attentiveness (e.g., *"It makes me less careful"*).

Overall, the data suggest that college freshmen employ a combination of AI-supported and manual strategies when revising their writing. While AI tools clearly facilitate the identification of errors, an overdependence on technology may limit the development of self-regulated editing skills and deeper engagement with punctuation rules. Xu and Zhang (2021) emphasized that excessive dependence on AI tools can lead to surface-level learning, where students passively accept corrections without engaging in critical analysis or internalizing grammatical rules. These findings highlight that punctuation competence extends beyond mechanical accuracy; it involves cognitive processes such as understanding grammatical relationships, internalizing rules, and deliberate, reflective practice (Lunsford & Connors, 2015). Therefore, fostering punctuation literacy requires a balanced approach that combines the benefits of AI-assisted feedback with explicit instruction and guided, reflective revision practices. Such an approach can support students in developing both accuracy and independence, ensuring that technological assistance enhances rather than replaces critical engagement with the writing process.

7. The AI writing tool usage of college freshmen

Frequency of Use

Table 7
AI Writing Tool Usage of College Students

Likert Scale Category	Frequency	Percentage (%)	Verbal Interpretation
Always	14	8.3%	Very High Use
Often	51	30.4%	High Use
Sometimes	96	57.1%	Moderate Use
Never	7	4.2%	Low/No Use
Total	168	100%	—

The findings reveal that most college freshmen use AI writing tools often, with a smaller group indicating that they often rely on such tools, while only a few reported always and never using them. This pattern suggests that AI-assisted writing has become a common feature of students' academic practices, integrated into their writing routines to differing extents (Bii, 2018; Godwin-Jones, 2022; Kumar, 2023). Students predominantly use these tools to revise their work, check grammar and punctuation, propose alternative wordings, and enhance sentence flow and clarity.

The data suggest that students perceive AI tools as helpful companions that improve the mechanical and stylistic aspects of their writing. Despite these benefits, their engagement with AI appears to be largely corrective rather than educational. In other words, students use AI primarily to polish and refine their outputs, rather than to develop a deeper understanding of writing conventions or internalize grammatical principles. This tendency reflects an emerging reliance on technology for achieving linguistic accuracy, which may limit the development of autonomous writing skills. These findings highlight the need to

combine AI-assisted writing with teaching strategies that help students learn independently. While AI tools are useful for spotting and fixing errors, they cannot replace the thinking involved in understanding grammar and punctuation rules. Using AI alongside guided revision, reflective practice, and clear instruction can help students improve their skills, become more confident writers, and develop habits for independent learning (Zu & Zhang, 2021).

8. Significant relationship between college freshmen's punctuation literacy and their use of AI writing tools

Table 8

Correlation Between Punctuation Literacy and AI Writing Tool Usage (N = 168)

Variables	1	2	M	SD	r	p	Interpretation
1. Punctuation Literacy	—		3.72	0.68	—	—	Weak, significant negative correlation
2. AI Writing Tool Usage		—	3.94	0.74	–.284*	. 023	

$p < .05$ indicates statistical significance. A negative correlation suggests that higher AI tool usage is associated with lower punctuation literacy scores.

To determine whether a relationship exists between college freshmen's punctuation literacy and their use of AI writing tools, a Pearson product–moment correlation analysis was conducted using the quantitative data gathered through the questionnaire. As shown in Table 7, the results revealed a weak but statistically significant negative correlation between punctuation literacy and AI writing tool usage, $r(166) = –.284$, $p < .05$.

This finding suggests that as the frequency of AI writing tool use increases, punctuation literacy scores slightly decrease. Although the relationship is statistically significant, its weak strength indicates that while AI usage is associated with punctuation performance, it is not the sole determinant. Students who rely heavily on AI tools such as Grammarly, QuillBot, and ChatGPT may experience reduced independent engagement with punctuation rules, consistent with the concept of cognitive offloading (Risko & Gilbert, 2016). Conversely, those who use AI selectively and combine it with manual proofreading tend to retain greater grammatical awareness.

The findings align with prior research on AI-assisted writing. Sun and Teng (2022) reported that AI-generated feedback can improve revision quality, but its effectiveness depends on how actively students engage with the suggestions. Learners who thoughtfully consider AI recommendations develop stronger self-editing skills, whereas overreliance on automated corrections provides limited cognitive benefit. Similarly, Chien (2023) found that AI-assisted writing can enhance surface-level accuracy, including spelling, grammar, and punctuation. However, these improvements often occur at the expense of deep cognitive engagement, as students may prioritize mechanical correction over developing complex ideas and rhetorical strategies. Together, these studies suggest that AI tools can improve mechanical accuracy but may hinder deeper understanding if used unreflectively.

The qualitative data further support this pattern, revealing that frequent AI users often become less attentive to punctuation accuracy, whereas others view AI as an aid that enhances awareness but not deep understanding. There is a significant but weak negative relationship between punctuation literacy and AI tool usage, highlighting the importance of balanced, reflective use of AI in academic writing to strengthen

both mechanical accuracy and linguistic competence.

Conclusion

This study examined the relationship between college freshmen's punctuation literacy and their use of AI writing tools, highlighting how foundational writing skills interact with emerging technologies. The findings showed that semicolons, colons, commas, and apostrophes remain particularly challenging for students, with these difficulties associated with rule confusion, cognitive gaps, and exposure to informal writing practices. These results indicate that punctuation literacy is not solely dependent on knowledge of rules but also on sustained practice and deeper cognitive engagement.

Furthermore, although AI writing tools are commonly used as part of students' writing processes, their role appears to support surface-level corrections rather than deeper learning. The tendency to rely on automated feedback may limit students' opportunities to internalize punctuation conventions and develop independent revision skills. Overall, the study provides insight into the complex relationship between technological support and skill development, emphasizing that the presence of AI tools does not automatically lead to improved foundational writing competence.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Students should be encouraged to use AI writing tools as supplementary aids rather than substitutes for their own writing efforts. Combining automated feedback with manual proofreading and self-review can strengthen their understanding and application of punctuation rules.

2. Teachers should integrate explicit punctuation instruction and AI literacy into writing courses. This includes guiding students in critically evaluating AI-generated suggestions and understanding the limitations of such tools in developing foundational writing skills.

3. Schools and administrators should organize seminars and workshops on responsible AI use, while also ensuring access to legitimate and ethical AI platforms that support informed and balanced technology use in academic writing.

4. Future researchers are encouraged to conduct longitudinal and comparative studies to examine the long-term effects of AI tool usage on writing proficiency, particularly in relation to punctuation literacy and cognitive learning outcomes across different disciplines and educational levels.

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