AI Integration in Research Writing: A Quantitative Study among Students and Teacher-researchers toward a Human-AI Model

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ABSTRACT

This quantitative study investigated the integration of artificial-intelligence (AI) tools in academic research writing among students and teacher-researchers at Quezon City University. Conducted in April 2025, the research assessed usage patterns, perceived effectiveness, and ethical considerations surrounding AI-assisted writing. Using a validated structured survey (Cronbach's $\alpha = 0.91$) administered to 120 participants (80 students, 40 faculty), results revealed extensive AI use for grammar correction, paraphrasing, citation formatting, and literature summarization. Statistically significant differences ($p < .05$) appeared between students and faculty in usage frequency and ethical perception. The study developed the Adaptive Human–AI Writing Continuum (AHAWC) Model—a flexible framework integrating five collaboration patterns (Human–AI–Human, AI–Human–AI, Human-in-the-Loop, AI Companion, Human–AI Co-creation)—to guide responsible, context-sensitive AI integration in research writing.

Keywords: Artificial Intelligence, Research Writing, Human-AI Collaboration, Academic Integrity, Higher Education

1. Introduction

The rapid advancement of artificial intelligence (AI) technologies has profoundly transformed academic writing and scholarly communication. Tools such as Grammarly, Quillbot, Wordtune, and ChatGPT now support students and researchers by improving grammar, paraphrasing, summarizing, and synthesizing ideas (Rezaee & Allahyari, 2023; Roe et al., 2023; Zhao, 2025). These AI-powered platforms have proven particularly beneficial in non-native English contexts, where they enhance linguistic fluency and writing confidence (Abdullah, 2025; Nurchurifiani et al., 2025).

Despite these advantages, concerns persist about AI's implications for originality, authorship, and critical thinking. Studies warn that dependence on generative systems may erode metacognitive engagement and blur the boundaries of intellectual ownership (Fowler, 2023; Kotsis, 2024; Zhai et al., 2024). Ethical tensions arise as AI outputs challenge traditional notions of academic honesty, raising questions about attribution, disclosure, and plagiarism (Hutson, 2024; Tripathi & Thakar, 2024). Institutions are thus pressed to balance technological innovation with integrity and responsible authorship (Chan, 2023; Bankins, 2021).

While literature on AI in education is rapidly expanding, the majority of existing studies remain tool-based or conceptual, often focusing on linguistic improvements or AI's technical affordances rather than its social, ethical, and pedagogical dimensions. For instance, Roe et al. (2023) examined writing improvement using Grammarly, while Al-Shaboul et al. (2024) analyzed ChatGPT's stylistic impacts on academic tone. However, few studies explore how students and teacher-researchers actually integrate AI into research writing, or how their ethical perceptions and institutional contexts shape this process. Even fewer focus on developing countries, such as the Philippines, where AI use has outpaced formal policies on academic integrity and digital literacy (Al-Bukhrani et al., 2025; Khalifa & Albadawy, 2024).

The absence of empirical evidence on AI usage behavior and ethical engagement within higher education leaves critical gaps. These include: (1) the extent to which students and faculty rely on AI tools, (2) differences in perceived productivity and ethical awareness between academic groups, and (3) the lack of a context-specific framework guiding responsible AI collaboration in academic writing. Addressing these gaps is vital for developing institutional policies that promote both innovation and integrity.

This study therefore quantitatively investigates the integration of AI tools in research writing among students and teacher-researchers at Quezon City University. It examines usage patterns, perceived effectiveness, and ethical considerations, while comparing perceptions between the two groups. Ultimately, it proposes the Adaptive Human–AI Writing Continuum (AHAWC) Model, an empirically grounded framework that contextualizes AI integration across stages of authorship and ethical awareness. By bridging conceptual theory and empirical practice, this study contributes to redefining academic writing as a process of reflective human–AI collaboration, aligned with institutional accountability and scholarly ethics.

2. Literature Review

Artificial intelligence has emerged as both a tool of empowerment and a source of pedagogical complexity in higher education. Research highlights AI's capacity to streamline grammar

correction, idea generation, and data organization, thereby improving writing efficiency and confidence (Rezaee & Allahyari, 2023; Roe et al., 2023; Widiati et al., 2023). For many writers, especially those in non-Western academic settings, these tools bridge linguistic barriers and democratize access to scholarly publication (Abdullah, 2025; Nurchurifiani et al., 2025).

However, studies have increasingly noted that AI's cognitive convenience may compromise originality, authorship identity, and independent thought (Fowler, 2023; Kotsis, 2024). Overdependence on AI may reduce authentic student engagement, while unregulated use can lead to ethical infractions, including plagiarism and ghost authorship (Hutson, 2024; Tripathi & Thakar, 2024). Consequently, scholars and institutions have called for AI literacy frameworks emphasizing human judgment, transparency, and responsible disclosure (Chan, 2023; Bankins, 2021).

Despite global progress, empirical studies examining the real-world integration of AI in academic writing remain scarce. Most research has centered on system performance or classroom evaluation rather than user experiences, institutional contexts, or ethical variations (Khalifa & Albadawy, 2024; Al-Bukhrani et al., 2025). This is particularly evident in the Philippine higher education sector, where digital infrastructures and AI policies are still developing. The resulting gap underscores the need for localized empirical evidence to guide teaching, supervision, and institutional policy development.

Human–AI Collaboration Models in Writing

Recent frameworks attempt to conceptualize how humans and AI co-create text. Kumar et al. (2024) introduced Human-in-the-Loop (HITL) models emphasizing iterative review cycles with human oversight, while McGrath et al. (2024) proposed Human–AI–Human (HAIH) frameworks where AI mediates idea refinement between drafts. Shneiderman (2020) and Gilson et al. (2023) advocate for Human–Computer Partnership Models that prioritize creativity, ethical reflection, and accountability in co-authoring processes.

However, these models are predominantly theoretical or engineering-based and rarely grounded in educational research. Few examine AI collaboration as a social and pedagogical process influenced by institutional culture and academic norms. This study addresses that gap by empirically modeling Human–AI collaboration in the Philippine higher education context, leading to the development of the Adaptive Human–AI Writing Continuum (AHAWC).

To synthesize findings from the literature, Figure 1 presents a concept map linking the study's main constructs—AI Use, Productivity, Ethical Awareness, and Institutional Response—illustrating how these dimensions interact dynamically in the academic writing process.

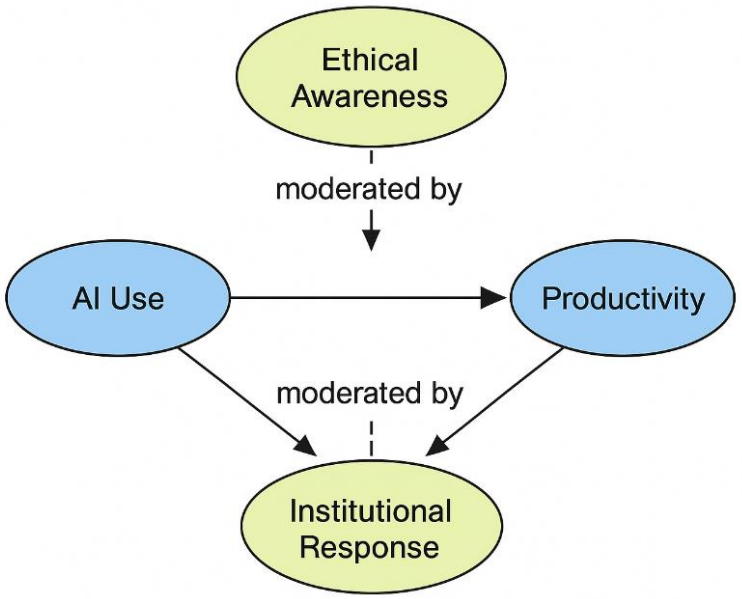

Figure 1: Concept Map of AI Integration in Academic Writing

3. Theoretical Framework

This study is grounded in Socio-Technical Systems Theory (Appelbaum, 1997) and the Human–Computer Interaction (HCI) Framework (Shneiderman, 2020; Gilson et al., 2023)—two complementary lenses that explain the interaction between human authors, technological tools, and institutional systems in academic writing.

Socio-Technical Systems Theory posits that effective performance arises when human and technological subsystems are aligned. Applied to AI-assisted writing, it suggests that optimal academic output results from balancing technical efficiency with human ethical reasoning and institutional guidance. This theory provides the foundation for analyzing how AI enhances writing productivity while simultaneously challenging the moral and cognitive dimensions of authorship.

The Human–Computer Interaction (HCI) Framework complements this perspective by focusing on the usability, feedback, and trust mechanisms that govern user engagement with intelligent systems. In academic writing, HCI emphasizes how iterative interactions between users and AI tools shape writing behavior, reflection, and decision-making. This framework offers a more relevant behavioral lens than the earlier Activity Theory, as it directly aligns with the study's focus on how writers use, interpret, and regulate AI assistance.

Together, these theories inform the design of the Adaptive Human–AI Writing Continuum (AHAWC). By integrating socio-technical balance (human–machine harmony) and HCI principles (user reflection and transparency), the model operationalizes the dynamic relationship between productivity, ethical responsibility, and institutional mediation in AI-assisted research writing.

4. Conceptual Framework and Construct Operationalization

The conceptual framework (Figure 2) illustrates the hypothesized relationships among the study's key constructs—AI Use, Perceived Productivity, Ethical Awareness, and Institutional Response—culminating in the development of Human–AI Collaboration Models.

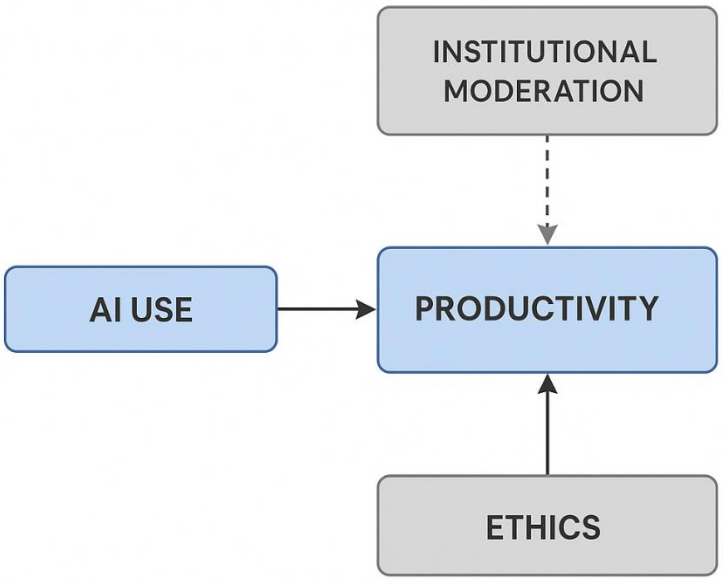

Figure 2: Conceptual Framework for the Adaptive Human–AI Writing Continuum

Construct Operationalization

Construct	Operational Definition	Example Questionnaire Item	Source(s)
AI Use	Frequency and purpose of AI engagement (e.g., editing, paraphrasing, summarizing).	"I use AI tools regularly to improve the clarity of my writing."	Roe et al., 2023; Khalifa & Albadawy, 2024
Perceived Productivity	The extent to which AI use enhances writing efficiency, coherence, and output quality.	"AI helps me complete research writing tasks faster and more effectively."	Zhao, 2025; Widiati et al., 2023
Ethical Awareness	Knowledge and practice of ethical principles in AI use, including citation and originality.	"Using AI without acknowledgment constitutes plagiarism."	Hutson, 2024; Tripathi & Thakar, 2024
Institutional Response	The presence of guidelines, supervision, and training supporting responsible AI use.	"My university provides policies or seminars on ethical AI use in writing."	Chan, 2023; Bankins, 2021
Human–AI Collaboration	The degree of partnership between human writers and AI tools across writing stages.	"I use AI as a writing assistant but retain full control over the content."	Kumar et al., 2024; McGrath et al., 2024

Each construct was measured using Likert-scale items validated through expert review and pilot testing (Cronbach's $\alpha = 0.91$). The operational definitions guided both instrument development and model formulation, ensuring that the AHAWC Model reflects observable behaviors and ethical perceptions.

Framework Linkage

The conceptual relationships illustrated in this study reveal that AI use positively influences perceived productivity, reflecting the efficiency gains that users experience when integrating AI tools into academic writing. However, this relationship is moderated by ethical awareness, which ensures that such efficiency is achieved responsibly and within the bounds of academic integrity. Furthermore, the institutional response—in the form of clear policies, training programs, and governance mechanisms—plays a crucial role in strengthening both productivity and ethical alignment, promoting informed and accountable AI practices. Collectively, these interactions form the foundation of the Adaptive Human–AI Writing Continuum (AHAWC), an empirically grounded model that conceptualizes five progressive stages of human–AI collaboration, evolving from basic mechanical assistance to ethically guided co-creation.

5. Methodology

Research Design

This study employed a quantitative descriptive–comparative design to examine how AI tools are integrated into academic writing among university students and teacher-researchers. This design was chosen to systematically identify patterns, perceptions, and ethical considerations associated with AI use and to compare these across two distinct academic groups. Quantitative data served as the foundation for developing the Adaptive Human–AI Writing Continuum (AHAWC) Model, which illustrates progressive levels of human–AI collaboration.

While this approach effectively captured measurable differences between students and faculty, its single-institution scope presents a limitation in generalizability. To enhance future studies, triangulation across multiple institutions or the inclusion of qualitative interviews and focus groups is recommended to provide richer contextual insights into the complexities of AI-assisted writing across diverse educational environments.

Participants

The study involved a total of 120 participants, consisting of 80 students enrolled in undergraduate research courses and 40 teacher-researchers engaged in scholarly writing or thesis supervision.

A purposive sampling technique was applied to ensure that participants had relevant experience with AI tools in research writing. Invitations were distributed through college deans and faculty advisers, targeting individuals who met two inclusion criteria:

1. Active use of at least one AI-powered writing tool (e.g., Grammarly, Quillbot, ChatGPT) during the past academic year; and
2. Involvement in research-related coursework or publication activities.

Out of 140 invitations, 120 valid responses were received, representing an 86% response rate. The sample was diverse in age, discipline, and writing experience, providing a representative profile of AI users within the institution's academic community.

Research Context

The study was conducted at Quezon City University, a public higher-education institution in Metro Manila, Philippines, during April 2025. The research setting is significant because the university is among the early adopters of digital and AI-assisted teaching and research practices. Institutional discussions about responsible AI use and data ethics were emerging at the time of the study, offering an ideal context for analyzing academic behaviors, perceptions, and challenges related to AI integration in scholarly writing.

Research Instrument

Data were collected using a researcher-developed questionnaire titled "Survey Questionnaire on AI Integration in Academic Writing". The tool was designed to gather information on AI usage patterns, perceived benefits and challenges, ethical awareness, and institutional responses among students and teacher-researchers.

The instrument consisted of five main parts: (1) demographic profile; (2) usage of AI tools in academic writing; (3) perceived benefits and challenges; (4) ethical and academic integrity concerns; and (5) open-ended questions on experiences and reflections. Most items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5), while the final section provided qualitative data to complement the quantitative results.

The questionnaire was aligned with existing validated measures (Roe et al., 2023; Zhao, 2025; Hutson, 2024) and contextualized for the Philippine higher education setting. It served as the primary data-gathering instrument for identifying patterns of AI use and informing the development of the Adaptive Human–AI Writing Continuum (AHAWC) Model.

Instrument Validation and Reliability

The questionnaire underwent a two-phase validation process: expert review and pilot testing. Three field experts—specialists in educational research, research ethics, and educational technology—were invited to evaluate the survey's content validity, clarity, and face validity. They reviewed each item for relevance, completeness, and alignment with the study constructs, providing written feedback that led to minor revisions such as simplifying terminologies, reordering items for clarity, and merging overlapping questions.

A pilot test was conducted with 20 respondents (10 students and 10 faculty members) from a similar institution. The pilot results produced a Cronbach's $\alpha = 0.91$, indicating excellent internal consistency. Qualitative comments from pilot participants were used to further refine item phrasing and ensure clear comprehension across varying literacy levels.

Research Procedures

Prior to data collection, ethical clearance was obtained from the Quezon City University Research Ethics Committee. The survey was administered online via Google Forms, accompanied by an informed-consent statement outlining the purpose of the study, voluntary

participation, confidentiality of responses, and adherence to the Data Privacy Act of 2012 (RA 10173).

Participants were informed that completion of the survey signified consent. No identifying information was collected. Data were stored in a secure institutional drive accessible only to the research team.

Data Analysis

Quantitative data were analyzed using IBM SPSS Statistics v26.

- Descriptive statistics (frequencies, means, and standard deviations) summarized demographic information, AI-usage patterns, and perceptions.
- Inferential statistics, including independent-samples t-tests, were used to compare students and faculty regarding perceived productivity and ethical awareness.
- Pearson correlation coefficients examined relationships between AI-usage frequency, productivity, and ethical awareness scores.

Open-ended responses from 94 participants (62 students and 32 faculty members) were analyzed using a thematic-content approach. The unit of analysis was each distinct idea or reflection relating to AI benefits, challenges, or ethics. Two independent coders analyzed responses using a hybrid deductive–inductive coding scheme. The resulting themes included enhanced efficiency, ethical uncertainty, dependence concerns, and pedagogical implications.

Inter-coder reliability reached $\kappa = 0.87$, indicating strong consistency. Comparative analysis between the two respondent groups revealed that students emphasized efficiency and accessibility, while faculty emphasized accountability and ethical risk.

Recognizing the limitation of self-reported Likert data, the researchers note potential response biases and advocate the use of triangulation (e.g., interviews, document analysis, or AI tool usage logs) in future studies to verify findings and enhance credibility.

6. Results

AI Usage Patterns

As shown in the data, the most frequently used AI tools were Grammarly (n = 51), ChatGPT (n = 26), Quillbot (n = 15), and Citation Generators (n = 10). Respondents also reported using Summarization Tools (n = 7) and AI-based Plagiarism Checkers (n = 6), with fewer using other tools (n = 5).

Table 1: AI Tools Usage Patterns

AI Tool	F	%
Grammarly	51	42.50
ChatGPT	26	21.67
Quillbot	15	12.50

Citation Generators	10	8.33
Summarization Tools	7	5.83
Plagiarism Checkers	6	5.00
Others	5	4.17
Total	120	

AI was primarily used in the stages of Citation Formatting (n = 53), Editing (n = 30), and Literature Review (n = 20), with substantial use during Drafting (n = 8), Finalizing (n = 6), and Topic Generation (n = 3). These findings suggest that AI is used not only for polishing texts but also for content development and research support.

Table 2. AI Usage by Writing Stage

Writing Stage	**F**	**%**
Citation Formatting	53	44.16
Editing	30	25.00
Literature Review	20	16.67
Drafting	8	6.67
Finalizing	6	5.00
Topic Generation	3	2.50
Total	120	

This widespread and multi-stage use aligns with literature suggesting AI is reshaping not just how we write, but how we think through and structure research work. The prominence of Grammarly and citation tools also indicates a persistent concern with form, accuracy, and formatting in academic output.

Perceived Effectiveness of AI Tools

Both student and teacher respondents generally agreed on the positive impact of AI tools in research writing. Among teachers, the highest mean ratings were observed in the following items: “AI tools help improve the quality of my writing” (M = 4.20), “AI tools are useful in summarizing literature” (M = 4.10), and “AI tools assist in reducing grammatical and typographical errors” (M = 4.05).

Table 3: Perceived Effectiveness of AI Tools

	Student Mean	**Teacher Mean**
Improves writing quality	3.96	4.2
Increases efficiency	3.95	3.9
Reduces errors	4.01	4.05
Enhances idea generation	3.88	4.05
Summarizes literature	3.75	4.1
Clarifies structure	3.9	4.1
Helps with citation	3.98	3.95
Boosts confidence	4.01	4
Reduces cognitive load	3.95	4
Overall helpful	4.08	3.98

Students gave comparable ratings, with slightly lower means, though still within the "Agree" range (M = 3.88–4.01). These results highlight consensus on AI's role in enhancing productivity, clarity, and confidence in research writing.

These findings support the view that AI tools, when used appropriately, can meaningfully support academic writing. The statistical analysis shows minimal divergence in perception between students and teachers, reinforcing the idea that AI effectiveness is broadly recognized across academic roles.

Ethical Considerations on AI Use

The study also explored ethical dimensions, revealing that teacher-researchers held a more cautious stance compared to students. Teachers gave higher ratings on key ethical statements, including "AI-generated content should be cited" (M = 4.08 vs. 3.29), "AI may promote plagiarism" (M = 4.03 vs. 3.24), and "Using AI to generate full sections raises ethical concerns" (M = 4.03 vs. 3.42).

Table 4. Ethical Considerations on AI Use

	Student Mean	**Teacher Mean**
AI content should be cited	3.29	4.08
Hinders original thinking	3.49	3.9
Raises ethical concerns	3.42	4.03
May promote plagiarism	3.24	4.03
Needs university guidelines	3.62	3.95
Affects writing skills	3.45	3.98
Can cause unfair advantage	3.51	4.1
Should be support only	3.45	3.85
Unclear ethical limits	3.4	3.85
Should be declared	3.44	3.9

These differences were statistically significant ($p < 0.05$), indicating a genuine gap in how each group perceives the ethical risks of AI in academic settings. Teachers' heightened concern reflects their role as gatekeepers of academic integrity, while students may be more focused on productivity gains.

This supports earlier findings in literature emphasizing the importance of AI ethics education. Without clear institutional guidelines, students may under-recognize the boundaries of appropriate AI use, making teacher guidance and policy frameworks essential.

Relationship Between AI Use, Effectiveness, and Ethics

Correlation analyses deepened the understanding of these dynamics. A moderate positive correlation was found between AI usage frequency and perceived effectiveness ($r = .48$, $p < .01$), suggesting that familiarity and consistent engagement lead to greater confidence in AI use.

However, a weak negative correlation between usage frequency and ethical awareness ($r = –.19$, $p < .05$) indicates that increased reliance on AI does not necessarily enhance ethical mindfulness. This underscores the importance of explicit ethical scaffolding in academic programs to prevent normalization of superficial or unacknowledged AI authorship.

These findings reinforce the Socio-Technical principle that technological systems require social regulation—through policy and pedagogy—to ensure balanced, ethical outcomes.

Qualitative Insights

Open-ended responses from 94 participants (62 students and 32 faculty members) were analyzed using a thematic content approach, consistent with the study's methodology. Each distinct idea in a response served as the unit of analysis, capturing reflections on AI's benefits, risks, and ethical dimensions. A hybrid deductive–inductive coding scheme guided the analysis, and two independent coders reached strong agreement ($\kappa = 0.87$), ensuring reliability. To deepen interpretation, themes were compared between students and faculty, revealing meaningful contrasts that informed the construction of the Adaptive Human–AI Writing Continuum (AHAWC).

Three major themes and corresponding subthemes emerged:

Theme 1: AI as Cognitive and Affective Support
(Subthemes: Writing Assistance, Confidence Boost, Linguistic Support)
Students and faculty consistently highlighted AI's value in enhancing clarity, generating ideas, and reducing writing anxiety. Many respondents viewed AI as a form of cognitive scaffolding—a tool that helps them express ideas more clearly and organize their writing.

> A student described AI as a *"digital tutor that helps me finish my research faster because it gives ideas and fixes grammar."*
> Another explained that AI *"makes writing easier and less time-consuming,"* especially during the drafting stage.
> Faculty echoed these benefits, noting that AI provides efficient proofreading and stylistic refinement, making writing *"more organized and clear."*

However, the depth of use differed significantly between groups. Students tended to rely on AI for surface-level tasks such as grammar correction, paraphrasing, and idea generation. As one student put it: *"It helps in grammar and gives ideas; I just need to rephrase it."*

Faculty, on the other hand, used AI more strategically for conceptual coherence, consistency checks, and validating paraphrased content.
This functional differentiation between superficial and deeper levels of support corresponds directly to the lower stages of the AHAWC model (*Minimal Support* and *Assisted Structuring*), where AI serves primarily as a linguistic and organizational aid.

Theme 2: Ethical and Pedagogical Tensions
(Subthemes: Academic Integrity, Overreliance, Misconceptions about Disclosure)
Ethical concerns emerged strongly, especially among faculty respondents, who emphasized risks of plagiarism, overreliance, and loss of authentic academic voice.
Faculty explicitly warned about academic dishonesty:

> *"AI is a helpful editor, but it must not become the author."*
> *"Students may no longer read or understand their own research because AI produces answers for them."*

Students, however, often equated responsible use with simple transparency:

"As long as you cite AI, it is okay."

"Use AI but don't rely too much—just rephrase it."

This contrast reveals a clear ethical maturity gap: faculty advocated accountability, whereas many students prioritized procedural compliance (e.g., paraphrasing or citing AI). Some students even expressed misconceptions such as:

"AI information is okay as long as you double-check and rephrase it," suggesting uncertainty about deeper ethical obligations like source verification, authorship integrity, and critical evaluation.

These tensions directly informed the ethical checkpoints embedded throughout the AHAWC continuum, particularly the middle stages (*Iterative Supervision* and *Dialogic Collaboration*), where human judgment and verification are emphasized.

Theme 3: Evolving Human–AI Collaboration Practices

(Subthemes: Co-Development of Text, Changing Writer Roles, Reflective Oversight)

Both groups described AI as a dynamic collaborator, though they conceptualized this partnership differently.

Students tended to view AI as a peer-like assistant:

"It gives many ideas—it's easier to write when AI helps."

"AI helps me understand confusing topics by using simpler words."

Teachers viewed AI within a guided pedagogical system, stressing reflective use and human oversight:

"Use AI only for organizing ideas, not as the source of information."

"Teachers should set guidelines and use AI detection carefully—students must think on their own."

Comparative analysis showed:

Students → emphasize *efficiency, accessibility, idea generation*.

Faculty → emphasize *critical thinking, academic honesty, accountability*.

These developmental differences map onto the higher stages of the AHAWC model (*Dialogic Collaboration* and *Guided Co-Creation*), where AI becomes a co-developer of text but must be mediated by reflective human control.

The qualitative findings provided essential empirical grounding for the development of the Adaptive Human–AI Writing Continuum (AHAWC). Reports of surface-level AI use—such as grammar correction, paraphrasing, and basic idea generation—directly informed Stages 1 and 2, where AI functions primarily as a mechanical and structural aid. Faculty members' emphasis on verification, critical checking, and responsible evaluation shaped Stage 3, which centers on iterative supervision and human-led judgment. Participants' descriptions of back-and-forth engagement with AI, including refining drafts and clarifying arguments, contributed to Stage 4, characterized by dialogic collaboration between human and machine. Finally, repeated calls for explicit guidelines, ethical boundaries, and pedagogical oversight grounded Stage 5, where co-creation occurs under reflective and institutionalized ethical safeguards. Taken together, these insights did more than support the model—they actively shaped its

structure, ensuring that the AHAWC continuum authentically reflects the diverse, developmental, and ethically layered ways users engage with AI in academic writing.

Development of the Adaptive Human–AI Writing Continuum (AHAWC) Model

Synthesizing the quantitative trends and qualitative insights, the AHAWC Model conceptualizes the integration of AI tools as a fluid, reflective continuum moderated by ethical awareness and human oversight.

Stage	Description	Dominant Actor	Ethical Focus
1. Minimal Support	AI used only for grammar or citation correction	Human	Accuracy
2. Assisted Structuring	AI aids in sequencing ideas and improving coherence	Human	Transparency
3. Iterative Supervision	Human critically evaluates AI-generated suggestions	Human-led	Accountability
4. Dialogic Collaboration	AI and human co-develop text through iterative feedback	Shared	Disclosure
5. Guided Co-Creation	Human and AI co-produce text under ethical supervision	Collaborative	Reflective integrity

Progression through these stages mirrors Socio-Technical Systems Theory (Appelbaum, 1997) and Activity Theory (Engeström, 1999)—emphasizing equilibrium between technological efficiency and human judgment.

The model underscores that ethical literacy and reflective agency, not mere access to AI tools, define successful academic integration. Institutions may adopt AHAWC as a tiered pedagogical framework, enabling learners to move from surface-level automation toward ethically reflective co-authorship.

7. Discussion

This study examined how students and teacher-researchers at Quezon City University integrate artificial intelligence (AI) tools into their research writing practices. Quantitative and qualitative analyses revealed both the potential and the tensions inherent in AI-assisted writing, highlighting differences in perception between students and faculty. The discussion that follows synthesizes these findings and explains how they informed the development of the Adaptive Human–AI Writing Continuum (AHAWC) Model.

Linking Findings to the Proposed Model

The data show that AI tools such as Grammarly, ChatGPT, Quillbot, and citation generators are used across multiple writing stages—from editing and formatting to literature summarization. This widespread, multi-stage application aligns with global findings that AI increasingly mediates both mechanical and cognitive aspects of writing (Khalifa & Albadawy, 2024; Nurchurifiani et al., 2025).

At the same time, users in this study varied significantly in depth of engagement and ethical orientation. Students tended to employ AI for grammar correction and idea generation, valuing its convenience (M = 3.9–4.0), whereas faculty respondents emphasized accuracy, verification, and responsible use (M = 4.0–4.2). The t-test confirmed statistically significant differences in ethical concern ($p < .05$). These contrasts directly informed the continuum logic of the AHAWC Model: the model's five levels correspond to the increasing complexity and ethical sensitivity of AI involvement observed among participants.

For example, respondents who used AI solely for surface-level corrections reflect Stage 1 (Minimal Support); those who combined AI summarization with personal synthesis correspond to Stage 3 (Iterative Supervision); and participants who collaborated with AI for brainstorming or translation resemble Stage 4 (Dialogic Collaboration). The progression from mechanical to creative reliance—anchored by teacher supervision and disclosure—emerged organically from the dataset rather than being imposed a priori. Thus, the AHAWC Model is empirically grounded: each continuum stage is traceable to specific usage patterns, frequency data, and qualitative themes documented in this study.

Data-Driven Implications

The implications drawn from this study are not theoretical speculations but are firmly anchored in the evidence collected from both quantitative and qualitative findings. First, AI literacy must emphasize ethical competence. Teachers' significantly higher ethical ratings ($M \approx 4.0$ vs. 3.3 for students) reveal a notable gap that institutions must address through explicit instruction on citation, authorship, and responsible AI assistance. This finding underscores the need to embed ethical training in AI-related writing programs to cultivate academic integrity and critical awareness among learners.

Second, institutional scaffolding is essential. Frequent mentions in the open-ended responses about the need for "clearer policies" and "AI training in schools" support the call for structured frameworks, such as the Adaptive Human–AI Writing Continuum (AHAWC) Model. Institutional mechanisms can ensure that technological fluency is complemented by ethical accountability, allowing AI integration to enhance learning outcomes without compromising authenticity.

Third, pedagogical differentiation is required to address role-based differences in AI utilization. The findings demonstrate that a one-size-fits-all policy is ineffective, as students and teacher-researchers engage with AI tools differently. The AHAWC continuum offers a tiered approach: early-stage writers may remain within Stages 1–2, focusing on accuracy and transparency, while advanced researchers can progress to Stages 4–5, where collaboration and ethical co-creation are emphasized under guided supervision.

Lastly, the study provides evidence for dynamic human–AI interaction. Participants reported that their reliance on AI shifted depending on task complexity and time constraints, highlighting that AI engagement is situational rather than linear. This observation validates the adaptive nature of the AHAWC Model and reinforces the need for ethical checkpoints at every stage of AI integration, ensuring that human judgment remains central in the writing process.

Integrating Quantitative and Qualitative Insights

The quantitative trends observed in AI usage, perceived effectiveness, and ethical awareness were strongly reinforced by the qualitative data drawn from 94 open-ended responses (62 students; 32 faculty). Thematic content analysis revealed four dominant categories—enhanced efficiency, ethical uncertainty, dependence concerns, and pedagogical implications—which mapped closely onto the statistical patterns identified earlier. Students' reflections such as *"AI helps me generate ideas faster"* and *"It makes writing easier and less time-consuming"* echoed the high mean scores on productivity and linguistic improvement, confirming that AI functions as a cognitive support tool for many novice writers. In contrast, faculty emphasis on critical oversight and integrity—captured in statements like *"AI must not replace critical thought"* and *"Use AI only to organize ideas, not to be the author"*—aligned with their significantly higher ethical-awareness scores in the quantitative analysis.

The convergence of these data sources substantiates the dual architecture of the AHAWC Model: the horizontal axis representing increasing levels of AI-supported productivity and writing refinement, and the vertical ethical checkpoints ensuring responsible engagement at each stage. This integration demonstrates that the continuum is not theoretically imposed but empirically derived, grounded in the lived experiences, concerns, and developmental needs of both students and teacher-researchers. As such, the AHAWC Model reflects a realistic progression of human–AI collaboration—from basic mechanical support to ethically guided co-creation—supported by evidence from both numerical trends and narrative insights.

The Adaptive Human–AI Writing Continuum (AHAWC Model)

Grounded in the empirical patterns above, the AHAWC Model conceptualizes AI engagement as a tiered continuum ranging from minimal tool assistance to collaborative co-creation. Each stage embeds ethical prompts—transparency, oversight, originality, and attribution—derived from participants' expressed concerns.

The continuum accommodates user diversity, disciplinary variance, and evolving AI literacy, allowing seamless movement between stages based on task requirements and ethical risk.

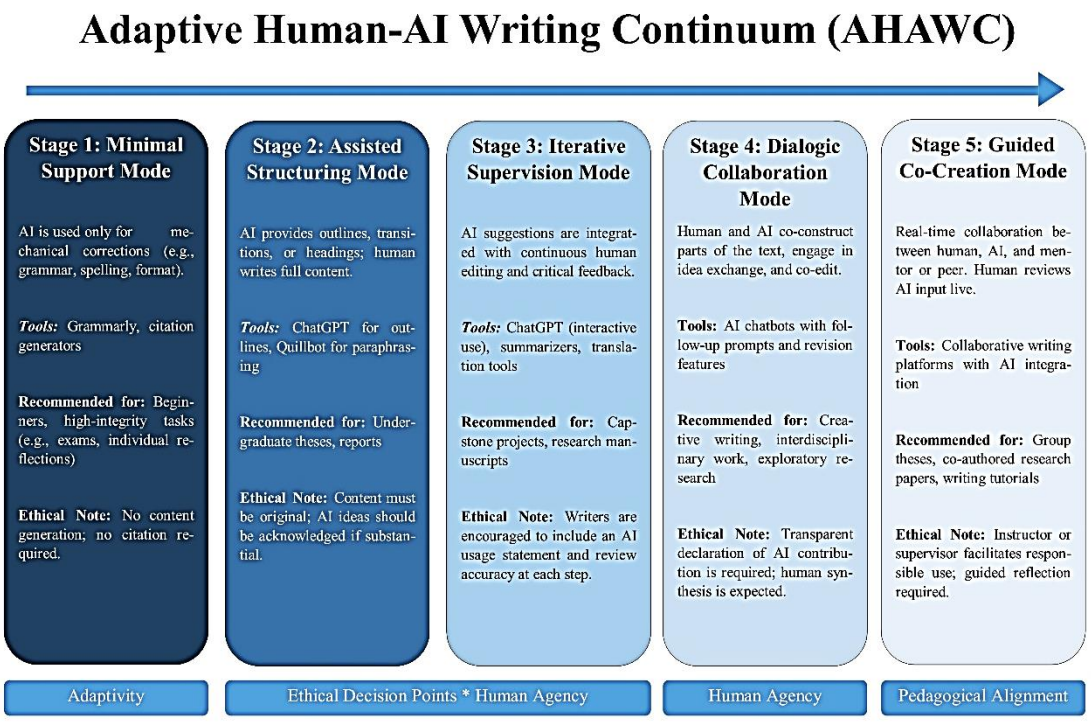

Figure 3: The Adaptive Human–AI Writing Collaboration (AHAWC Model)

Implications for Higher-Education Policy and Practice

Evidence from both datasets highlights several actionable directions for educational institutions. The findings point to the need for Institutional AI Literacy Programs, as quantitative results revealing ethical gaps support the creation of structured curricula that explicitly address AI ethics, authorship, and responsible tool use. Furthermore, Tiered AI Use Policies are recommended, wherein the five levels of the AHAWC continuum can serve as benchmarks for determining acceptable degrees of AI assistance based on the learner's course level or research experience.

In addition, Faculty Professional Development emerges as a crucial component. Faculty members' strong ethical orientation positions them as key facilitators in embedding AI ethics within research mentorship and classroom instruction. Finally, the participants' expressed need for guidance justifies the establishment of Research Writing Support mechanisms, such as AI help desks or writing centers designed around the AHAWC framework, to provide ethical and technical assistance.

These recommendations are both data-driven and contextually grounded, reflecting the unique patterns of AI adoption and ethical perception observed at Quezon City University, while also offering transferrable insights and strategies for other higher education institutions navigating responsible AI integration.

Limitations and Future Research Directions

The study's limitations were consolidated here for clarity. First, the single-institution sample restricts generalizability; future studies should triangulate results through multi-campus or cross-cultural comparisons. Second, reliance on self-reported Likert data may introduce bias;

mixed-method approaches combining interviews, writing-sample analysis, or AI-usage logs are recommended for validation. Third, while open-ended responses added depth, more robust qualitative methods (e.g., focus groups) would capture collaborative and disciplinary nuances. Finally, the model's application was theoretical; subsequent research should pilot and evaluate the AHAWC Model across disciplines and cultures to test its pedagogical and ethical efficacy.

8. Recommendations

In light of the study's findings, several practical steps are recommended to help higher education institutions promote the ethical, effective, and responsible use of AI in academic writing. Institutions should begin by establishing clear and accessible policies that define acceptable AI use, outline proper citation of AI-generated content, specify consequences for misuse, and ensure that these guidelines are easily accessible through student handbooks, course materials, or online portals. The Adaptive Human–AI Writing Continuum (AHAWC) Model should also be adopted as a pedagogical tool to guide both students and teachers in understanding appropriate levels of AI involvement in writing, adjusting use according to task complexity and academic level while maintaining a balance between human cognition and AI assistance. Furthermore, AI literacy training must be integrated into the curriculum through workshops, seminars, or embedded modules that teach technical proficiency, responsible use, and reflective awareness of AI tools. Assessment practices should likewise be revised to include ethical dimensions, with rubrics that evaluate originality, critical thinking, and adherence to institutional AI-use policies. Finally, universities should continue conducting research on the pedagogical and ethical implications of AI, testing and refining the AHAWC Model across disciplines to inform future policies and teaching innovations. Collectively, these measures aim to foster a culture of thoughtful and ethical AI engagement, ensuring that technological advancement enhances rather than undermines academic integrity.

References

Abdullah, M. Y. (2025). Probing into EFL students' perceptions about the impact of utilizing AI-powered tools on their academic writing practices. *Education and Information Technologies*, *30*, 21189–21220

Al-Bukhrani, M. A., Alrefaee, Y. M. H., & Tawfik, M. (2025). Adoption of AI writing tools among academic researchers: A Theory of Reasoned Action approach. *PloS One*, *20*(1), e0313837.

Al-Shaboul, I. A., Al Rousan, R. M., Kalsoom, T., & A-Awawdeh, N. (2024). A critical examination of how AI-driven writing tools have impacted the content, style, and organization of foreign language undergraduates' writing: A survey of lecturers. *Research Journal in Advanced Humanities*, *5*(4). https://doi.org/10.58256/pjf6en83

Al-Sofi, B. B. M. A. (2024). Artificial intelligence-powered tools and academic writing: to use or not to use ChatGPT. *Saudi Journal of Language Studies*, *4*(3), 145-161.

Appelbaum, S. H. (1997). Socio-technical systems theory: an intervention strategy for organizational development. *Management Decision*, *35*(6), 452-463.

Bankins, S. (2021). The ethical use of artificial intelligence in human resource management: a decision-making framework. *Ethics and Information Technology*, *23*(4), 841-854.

Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, *20*(1), 38.

Chen, Z., Chen, C., Yang, G., He, X., Chi, X., Zeng, Z., & Chen, X. (2024). Research integrity in the era of artificial intelligence: Challenges and responses. *Medicine*, *103*(27), e38811.

Engeström, Y. (1999). Activity theory and individual and social transformation. *Perspectives on Activity Theory*, *19*(38), 19-30.

Fowler, D. S. (2023). AI in higher education: academic integrity, harmony of insights, and recommendations. *Journal of Ethics in Higher Education*, (3), 127-143.

Grace, J. C. (2025). Chalkboards to Chatbots: Helping Faculty Harness AI for the Future of Higher Education.

Hong, X., & Guo, L. (2025). Effects of AI-enhanced multi-display language teaching systems on learning motivation, cognitive load management, and learner autonomy. *Education and Information Technologies*, 1-35.

Hutson, J. (2024). Rethinking plagiarism in the era of generative AI. *Journal of Intelligent Communication*, *3*(2), 20-31.

Karam, J. (2023). Reforming higher education through AI. In *Governance in Higher Education: Global Reform and Trends in the MENA Region* (pp. 275-306). Cham: Springer Nature Switzerland.

Khalifa, M., & Albadawy, M. (2024). Using artificial intelligence in academic writing and research: An essential productivity tool. *Computer Methods and Programs in Biomedicine Update*, 100145.

Khatri, B. B., & Karki, P. D. (2023). Artificial intelligence (AI) in higher education: Growing academic integrity and ethical concerns. *Nepalese Journal of Development and Rural Studies, 20*(01), 1-7.

Kotsis, K. T. (2024). Artificial Intelligence Creates Plagiarism or Academic Research? *European Journal of Arts, Humanities and Social Sciences*, *1*(6), 169-179.

Kumar, S., Datta, S., Singh, V., Datta, D., Singh, S. K., & Sharma, R. (2024). Applications, challenges, and future directions of human-in-the-loop learning. *IEEE Access*.

McGrath, M. J., Duenser, A., Lacey, J., & Paris, C. (2024). Collaborative human-AI trust (CHAI-T): A process framework for active management of trust in human-AI collaboration. *arXiv preprint arXiv:2404.01615*.

Nurchurifiani, E., Maximilian, A., Ajeng, G. D., Wiratno, P., Hastomo, T., & Wicaksono, A. (2025). Leveraging AI-Powered Tools in Academic Writing and Research: Insights from English Faculty Members in Indonesia. *International Journal of Information and Education Technology*, *15*(2), 312-322.

Patel, K. (2024). Ethical reflections on data-centric AI: balancing benefits and risks. Available at SSRN 4993089.

Roe, J., Renandya, W. A., & Jacobs, G. M. (2023). A review of AI-powered writing tools and their implications for academic integrity in the language classroom. *Journal of English and Applied Linguistics*, *2*(1), 3.

Rezaee, M., & Allahyari, A. (2023). The Advantages and Limitations of AI-Powered Writing Assistants in the EFL Classroom: Recent Insights and Future Directions. *Modeling and Simulation in Electrical and Electronics Engineering*, *3*(3), 61-68.

Tripathi, A., & Thakar, S. V. (2024). Ethical use of AI for academic integrity: Preventing plagiarism and cheating. *Ethical Frameworks in Special Education: A Guide for Researchers*, *91*.

Vasylyshyna, N., Skyrda, T., Lazorenko, N., & Kravets, I. (2024). Legal perspective on artificial intelligence and academic integrity within university education process participants research activity: New possibilities along with new limitations. *Scientific Journals of the International Academy of Applied Sciences in Lomza*, *96*(4), 59-82.

Widiati, U., Rusdin, D., & Indrawati, I. (2023). The impact of AI writing tools on the content and organization of students' writing: EFL teachers' perspective. *Cogent Education*, *10*(2).

Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: a systematic review. *Smart Learning Environments*, *11*(1), 28.

Zhao, D. (2025). The impact of AI-enhanced natural language processing tools on writing proficiency: An analysis of language precision, content summarization, and creative writing facilitation. *Education and Information Technologies*, *30*(6), 8055-8086.