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AI Affordances, Teacher Support, and Research-Writing Competence: The Mediating Roles of Self-Efficacy and Disposition

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Abstract. With artificial intelligence (AI) tools being increasingly integrated into university education, students are using them to search for literature, organize ideas, and refine research writing, raising questions about how these tools interact with traditional forms of instructional support. This study investigated the relationships between perceived AI affordances, teacher support, and research-writing competence in undergraduate students, with an emphasis on the mediating roles of research-writing self-efficacy and research-writing disposition. Guided by the social cognitive theory and the self-determination theory, the study employed a quantitative, non-experimental, cross-sectional survey design. Data were collected from 526 undergraduate students in a Philippine higher education institution and analyzed using confirmatory factor analysis and structural equation modeling. Results showed that AI affordances significantly predicted research-writing self-efficacy and research-writing disposition but did not have a direct effect on research-writing competence. Perceived teacher support significantly predicted research-writing self-efficacy, research-writing disposition, and research-writing competence. Both research-writing self-efficacy and research-writing disposition had significant positive effects on research-writing competence, confirming their mediating roles in the final model. These findings highlight how responsible AI integration and strong instructional guidance jointly support research-writing competence.

Keywords: artificial intelligence; AI affordances; teacher support; research-writing competence; structural equation modeling

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1. Introduction

The landscape of higher education is rapidly evolving as artificial intelligence (AI) becomes increasingly integrated into everyday academic work. In many universities, learners are currently using generative AI tools such as ChatGPT to find sources, organize ideas, and refine their writing. Higher education is changing as AI becomes more integrated into academic work (Wang, Wang, Zhu, et al., 2024). These tools not only open new possibilities for research and academic writing but also introduce fresh pedagogical challenges (Al-Zahrani & Alasmari, 2024). They influence how students approach research tasks, manage information, and construct scholarly texts, which in turn reshapes familiar teaching and learning routines.

Recent reviews of studies published between 2020 and 2025 indicate a sharp increase in research on AI and academic writing, with consistent evidence that AI can enhance writing fluency, grammatical accuracy, and work efficiency (Afzaal et al., 2024; Alharbi, 2023). At the same time, the rapid spread of AI has raised serious questions about academic integrity (e.g., unclear authorship and improper attribution), overreliance on automated output (e.g., copying AI-generated text without verification), and the preservation of core critical thinking skills (e.g., weakened synthesis, evaluation of sources, and independent argument construction) (Tilala et al., 2024). In this context, it becomes essential to understand the 'affordances' of AI, that is, how students perceive these tools in enabling them to undertake their research writing (Farrokhnia et al., 2024).

Recent studies have highlighted several key affordances, including faster access to relevant information, real-time feedback on drafts, and personalized forms of support that can reduce cognitive load and make demanding tasks more manageable (Kakhki et al., 2024). When learners recognize these affordances as genuinely useful, they are more likely to adopt AI tools, feel more confident, and participate more actively in the research writing process (Yang et al., 2022). However, the presence of AI tools by itself does not guarantee better research-writing competence. Their impact is filtered through students' own characteristics and through the quality of the learning environment in which AI is introduced (Amani & Bisriyah, 2025). Even in AI-rich settings, the role of the teacher in research writing includes explicit modeling of parts of a research paper, giving annotated feedback on drafts, scaffolding milestones, and guiding students on responsible AI use remains central.

A substantial body of work demonstrates that teacher support that encompasses clear instructional guidance, constructive and timely feedback, emotional encouragement, and opportunities for autonomy has a significant impact on students' engagement, motivation, and achievement (Digamon & de la Peña, 2022; Guo et al., 2023). For many undergraduates, research writing is a demanding and often anxiety-provoking requirement, so a supportive relationship with the teacher can make the difference between withdrawal and sustained effort. As online and hybrid modes of instruction become more common, effective teacher support is also needed to help students navigate both research-writing tasks and the ethical, purposeful use of AI (Duan et al., 2024).

To explain how these technological and pedagogical supports work together to build research-writing competence, it is also necessary to look at students' internal psychological resources. Drawing on social cognitive theory, this study assumes that AI affordances and teacher support partly influence competence through two mediating factors: research-writing self-efficacy (students' belief that they can successfully carry out research and writing tasks) and research-writing disposition (students' motivational-attitudinal readiness to engage in research writing, including interest and persistence). Teacher support and AI affordances are expected to shape these psychological resources, which in turn translate into higher research-writing competence.

Research on self-efficacy in research writing has shown that self-efficacy predicts academic performance across settings (Damerji & Salimi, 2021). Positive experiences with technology and well-structured learning activities can strengthen this belief by providing mastery experiences and reducing anxiety (Huang & Wang, 2023). At the same time, research-writing disposition, which refers to students' attitudes, motivation, and willingness to persist in research, is central to sustaining effort and producing high-quality work. Studies consistently show that teacher support contributes to more positive research dispositions among students (Prananto et al., 2025).

Despite growing interest in AI for academic writing, important gaps remain. First, existing evidence often emphasizes general writing outcomes and does not directly focus on research-writing competence among undergraduate students. Second, many studies do not explain the mechanisms through which AI-related support and instructional support translate into competence. In contrast, this study tests research-writing self-efficacy and research-writing disposition as mediating psychological resources. Third, much of the literature relies on descriptive or correlational approaches. This study addresses the methodological gap by using structural equation modeling to test direct and indirect pathways simultaneously.

Finally, evidence on these relationships in Philippine higher education remains limited. By examining AI affordances and teacher support together in one structural equation modeling (SEM) model, this study provides actionable evidence for (a) educators – by identifying which support (AI affordances and teacher support) strengthen students' self-efficacy and disposition, leading to competence; (b) curriculum developers – by guiding the integration of AI literacy and scaffolded research-writing instruction into research courses; and (c) policymakers – by informing institutional guidelines for responsible AI use and professional development that sustain critical, ethical, and competent research writing.

2. Literature Review and Hypothesis Development

2.1 AI Affordances as Antecedents of Research-Writing Self-Efficacy and Research-Writing Disposition

Artificial intelligence affordances demonstrate significant value in improving research-writing self-efficacy by promoting deeper engagement, building confidence, and reinforcing academic writing abilities. As Suardewa et al. (2024) explain, individuals who feel confident using AI tools are more inclined to incorporate them into their writing instruction, which in turn reinforces their belief in their academic writing abilities. Similarly, Nazari et al. (2021) report that AI-powered writing tools help postgraduate students to build writing self-efficacy by boosting their behavioral, emotional, and cognitive engagement. Pellas (2023) also emphasizes that generative AI considerably enhances the writing self-assurance and narrative skills of undergraduate students when compared to more traditional methods. This highlights the strength of AI in developing advanced cognitive writing capabilities.

Malik et al. (2023) corroborate these positive findings, noting favorable responses from Indonesian students to AI features such as grammar checkers, plagiarism detection, and essay organization – tools that collectively support improved writing proficiency and research confidence. However, it should be noted that there must be a balance when integrating AI into academic writing, as students may become overly dependent on it. Evidence from recent higher-education research warns that overreliance on ChatGPT-like tools may reduce cognitive engagement and limit opportunities for critical thinking and self-regulated learning when students use AI as a substitute for their own reasoning rather than a support (Lo et al., 2024).

Similarly, education-focused reviews caution that the uncritical use of generative AI can weaken higher-order processes such as synthesis, evaluation, and argument construction, especially when verification practices are not explicitly taught (Kasneji et al., 2023; Memarian et al., 2023). This may put their creativity and critical thinking at risk. The use of AI tools should not replace key writing and analytical skills. Accordingly, global guidance emphasizes that AI integration in education should prioritize critical evaluation of AI-generated content, academic integrity, and AI literacy to safeguard learning quality (Miao & Holmes, 2023). Together, these studies could strengthen the argument that

H1: AI affordances positively influence research-writing self-efficacy.

Artificial intelligence tools play a significant role in shaping students' and educators' perceptions of research writing by making it more efficient, engaging, and enjoyable. At Majmaah University, the English as a Foreign Language (EFL) faculty observed that using AI enhanced writing quality and simplified the process, resulting in a more positive outlook (Mudawy, 2024). Similarly, Indonesian high school students found AI tools helpful in the development and drafting stages of research writing (Utami et al., 2023).

A randomized controlled trial involving postgraduate students demonstrated that AI-powered tools enhanced behavioral, cognitive, and emotional engagement, thereby expanding self-efficacy and positive feelings (Nazari et al.,

2021). Likewise, undergraduates from Eastern and Central Indonesia reported benefits such as grammar correction, originality checks, and essay structuring when using AI in academic writing (Malik et al., 2023). Given the consistent positive influence of AI tools on writing processes, confidence, and engagement, it could be posited that:

H2: AI affordances positively influence research-writing disposition.

2.2 Perceived Teacher Support as an Antecedent of Research-Writing Self-Efficacy and Disposition

Teacher support extends beyond academic assistance to include emotional encouragement, reassurance, and genuine concern for students' success (Ghaith, 2002). It typically takes three forms: affective support (emotional encouragement), cognitive support (helping students to understand and build skills), and autonomy support (promoting student choice and ownership); these align with self-determination theory (Guo et al., 2023). Research indicates that academic self-efficacy is shaped not only by individual characteristics but also by environmental factors, such as teacher-student relationships and peer social support, which influence students' learning engagement and motivation (Wang, Wang, Yang, et al., 2024). Studies affirm that teacher-student relationships (Affuso et al., 2023), direct teacher support (Feng et al., 2023), academic emotions (Khan, 2023), and goal orientation (Liu et al., 2023) play significant roles in strengthening academic self-efficacy.

Greene et al. (2004) emphasize that teachers' autonomy support boosts self-belief, while Sakiz et al. (2012) found that emotional support increases students' confidence. Recent studies from China support these conclusions. Liu et al. (2018) reported that all three support types enhance self-efficacy; Li et al. (2020) noted that autonomy support indirectly raises self-efficacy via improved academic emotions; Wang et al. (2022) showed that emotional support strengthens confidence; and Lu et al. (2023) identified a strong link between emotional support and overall academic self-efficacy. Jointly, these findings imply that learners cultivate more robust academic self-belief when provided with emotional, cognitive, and independence-promoting support. Hence, the following hypothesis is proposed:

H3: Perceived teacher support positively influences research-writing self-efficacy.

Learners cultivate more favorable views on learning and academic activities when they perceive authentic teacher support. Lei et al. (2018) found that teacher support significantly influences students' academic emotions, although this effect may vary across cultural contexts and age groups. Vargas-Madriz et al. (2024) also emphasize that emotionally supportive school environments help students to remain engaged and motivated. Beyond general engagement, teacher support shapes specific academic attitudes and skills. Digamon & de la Peña (2022) observed that students who receive strong teacher support show a more positive disposition toward research writing, highlighting the importance of well-rounded instructional guidance.

Granziera et al. (2022) note that learners who see their teachers providing practical, meaningful support develop greater academic resilience, which leads to improved engagement, stronger skills, and greater academic achievement. Similarly, according to Sakiz (2007), teacher-emotional support fosters a sense of belonging, enjoyment, and confidence while reducing feelings of hopelessness in school. On a broader scale, Abrami et al. (2008) emphasize that nurturing critical thinking requires intentional strategies embedded in coursework and professional development rather than relying solely on passive expectation. These ideas highlight the importance of teacher support in fostering students' motivation, confidence, and academic growth. In view of this, the following hypothesis was advanced:

H4: Perceived teacher support positively influences research-writing disposition.

2.3 Research-Writing Self-Efficacy and Research-Writing Disposition as an Antecedent of Research-Writing Competence

Research-writing self-efficacy – one's belief in their ability to perform academic writing tasks – emerged as a strong indicator of research-writing competence. This was also demonstrated through meta-regression in the study of Sun et al. (2021) in which students with higher self-efficacy exhibited stronger writing performance both in first- and second-language contexts. This correlation is echoed in the study of Mendoza et al. (2022) who found that students who perceive themselves as competent and knowledgeable are more capable of expressing ideas clearly and working on their academic writing effectively and in an organized manner. A higher degree of writing self-efficacy enables students to regulate their scholarly writing methods more effectively, ultimately contributing to enhanced competence and determination (Zhang et al., 2024).

Local studies have also affirmed this connection; the study of Pentang and Domingo (2024) reported that students exhibiting high research-related self-efficacy were more skilled and productive in research activities, especially with adequate training and institutional encouragement. Moreover, psychological factors such as self-confidence play a central role in the quality of academic written work, as evidenced by the significant link between self-efficacy and research engagement among Southeast Asian learners (Saepulmilah & Azhari, 2023). Considering the consistency and breadth of the above findings, it could be hypothesized that

H5: Research-writing self-efficacy positively influences research-writing competence.

Increasing academic publications endorse the idea that research-writing disposition – defined as the attitudes, motivation, and cognitive-emotional inclinations of writers – directly shapes research-writing competence. MacArthur et al. (2025) highlight that positive dispositions toward writing significantly influence effort and persistence, key drivers of writing proficiency. Jessup (2025) further explains that writing competence develops in socially situated contexts where affective and cognitive dispositions co-evolve with skills. In a local context, Putri (2025) emphasizes that affective dispositions, including persistence and self-efficacy, enhance students' engagement in problem-solving and writing tasks. Ayoola and Ibrahim (2024) argue that a growth mindset – a critical disposition – enables students to manage writing challenges better through increased resilience

and metacognitive regulation. Similarly, Shostak (2024) suggests that reflective dispositions – the writer's habit of reflecting on feedback and their writing choices to guide more effective revision – enable writers to integrate feedback constructively, thereby advancing their writing competence. In the Philippines, Calumag (2022) found that university learners with greater intrinsic motivation and confidence in their research abilities demonstrated better organization, coherence, and technical accuracy in their theses. This is consistent with the study of Nadeem and Lillas (2024), which confirms that teacher disposition enhances both pedagogical practice and student writing outcomes.

Moreover, Pfeiffer (2019) emphasizes that multilingual students benefit from dispositions that foster linguistic flexibility, thereby improving academic writing. Collectively, these findings demonstrate that cognitive, affective, and behavioral dispositions critically shape not only the mechanics of writing but also the confidence and persistence required for competence. Hence, it could be posited that

H6: Research-writing disposition positively influences research-writing competence.

2.4 AI Affordances and Research-Writing Competence

Recent studies have explored the interplay between AI affordances, research-writing self-efficacy, and research-writing competence. For example, research with Moroccan postgraduate students found that ChatGPT users reported greater writing self-belief than non-users. This suggests that AI tools can enhance writers' confidence and skills through continuous feedback and fostering a sense of accomplishment (Bouzar et al., 2024). Likewise, studies suggest that self-belief strongly predicts how long ChatGPT is used, indicating a direct link between self-efficacy and the extended use of AI tools.

In research-writing contexts, learners who feel more capable may be more willing to use AI for planning, drafting, and revising, suggesting that AI affordances can partly strengthen competence by boosting confidence (Hsu & Silalahi, 2024; Zhao et al., 2025). Additionally, a study involving Chinese EFL students found that AI-supported language learning has a positive influence on writing abilities and motivation, highlighting the capacity of AI to transform educational environments (Yuan & Liu, 2023).

Nevertheless, concerns exist about excessive dependence on AI tools, as overreliance may hinder the development of independent writing skills (Bouzar et al., 2024). In the Philippine setting, research examined the relationship between AI self-efficacy and AI trust among university students and uncovered a significant correlation between the two (Aliño et al., 2024). Furthermore, studies have examined how AI trust mediates the relationship between AI self-efficacy and attitudes toward AI, indicating that greater self-efficacy is associated with greater trust and more favorable views of AI applications (Obenza et al., 2024). Collectively, these findings implied that

H7: AI affordances positively influence research-writing competence.

2.5 Perceived Teacher Support and Research-Writing Competence

Teacher support is a determinant of students' academic growth, especially when undertaking research writing. Research has shown that when teachers provide guidance, supportive feedback, and motivation, learners become more motivated and better equipped to develop their research competence. For instance, writing research shows that students' perceptions of feedback predict writing self-efficacy and that writing self-efficacy mediates the link between feedback perception and self-regulated writing ability, which is closely tied to writing competence (Hwang, 2025). In the context of research writing, students who are confident in their abilities are more likely to engage in the writing process actively and persevere through challenges, ultimately enhancing their proficiency.

This notion is reinforced by Zhu et al. (2024) who found that teacher feedback improves writing outcomes mainly through learners' internal learning resources (i.e., strategies that students use to plan, monitor, and revise), underscoring that instructional support strengthens writing competence through psychological/behavioral mechanisms rather than by direct effects alone. Consequently, perceived teacher support boosts students' self-efficacy, which in turn elevates their competence in research writing. When teachers offer assistance, learners feel more competent, motivated, and encouraged to conduct research. In accordance with this, it was assumed that

H8: Perceived teacher support positively influences research-writing competence.

In summary, the research hypotheses were illustrated in a conceptual framework as presented in Figure 1.

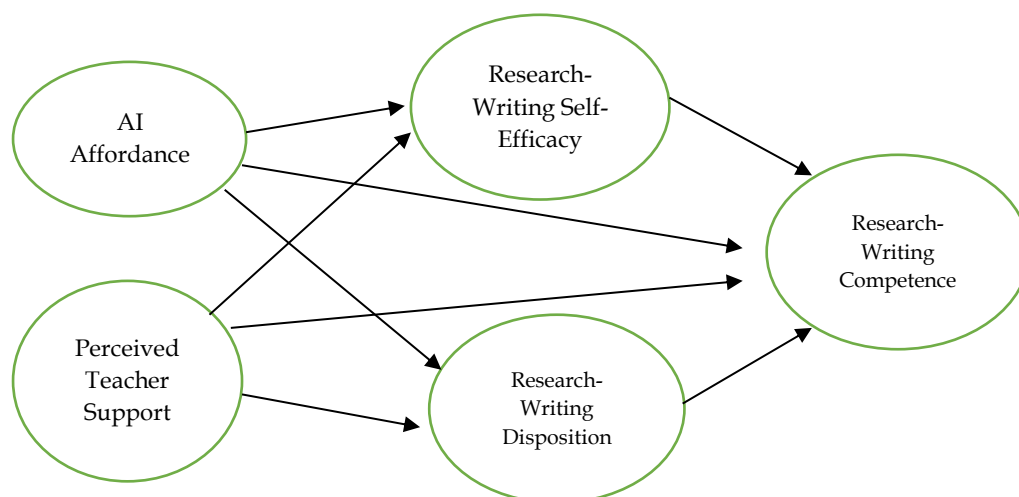


Figure 1: Proposed conceptual framework

3. Research Methodology

3.1 Data and Sample

The current study examined the relationship between AI affordances, perceived teacher support, and research-writing competence among students at Northeastern Mindanao State University (NEMSU), Cantilan Campus. A quantitative, non-experimental, cross-sectional survey design was employed to test a structural model proposed in academic literature empirically. An online

survey was conducted among undergraduate students, employing convenience sampling for its practicality and cost-effectiveness. Participants were selected based on four criteria: (a) consent for data use in research and publication, (b) active enrollment in an undergraduate program at NEMSU Cantilan, (c) prior completion of a research project, and (d) prior use of AI tools in their research. Table 1 summarizes the students' demographic and academic profiles, and Table 2 indicates the specific AI tools they used.

Table 1: Demographic and academic profile of undergraduate students by age, sex, year level, and degree program (N = 526)

Profile	Category	<i>n</i>	%
Age (Years)	18	35	6.65%
	19	90	17.11%
	20	143	27.19%
	21	106	20.15%
	22	74	14.07%
	23 and above	78	14.83%
Sex	Male	343	65.21%
	Female	183	34.79%
Year Level	1 st	147	27.95%
	2 nd	281	53.42%
	3 rd	63	11.98%
	4 th	35	6.65%
Degree Program	BSED/BTVTED/BTLED	44	8.37%
	BSCPE/BSCS/BS Info Tech	41	7.79%
	BSBA/BSTM/BSHM	19	3.61%
	BSIT	365	69.39%
	BS Criminology	57	10.84%

Table 2: Use of AI tools by students in research (categorized by function)

Category	AI	<i>n</i>	%
Reference Management	Zotero	4	0.76%
	Endnote	3	0.57%
	Mendeley	7	1.33%
	Scite.ai	1	0.19%
Writing Assistance	Grammarly	41	7.79%
	SciSpace	1	0.19%
	ChatGPT	287	54.56%
Literature Review	Iris.ai	3	0.57%
	Connected Papers	10	1.90%
	Meta (formerly MetaScience)	17	3.23%
	Google Scholar	91	17.30%
	Semantic Scholar	1	0.19%
	Microsoft Academic	4	0.76%
	VOSviewer	1	0.19%
	Rayyan	1	0.19%
Others		82	15.59%

3.2 Instrument

The survey instrument consisted of three distinct sections. The initial section included an informed consent form that detailed the study's purpose, potential

risks and inconveniences, confidentiality protocols, and anticipated benefits. Participants were required to review and approve these statements before continuing. The second section collected demographic and academic data on gender, academic year, undergraduate program, and age. It also contained a preliminary filter question regarding mandatory research project, only affirmative responses qualified individuals for participation.

Furthermore, students were asked to specify the AI tools they employed. The final section evaluated students' perceived AI affordances, research-writing self-efficacy, perceived teacher support, research disposition, and research-writing competence. These conceptual areas were operationally defined through a literature review that guided item generation. The questionnaire items were adapted from established scales and refined for the context of undergraduate research writing with AI. The adaptation followed four steps: (1) construct mapping in which each item was aligned with the operational definition of its construct; (2) contextual tailoring in which wording was slightly adjusted to fit research-writing tasks and AI use without changing the original meaning; (3) expert review in which the research and language-education faculty checked the items for clarity, relevance, and coverage of each construct; and (4) pilot-clarity checking with a small group of students to confirm readability and consistent interpretation.

Reliability and validity were supported through the study's measurement model results (confirmatory factor analysis [CFA]), including acceptable factor loadings, composite reliability (CR), average variance extracted (AVE), and Fornell-Larcker discriminant validity.

Table 3 illustrates the instrument's five constructs together with their respective items and sources. The item count varied across constructs from four for research disposition to five each for research-writing competence, research-writing self-efficacy, perceived teacher support, and AI affordances. All items were rated on a five-point Likert scale, with 1 signifying 'strongly disagree' and 5 signifying 'strongly agree'.

Table 3: Instrument's constructs, with associated items and references

Construct	Item Code and Statement	No. of Items	References
AI Affordances	AA1. The AI tools I use make accessing research materials faster and easier. AA2. AI-based feedback helps me improve my research writing. AA3. AI platforms allow me to interact more effectively with academic content. AA4. I feel that AI tools provide responses tailored to my specific research writing needs. AA5. Using AI tools makes me feel more connected and supported during my independent research.	5	Adapted from Kakhki et al. (2024), Malik et al. (2023), and Nazari et al. (2021)
Research Self-Efficacy	RSE1. I am confident in developing research questions. RSE2. I feel capable of designing a study. RSE3. I feel capable of collecting data. RSE4. I am confident in analyzing research data. RSE5. I am confident in communicating the findings of my research clearly.	5	Adapted from Hill et al. (2022)
Research Disposition	RD1. I enjoy research. RD2. I love research. RD3. I find research interesting. RD4. Research is pleasant.	4	Adapted from Papanastasiou (2005)
Research Competence	RC1. I can review the state of research regarding a specific topic systematically. RC2. I find it easy to formulate specific research questions/hypotheses. RC3. I can adequately interpret my research findings. RC4. I find it easy to write a report that meets the standards of academic writing. RC5. I have a sound knowledge of the main research methods in my discipline.	5	Adapted from Marrs et al. (2022)
Teacher Support	TS1. My research instructor provides timely and helpful feedback on my research writing drafts. TS2. My instructor encourages me to improve my academic writing skills. TS3. I can ask my instructor for advice when I encounter difficulties in writing my research papers. TS4. My instructor provides clear guidelines and expectations for research papers. TS5. My instructor motivates me to engage more deeply in research writing.	5	Adapted from Gan et al. (2021), Granziera et al. (2022), Zhu et al. (2024), and Digamon and de la Peña (2022)

3.3 Data Gathering Procedure

The researchers disseminated the survey questionnaire through Google Forms in April 2025 using a link shared via email and messaging applications. Prior to distributing the link, the researchers adhered to all ethical guidelines established by the University Research and Development Office, ensuring compliance at every stage of the data collection. Participants were thoroughly informed about the study and were required to review and digitally sign a consent section that declared: "Having reviewed this document, I agree to engage in the study as outlined. Its overall goals, participation details, potential hazards, and advantages have been adequately presented. I acknowledge my right to withdraw at any point and confirm receipt of this form." Only learners who digitally signed this consent were granted access to the Google Form. All data collected through the survey were used exclusively for research and publication objectives and were handled with utmost confidentiality. The acquired responses were subsequently analyzed statistically.

3.4 Data Analysis

The collected data were analyzed using SPSS version 26 and AMOS 26.0. Descriptive statistics summarized the categorical information gathered from the survey. Confirmatory factor analysis was performed to verify the measurement model and establish its internal consistency, construct validity, and dimensionality. Descriptive statistics were used to summarize the categorical survey data. To show discriminant validity, the Fornell-Larcker criterion was applied (Ab Hamid et al., 2017). Finally, SEM was employed to evaluate the structural model and examine the hypothesized relationships.

4. Results

4.1 Measurement Model Assessment

Using the maximum likelihood approach, the CFA was performed, a choice often preferred for its asymptotic efficiency in studies with substantial sample sizes (Tarima & Flournoy, 2019). The initial step involved reviewing the *t*-values and standardized factor loadings (SFLs) for each item on the scale to determine the overall suitability of the measurement model. The *T*-values that were observed ranged from 24.199 (AA1) to 37.008 (RD2), while the SFLs fell between 0.832 (AA1) and 0.924 (RD2) (refer to Figure 2 and Table 5). According to the guidelines from Hair et al. (2014) and Kline (2016), which stipulate *t*-values of 1.96 or greater and SFLs of at least 0.50, all items were retained. Subsequently, five Goodness-of-Fit Indices (GFIs) were evaluated to assess the overall measurement model fit. Table 4 provides these indices together with the recommended thresholds of Hair et al. (2009) and the values derived from the analysis. Significantly, all five fit indices demonstrated an acceptable model fit after correlating items that exhibited high covariance.

Table 4: Results of data fit indices for measurement model

Model Fit Indices	Proposed Threshold Value	Source	Resulting Value before Modification
CFI	> 0.90	Hair et al. (2009)	0.973
TLI	> 0.90	Hair et al. (2009)	0.970
RMSEA	< 0.08	Hair et al. (2009)	0.054
SRMR	≤ 0.08	Hair et al. (2009)	0.0242
Chi-square/ <i>df</i> ratio	< 3.00	Hair et al. (2009)	2.503

The assessment of the internal consistency and convergent validity of the measurement model was conducted next, using SFLs and CR as presented in Table 5. Gefen et al. (2000) and Hair et al. (2014) recommend a minimum threshold value of ≥ 0.50 for both SFL and CR. These psychometric properties were established since none of the SFL or CR values fell below the proposed cut-off.

Discriminant validity was eventually determined through the Fornell-Larcker criterion. This method stipulates that the square root of the average variance extracted (\sqrt{AVE}) for each construct must be greater than its correlation with other constructs, signifying their unique nature. This criterion was originally proposed by Fornell and Larcker (1981) who argued that discriminant validity is established when a construct explains more variance in its own indicators than it shares with other constructs (Henseler et al., 2015).

Table 5 indicates that the \sqrt{AVE} for each of the five constructs consistently surpassed the inter-construct correlation coefficients, demonstrating sufficient discriminant validity.

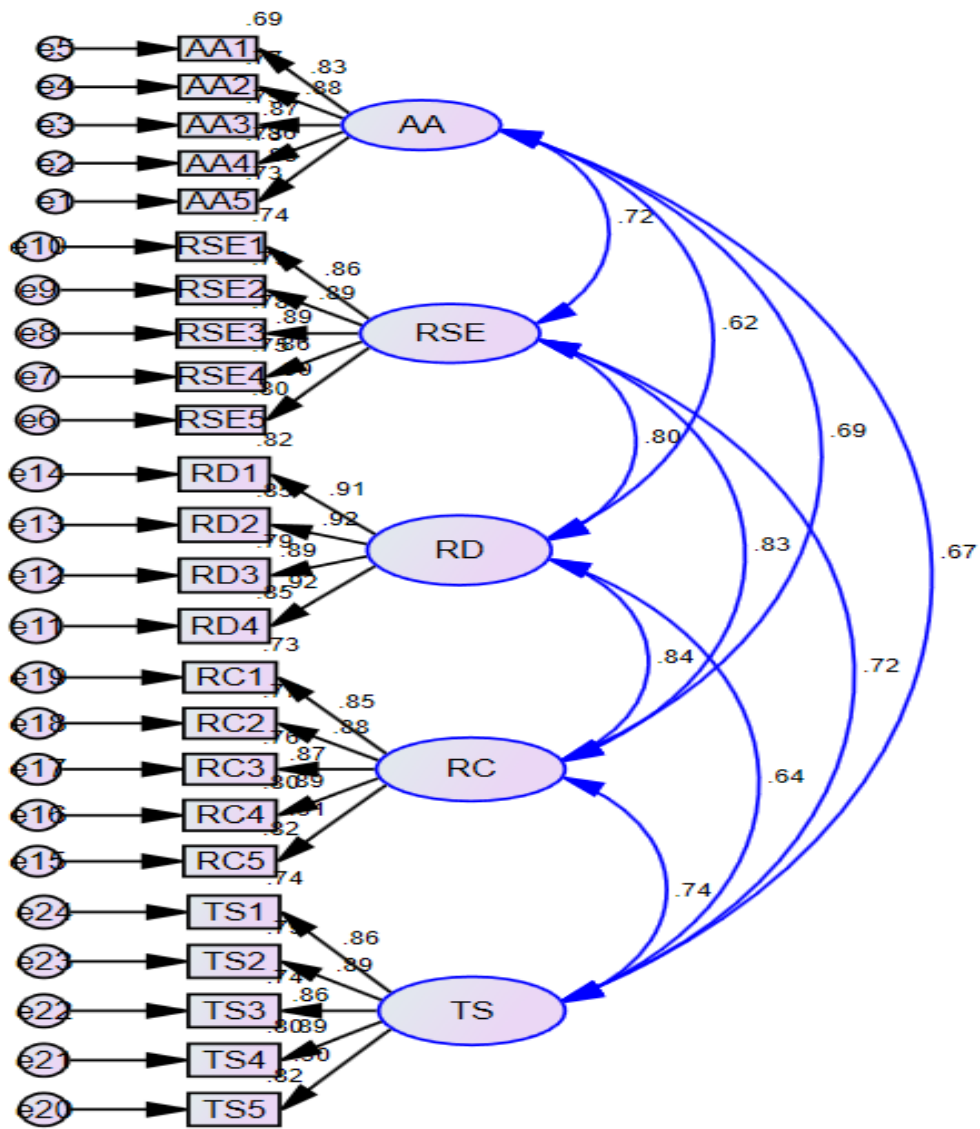


Figure 2: Confirmatory factor analysis results

Table 5: Convergent validity and internal consistency results of the measurement model

Constructs	Item	t-value	SFL	AVE	AVE ²	Composite Reliability
AI Affordances (AA)	AA1	24.199	0.832	0.682	0.826	0.915
	AA2	26.432	0.875			
	AA3	25.910	0.866			
	AA4	25.467	0.857			
	AA5		0.853			
Research Self-Efficacy (RSE)	RSE1	28.865	0.863	0.709	0.842	0.9241
	RSE2	30.671	0.886			
	RSE3	30.598	0.885			
	RSE4	28.924	0.864			
	RSE5		0.897			
Research Disposition (RD)	RD1	34.864	0.906	0.787	0.887	0.937
	RD2	37.008	0.924			
	RD3	33.051	0.889			
	RD4		0.920			
Research Competence (RC)	RC1	28.919	0.854	0.722	0.850	0.928
	RC2	30.609	0.875			
	RC3	30.179	0.870			
	RC4	32.191	0.893			
	RC5		0.906			
Teacher Support (TS)	TS1	28.831	.858	0.728	0.853	0.931
	TS2	31.096	.886			
	TS3	28.949	.859			
	TS4	31.710	.893			
	TS5		.904			

Table 6: Discriminant validity results (Fornell-Larcker criterion)

Variable	AA	RSE	RD	RC	TS
AA	0.826				
RSE	0.723	0.842			
RD	0.622	0.799	0.887		
RC	0.685	0.832	0.840	0.850	
TS	0.667	0.722	0.644	0.739	0.853

Note: Square root of AVE is shown on the diagonal of the matrix in bold; inter-construct correlation is shown off the diagonal

4.2 Structural Model Assessment

To validate the hypothesized structural model, SEM was employed for both model estimation and hypothesis testing. Table 7 and Figure 3 illustrate that seven of the eight hypotheses were confirmed. Specifically, having p -values less than the 0.01 level of significance, the AI affordances positively and significantly influenced research self-efficacy ($\beta_{H1} = 0.436$, $t = 9.968$, $p = 0.000 < 0.01$) and research disposition ($\beta_{H2} = 0.434$, $t = 7.433$, $p = 0.000 < 0.01$), explaining 44% and 43% of their variance, respectively. This suggests that when students perceive AI tools as accessible, useful, and supportive of research tasks, they tend to develop

greater confidence in their research abilities and more positive attitudes toward conducting research. Additionally, teacher support had a positive and significant influence on research self-efficacy ($\beta H3 = 0.442, t = 10.088, p = 0.000 < 0.01$) and research disposition ($\beta H4 = 0.508, t = 8.602, p = 0.000 < 0.01$), explaining 44% and 51% of their variance, respectively. This implies that while technology can assist students in research, teachers remain the most important factor in influencing students' motivation, engagement, and attitudes. Through feedback, mentoring, guidance, and emotional support, teachers can help students handle the challenges of research. Their clear instructions and constructive feedback can also help students build better research habits, persistence, and curiosity.

Moreover, research self-efficacy ($\beta H5 = 0.333, t = 6.900, p = 0.000 < 0.001$), research disposition ($\beta H6 = 0.409, t = 12.182, p = 0.000 < 0.01$), and teacher support ($\beta H8 = 0.220, t = 4.739, p = 0.000 < 0.01$) positively and significantly influenced research competence, respectively explaining 33%, 41%, and 22% of its variance. This finding suggests that research competence is not purely a technical outcome but also a motivational and psychological one. Students who believe in their capabilities and who possess positive research attitudes are more likely to engage deeply in research tasks, persist through challenges, and ultimately demonstrate higher competence. However, AI affordances ($\beta H7 = 0.069, t = 1.536, p = 0.125 > 0.01$) failed to exhibit a significant impact on research competence as the computed p -value was larger than the 0.01 level of significance.

This finding suggests that although AI tools may support the research process, their mere availability or perceived usefulness does not automatically translate into improved research competence. This indicates that access to AI technologies alone may not be sufficient to develop students' ability to design, conduct, and communicate research effectively. Furthermore, this implies that research self-efficacy and research disposition mediate the relationship between AI affordances and research-writing competence. Specifically, AI affordances significantly influence students' research self-efficacy and research disposition, which in turn influences their level of research-writing competence. Figure 4 illustrates the conclusive structural model from which the direct causal pathway between AI affordances and research competence has been removed.

Table 7: Structural model estimates

Hypothesized Path	Standardized Beta	t -value	p -value	Decision
H ₁ AA → RSE	0.436	9.968	***	supported
H ₂ AA → RD	0.434	7.433	***	supported
H ₃ TS → RSE	0.442	10.088	***	supported
H ₄ TS → RD	0.508	8.602	***	supported
H ₅ RSE → RC	0.333	6.900	***	supported
H ₆ RD → RC	0.409	12.182	***	supported
H ₇ AA → RC	0.069	1.536	0.125	rejected
H ₈ TS → RC	0.220	4.739	***	supported

Structural model estimates.

*** means 0.000

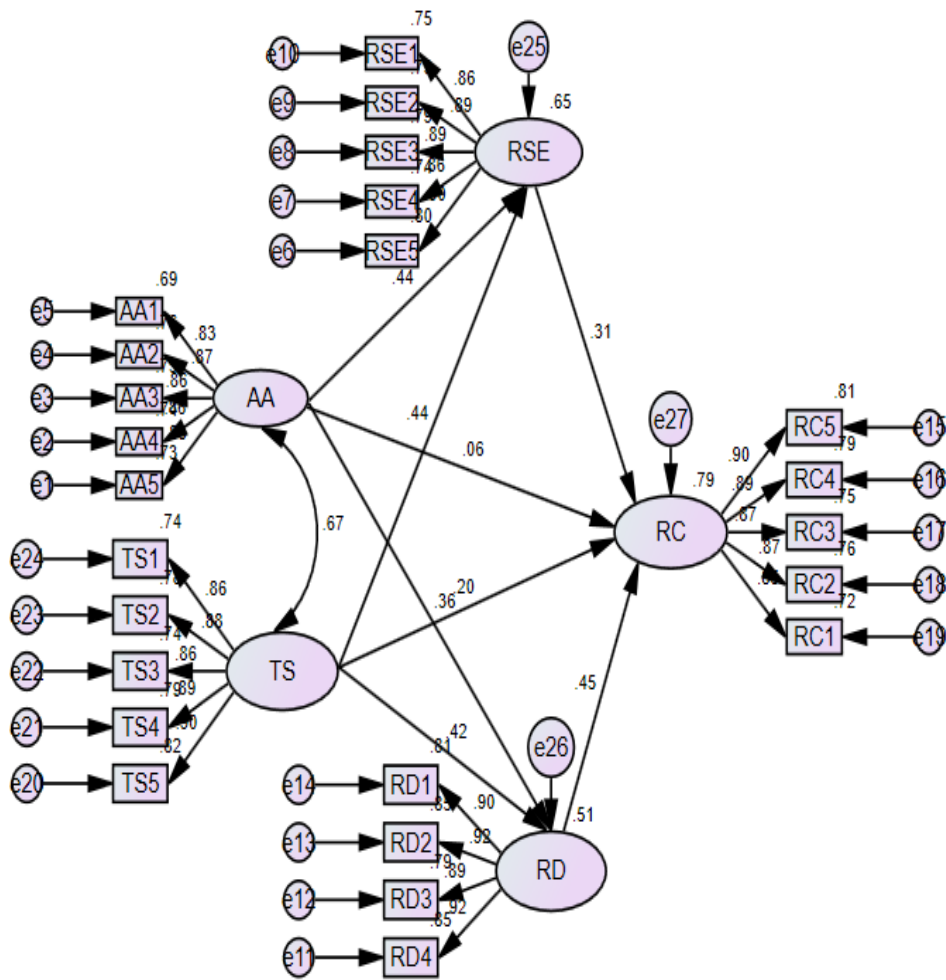


Figure 3: Structural equation modeling results

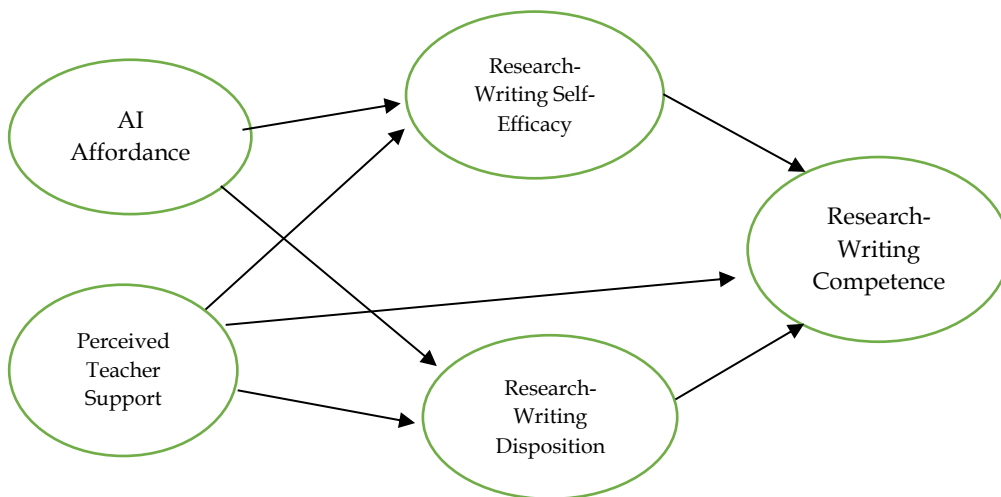


Figure 4: Final structural model

5. Discussion

In view of the increasing prevalence of AI applications in student academic work, this study examined how AI affordances and perceived teacher support influence students' self-efficacy, disposition, and competence in research writing. The suggested structural model was grounded in current academic writings on AI in education, highlighting both technological and pedagogical contributions. Because empirical research on AI-supported research writing remains limited, validating the hypothesized pathways provides evidence-based guidance for instructional practice. The model contributes to the emerging theory on AI-assisted academic writing.

The results showed that AI affordances positively and significantly influenced research-writing self-efficacy (H1), supporting numerous empirical studies (Deng et al., 2024; Jin et al., 2025; Marzuki, 2023; Teng et al., 2024). This suggests that learners who perceive AI tools as useful, supportive, and accessible develop greater confidence in performing research-related tasks. Moreover, AI platforms assist with literature searches, paraphrasing, grammar correction, data analysis, and idea generation, which reduces cognitive load and enhances students' belief in their writing capabilities. This finding is consistent with studies indicating that AI-supported writing platforms serve as scaffolding tools that enhance writing self-efficacy through timely and targeted feedback (Mohammed & Khalid, 2025; Zhu et al., 2025). In other words, recognizing AI's functional value helps students feel more capable of navigating the complexities of research writing.

Similarly, H2 was supported, indicating that AI affordances positively and significantly enhanced students' research-writing disposition. Students who viewed AI tools as beneficial demonstrated stronger motivation, interest, and engagement in research. Prior literature (Asio, 2025; Jia et al., 2024) supports this finding, reporting that AI capabilities improve students' self-efficacy, creativity, and learning motivation, thereby strengthening positive academic dispositions. In addition, AI tools reduce academic stress by simplifying tasks and providing personalized support, thereby cultivating a more favorable attitude toward research writing. As studies have shown, AI's ability to recommend relevant materials and facilitate adaptive learning experiences fosters deeper engagement and openness to research activities.

The results further exhibited that perceived teacher support positively and significantly predicted research-writing self-efficacy (H3). This aligns with prior research that highlights the importance of autonomy-promoting instruction in cultivating competence and inherent drive (Kingsford-Smith et al., 2024; Núñez & León, 2015; Stefanou et al., 2010). Students who received guidance, encouragement, and emotional support from their teachers developed greater confidence in managing research demands. Teachers' autonomy support provides meaningful rationales, acknowledges students' perspectives, and offers constructive choices, thereby reinforcing learners' confidence in their capacity to excel in research-writing assignments. This is consistent with Xu et al. (2024) who observed that teacher support and academic guidance together yield the highest self-efficacy outcomes.

Likewise, perceived teacher support positively and significantly predicted research-writing disposition (H4). This finding aligns with the literature, which shows that autonomy-supportive teacher behavior enhances students' academic emotions, engagement, and motivation (Bordbar, 2021; Digamon & de la Peña, 2022; Oriol-Granado et al., 2017). Instrumental and emotional guidance from teachers helps students to develop positive attitudes toward research tasks, making them more willing to engage, persist, and take intellectual risks. Mentorship also strengthens confidence and shapes favorable perceptions of scholarly work (Cutucache et al., 2017). Together, these results indicated that teacher support acts as a motivational catalyst that nurtures the positive dispositions that are essential for productive research writing.

The hypothesis that research-writing self-efficacy has a positive and significant influence on research-writing competence (H5) was also supported. Students with strong beliefs in their writing abilities tended to perform better in complex research-writing tasks. This finding is consistent with studies showing that self-efficacy fosters self-regulated learning, motivation, resilience, and persistence, which are critical factors for producing high-quality academic writing (Bråten et al., 2023; Busse et al., 2023; Sehlström et al., 2023; Skar et al., 2023; Zhang, 2024). Higher self-efficacy mitigates writing anxiety and enhances students' ability to synthesize sources, regulate their writing process, and sustain effort, thereby improving research-writing competence.

In addition, H6 was supported, as research-writing disposition positively and significantly predicted research-writing competence. Students who exhibited positive attitudes, motivation, perseverance, and openness toward writing tasks were more capable of producing competent research outputs. This finding is consistent with current studies that demonstrate that writing attitudes and motivational dispositions significantly predict writing quality and writing behaviors (Deti et al., 2023; Myhill et al., 2023; Rocha et al., 2024; Sarikaya, 2024; Skar et al., 2023). Positive dispositions foster persistence, deeper engagement, and the effective use of writing strategies, collectively enhancing research-writing competence.

However, AI affordances did not significantly predict research-writing competence (H7) and thus, the hypothesis was not supported. This suggests that the mere availability or perceived usefulness of AI tools does not automatically lead to improved research-writing performance. Overall, the results show that AI affordances do not directly increase research-writing competence, but they contribute indirectly by strengthening students' research-writing self-efficacy and research-writing disposition. In contrast, teachers support exerts both direct and indirect effects on competence, indicating that pedagogical guidance remains essential even in AI-supported research writing.

Prior studies (Li & Wilson, 2025; Ravi et al., 2025; Song & Song, 2023; Zhao, 2025) similarly report that while AI tools can support drafting and surface-level precision, they do not inherently strengthen higher-order skills such as argument development, synthesis, or conceptual reasoning without structured guidance.

These findings emphasize that AI must be integrated pedagogically rather than only being used instrumentally. Students may rely on AI for efficiency yet will still lack the deeper competencies required for high-level research writing unless they receive training, engage critically with AI output, and experience sustained instructional scaffolding. These findings imply that AI should be positioned as a scaffold rather than a substitute. Instructors need to provide structured guidance and feedback so that AI use strengthens confidence and engagement without replacing students' critical reasoning and research-writing skills.

Finally, perceived teachers support positively and significantly predicted research-writing competence (H8), affirming the importance of teacher involvement in developing students' research-writing skills. This supports existing studies showing that autonomy-supportive, emotionally attuned, and instrumentally helpful teacher behaviors improve students' attitudes, engagement, confidence, and performance in academic writing (Cutucache et al., 2017; Delhom et al., 2021; Digamon & de la Peña, 2022; Oriol-Granado et al., 2017; Strati et al., 2017). Students who felt genuinely supported by their teachers were better able to manage the demands of research writing and were more likely to produce competent research outputs.

Overall, the findings demonstrate that AI affordances and teacher support both play critical yet distinct roles in shaping students' research-writing outcomes. Notably, AI affordances strengthen self-efficacy and disposition but do not directly enhance competence without pedagogical mediation. In contrast, teacher support has a broad and consistent positive effect on self-efficacy, disposition, and competence. These results highlight that while AI can supplement and enrich research-writing processes, meaningful teacher involvement remains indispensable for building deep, transferable research-writing competence.

6. Conclusion

This study explored how AI affordances and perceived teacher support influence students' self-efficacy, disposition, and competence in research writing. Results showed that AI affordances significantly improved students' confidence and attitudes toward research writing but did not directly predict research-writing competence. Instead, competence was strongly shaped by students' self-efficacy and dispositions, highlighting the central role of psychological readiness and motivation in producing high-quality research. Perceived teacher support consistently had positive effects on all three variables – self-efficacy, disposition, and competence – confirming the indispensable role of educators in guiding the research-writing process. Overall, AI serves as a supportive tool that boosts engagement and confidence, while teacher support remains the foundation for developing deeper, more transferable research-writing skills.

The findings showed that AI tools help students to manage research tasks such as literature searches, drafting, grammar refinement, and idea generation, thereby freeing cognitive resources for higher-order thinking. However, AI mainly contributes to writing competence indirectly through its impact on self-efficacy and disposition. Conversely, teacher support exerts a broader and more direct

influence, reinforcing students' motivation, confidence, and skill development. The current study clarified that research-writing competence is best cultivated when AI assistance operates alongside strong pedagogical guidance.

The findings also suggested that combining AI integration with robust teacher support enhances learning experiences. Artificial intelligence can personalize learning, simplify complex tasks, and reduce academic stress while teachers continue to cultivate critical thinking, originality, and reflective writing. Together, AI and teacher support create a dynamic environment that empowers students to develop stronger research-writing competence.

7. Research Implications

Instructionally, AI tools may be most productive when used as scaffolds that build students' research-writing self-efficacy and disposition. At the same time, teachers provide explicit modeling and feedback for higher-order research-writing skills (e.g., synthesis, argumentation, and methodological reasoning). In terms of curricular, research-writing courses can integrate AI literacy (prompting, verification, and responsible citation practices) alongside structured revision cycles and mentoring. Institutionally, universities may develop clear guidelines for responsible AI use and offer faculty development to support ethical, critical, and pedagogy-led AI integration in research writing.

8. Limitations

This study used a cross-sectional design and self-report measures, which may have limited causal inference and introduced response bias. The sample was drawn from one higher-education context; thus, generalizability should be interpreted cautiously. In addition, qualitative triangulation was not feasible because data collection had already been completed; future mixed-method research is recommended to corroborate and deepen the interpretation of the SEM pathways.

9. Future Direction

Building on the findings of this study, several meaningful directions for future research are recommended. First, since the present model examined AI affordances and teacher support within a single higher-education institution, future studies could employ multi-site or cross-cultural samples to enhance the generalizability of the structural model. Comparative research across public and private universities, or across regions, may reveal institutional and cultural factors that shape students' attitudes, dispositions, and self-efficacy regarding AI use.

Second, while this study focused on the predictive and mediating effects of AI affordances and teacher support, subsequent research could explore other potential mediators and moderators such as research anxiety, digital literacy, cognitive load, motivation, academic emotions, or trust in AI. Including these variables may refine the understanding of how students translate technological and pedagogical support into actual research-writing competence.

Third, a deeper qualitative exploration of students' lived experiences with AI tools may yield richer insights into issues not captured by quantitative measures such as perceptions of overreliance, ethical concerns, loss of creativity, and tensions between human and AI-generated feedback. Longitudinal qualitative tracking may also illuminate how students' dispositions and self-efficacy change as they continue using AI throughout their academic journey.

Fourth, future studies could investigate the effectiveness of structured AI-integrated pedagogical interventions such as AI-guided writing workshops, teacher-AI co-feedback systems, or curriculum designs that combine autonomy support with responsible AI use. Experimental or quasi-experimental designs may help to establish causal relationships and identify practices that optimize both skill development and ethical AI engagement.

Finally, because AI technologies evolve rapidly, future research should explore emerging AI features such as multimodal feedback, automated research synthesis, and AI-supported peer review and assess how these new affordances shape higher-order research-writing skills. Monitoring these developments over time may help institutions to craft responsive policies and evidence-based guidelines for the responsible adoption of AI in academic writing.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

Ethics Statement

Ethical review and approval were not required for the study involving human participants, as per local legislation and institutional requirements. Written informed consent from participants was not required for participation in this study in accordance with national legislation and institutional requirements.

Statement of Informed Consent

All participants in this study were informed of the study's purpose, potential risks, and benefits before participating.

Declaration of Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper. The authors declare that there are no conflicts of interest regarding the publication of this paper.

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