

ChatGPT Use and Self-Reported Academic Writing Development among EFL Students: An Explanatory Sequential Mix-Methods Study

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ARTICLE HISTORY

Received:
(03-06-2026)

Revised:
(29-07-2026)

Accepted:
(06-08-2026)

KEYWORDS

*ChatGPT; academic writing;
EFL students; generative
artificial intelligence; higher
education*

ABSTRACT

This study examined the association between ChatGPT use and self-reported academic writing development and explored students' perceptions of its role across the planning, drafting, revising, and editing stages. A quantitative-priority explanatory sequential mixed-methods design was employed at one university in Batam, Indonesia. Using purposive sampling, questionnaire data were collected from 80 English Education students who had completed an academic writing course and used ChatGPT for writing tasks. Eight respondents with different ChatGPT-use profiles subsequently participated in semi-structured interviews. The quantitative results showed that higher composite ChatGPT-use scores were significantly associated with higher self-reported academic writing scores, explaining 60.1% of the variance. Based on the eight interviews, participants perceived ChatGPT as a source of support for idea generation, text organization, language refinement, revision, efficiency, and confidence. They also emphasized the importance of verifying information, evaluating AI-generated suggestions critically, maintaining authorship, and avoiding excessive dependence. These findings indicate an association between ChatGPT use and perceived writing outcomes rather than objectively measured or causal improvement. The interpretation is limited by the one-institution purposive sample, cross-sectional design, and reliance on self-reported data. Pedagogically, the findings suggest that verification practices, critical evaluation, academic integrity, and learner autonomy warrant further consideration in AI-assisted writing instruction.

Citation:

Marsevani, M., & Haeruddin, H. (2026). ChatGPT Use and Self-Reported Academic Writing Development among EFL Students: An Explanatory Sequential Mix-Methods Study. *Datokarama English Education Journal*, 7(2), 153-175. <https://doi.org/10.24239/dee.v7i2.178>

INTRODUCTION

Artificial Intelligence (AI) has advanced quickly in recent years, reshaping academic practice in higher education and changing how students plan, draft, and revise their written work. ChatGPT stands out among the generative AI tools now in common use, largely because it can produce text, offer instant feedback, propose alternative wording, and support revision (Li et al., 2024; Niswa & Daulay, 2024; Royani & Sihombing, 2024). Within English as a Foreign Language (EFL) setting, these capabilities can matter a great deal for university students who struggle to express ideas clearly, structure arguments, choose fitting vocabulary, and apply correct grammar in academic writing (Pitychoutis, 2024; Tseng & Lin, 2024). As a result, ChatGPT is being folded more into how students approach academic writing tasks.

Yet the rise of ChatGPT is not without pedagogical concern. Academic writing development involves more than producing a grammatically accurate text. In this study, it refers to students' perceived development in generating and organizing ideas, constructing arguments, using appropriate academic language, revising drafts, and managing their writing process independently. This differs from improvement in a single text, faster task completion, or increased confidence alone. Although ChatGPT can support students in clarifying ideas and refining drafts, it may also affect their engagement with the writing process (Puteri et al., 2025; Rozaimée & Mumin, 2025; Siregar et al., 2024). Some students use it as a scaffold, whereas others may rely on generated output with limited critical engagement and independent decision-making (Kharis & Indriyani, 2024; Tian & Zhang, 2025; Zhan & Yan, 2025). Therefore, this study focuses on self-reported academic writing development rather than objectively measured improvement in writing ability.

Previous studies have examined students' perceptions and experiences of ChatGPT in academic writing, but many have focused on general attitudes, immediate usefulness, confidence, or improvement in particular writing tasks. Other studies have explored specific writing stages without connecting students' patterns of ChatGPT use to broader dimensions of writer development. (Ahmadi, 2025; Fathimatuzahro & Rizkiyah, 2025; Lai & Trinh, 2025; Susanti et al., 2024; Tian & Zhang, 2025; Vo & Ho, 2026; Ya'u & Mohammed, 2025). Consequently, limited evidence remains on how university-level EFL students who have completed an academic writing course perceive ChatGPT's contribution to idea development, argument organization, academic language use, revision, and self-regulation. Moreover, the integration of quantitative relationships with qualitative explanations of students' experiences remains underexamined (Massoud & Zhang, 2025; Muvid et al., 2025). This study addresses this gap through an explanatory sequential mixed-methods design (Massoud & Zhang, 2025; Muvid et al., 2025).

This study examines the association between ChatGPT use and self-reported academic writing development through an explanatory sequential mixed-methods design. ChatGPT use refers to students' use of the tool during planning, drafting, revising, and editing. Self-reported academic

writing development refers to their perceived development in cognitive processes, academic language use, revision practices, and self-regulation. The questionnaire measures the statistical relationship between these separate constructs, while the interviews explore how students describe and explain their experiences of using ChatGPT in academic writing. Thus, the study provides a bounded explanation of how ChatGPT use is associated with perceived writing development rather than claiming causal or objectively measured improvement.

This relationship matters to students, lecturers, and institutions alike. The findings can guide students toward using ChatGPT more critically and responsibly, help lecturers design writing activities that make sensible use of AI, and inform institutional policy on academic integrity and AI literacy. Grasping this relationship is a necessary step before generative AI can be woven into writing instruction without pushing aside students' own thinking and authorship.

With that in mind, this study sets out to examine the relationship between ChatGPT use and academic writing development among university-level EFL students, and to explore how those students account for their own writing development when using ChatGPT. Two research questions guide the study. First, what extent is ChatGPT use associated with self-reported academic writing development among university-level EFL students. Second, how do university-level EFL students explain their academic writing development when using ChatGPT.

LITERATURE REVIEW

1.1. ChatGPT and Its Functions in the Academic Writing Process

Academic writing is viewed here through the process-writing model, in which writing develops recursively through planning, drafting, reviewing, and revising rather than through a fixed linear sequence (Flower & Hayes, 1981a). Within this process, ChatGPT can support idea generation, topic selection, argument organization, drafting, language correction, and revision. For EFL students, it can correct grammatical errors, improve sentence structure, suggest appropriate vocabulary, and provide alternative expressions (Al-Obaydi et al., 2025; Ekizoğlu & Demir, 2025; Munawwaroh & Fahreza, 2025). It can also help students overcome difficulties at the planning stage by generating possible topics, outlining ideas, and proposing initial arguments (Jelson et al., 2020; O'Brien-Melford & Gador, 2025; Zhan & Yan, 2025).

However, AI assistance becomes learning only when students remain actively involved in evaluating and transforming its output. During revision, for example, students may compare their original drafts with ChatGPT's suggestions, identify the reasons for particular changes, reject unsuitable recommendations, and apply the relevant principles to later writing tasks (Laila & Lestari, 2026; Lubis et al., 2025). These actions may strengthen linguistic awareness, evaluative judgment, and revision strategies. In contrast, when students accept generated text without critical examination, ChatGPT substitutes for rather than supports the cognitive work of writing. Therefore, its contribution depends not only on the functions it provides

but also on students' ability to question, modify, and independently apply its feedback (Ahmadi, 2025; Massoud & Zhang, 2025; Tian & Zhang, 2025).

1.2. Students' Experiences of Using ChatGPT in Academic Writing

How students experience ChatGPT covers the way they interact with it, why they turn to it in the first place, and how it shapes their writing habits (Lai & Trinh, 2025; Muvid et al., 2025; O'brien-Melford & Gador, 2025). A good number of students see it as a handy tool that makes academic writing simpler, quicker, and more manageable overall (Al-Harashsheh et al., 2025; Sarwanti et al., 2024). Its on-the-spot suggestions can help them push past language barriers, revise more efficiently, and feel more confident about what they produce (Susanti et al., 2024; Vo & Ho, 2026).

Even so, not every student uses ChatGPT the same way. Some treat it as a partner for exploring ideas and refining drafts, while others simply ask it to hand over finished content. Leaning on it too heavily can pull students away from actively generating, organizing, and voicing their own ideas (Al-Obaydi et al., 2025; Solak, 2024). What ChatGPT ultimately contributes to a student's writing development, then, hinges on how well that student can evaluate, adjust, and responsibly apply what the tool produces.

Students who have already finished an academic writing course deserve particular attention here, since they are presumed to hold the basic writing knowledge needed to work more independently (Serina et al., 2025). Looking at their experiences can reveal whether ChatGPT builds on that existing competence or instead breeds reliance on outside help.

1.3. The Changing Role of the Student Writer in the Presence of ChatGPT

The use of ChatGPT changes the role of students from sole text producers into decision-makers who select, evaluate, revise, and take responsibility for AI-generated suggestions. This shift can be understood through several interrelated constructs (Marsevani, Sasmi, et al., 2024). Agency refers to students' control over writing goals and decisions, while authorship concerns their responsibility for the ideas, arguments, and language presented in the final text. Feedback literacy involves understanding and using AI feedback appropriately, whereas evaluative judgment refers to the ability to assess whether generated content is accurate, relevant, and suitable for the writing purpose. Self-regulation includes planning, monitoring, revising, and reflecting on the writing process, while dependence occurs when students rely on ChatGPT in ways that reduce independent thought and decision-making.

When ChatGPT is used as a tutor or writing partner, these capacities may support reflection, language learning, and purposeful revision. Students can maintain agency by setting their own writing goals, preserve authorship by modifying AI-generated content, and exercise evaluative judgment by rejecting inaccurate or inappropriate suggestions (Ekizoğlu & Demir, 2025; Pitychoutis, 2024). Conversely, using ChatGPT primarily to produce complete answers may weaken self-regulation and create

dependence on external assistance (Al-Harahsheh et al., 2025; Lo et al., 2024; Sarwanti et al., 2024)). These constructs guide the present study: questionnaire items measure students' reported use of ChatGPT and perceived writing development, while the qualitative coding examines agency, authorship, feedback use, evaluative judgment, self-regulation, and dependence in their explanations.

Previous studies have examined writing performance and students' general perceptions of ChatGPT, but less is known about why particular patterns of use are associated with stronger or weaker perceptions of writing development. In this explanatory sequential design, the qualitative strand is used to explain specific quantitative findings, such as why certain forms of ChatGPT use show stronger relationships with self-reported writing development than others. The interview analysis examines the roles of agency, authorship, evaluative judgment, feedback literacy, self-regulation, and dependence in explaining these relationships. Integrating both strands therefore produces an inference that neither strand can provide alone: the quantitative findings show the pattern and strength of the association, while the qualitative findings explain the learner actions and conditions underlying that pattern.

METHOD

The study employed a quantitative-priority explanatory sequential mixed-methods design. This design was selected because the interviews were conducted after the survey to explain significant, weak, or unexpected quantitative findings. The quantitative phase examined the association between ChatGPT use and self-reported academic writing proficiency, while writing confidence was treated as a separate outcome. Eight interviewees were selected from respondents with high, moderate, and low ChatGPT-use scores. Both strands were integrated through a joint display to determine whether the qualitative findings confirmed, expanded, contradicted, or qualified the statistical results.

Data were collected from 80 students in the English Education Study Program at a university in Batam, Indonesia. Participants were recruited through class announcements and student WhatsApp groups. They were included if they were active students, had completed an academic writing course, and had used ChatGPT for academic writing. The course covered idea development, paragraph organization, argumentation, paraphrasing, citation, drafting, and revision, with English as the main instructional language. First-year students were eligible because they had completed a foundational academic writing course in their first semester. Most participants had intermediate English proficiency. ChatGPT was permitted as a supporting tool, but students were not allowed to submit unedited AI-generated texts.

Two instruments were used. The questionnaire measured ChatGPT-use frequency, purposes, and use during planning, drafting, revising, and editing. Items measuring perceived improvement, efficiency, motivation, confidence, learning, and reflection were treated as separate subscales and

were not included in the ChatGPT-use predictor. Self-reported proficiency and academic writing confidence were also analyzed separately.

Table 1. Questionnaire Instrument

No	Criteria	Sub-criteria	Indicators	Item Numbers	Adapted from
1.	Frequency and Purpose of Use of ChatGPT	Frequency of Use	Frequency of using ChatGPT in academic writing	1-5	(Bouzar et al., 2024; Kùhler & Hartig, 2024)
		Purpose of Use	Functions of ChatGPT such as generating ideas, paraphrasing, and revising	6-14	(Pallivathukal et al., 2024)
2.	Ways ChatGPT is Used in Writing Process	Pre-writing Stage	Use of ChatGPT in brainstorming and planning	15-17	(Flower & Hayes, 1981b)
		Drafting Stage	Use of ChatGPT in writing drafts	18-20	(Man et al., 2023)
		Revising Stage	Use of ChatGPT in revising writing	21-23	(Alghasab, 2025)
		Editing Stage	Use of ChatGPT in editing writing	24-25	(Baidoo-Anu & Owusu Ansah, 2023)
3.	Perceived Outcomes of ChatGPT Use	Perceived Writing Improvement	Perceived improvement in writing skills and text quality	26-29	(Nisa et al., 2025)
		Perceived Efficiency	Efficiency in completing writing tasks	30-32	(Apriani et al., 2025)
		Writing Motivation	Motivation to complete academic writing task	33-35	(Mai et al., 2024)
		Perceived Learning	Learning through ChatGPT-assisted writing	36-37	(Kasneci et al., 2023)
		Critical and Reflective Use	Evaluation and reflection on ChatGPT output	38-40	(Kasneci et al., 2023)
4.	Students' Academic Writing Development	Academic Writing Competence	Ability to produce clear, organized, and well-structured academic writing independently	41-44	(Teng & Wang, 2023)
		Academic Writing Self-Efficacy	Confidence and belief in producing effective academic writing and	45-47	(Mulyono et al., 2023)

No	Criteria	Sub-criteria	Indicators	Item Numbers	Adapted from
			completing writing tasks		

The questionnaire items were adapted to the university EFL and ChatGPT-assisted writing context. Three experts in English education, academic writing, and educational measurement reviewed the items. The questionnaire was administered in English using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Readability checks were conducted with five English Education students. A pilot test involving 30 eligible students examined item clarity, corrected item-total correlations, and Cronbach's alpha for each subscale.

The qualitative instrument consisted of nine semi-structured questions developed after the quantitative analysis. Questions 1–4 examined students' actual ChatGPT use. Questions 5–8 explained specific quantitative results by exploring verification, dependence, authorship, writing development, and differences between usage profiles. Question 9 examined the overall contribution and limitations of ChatGPT. The interview protocol was reviewed by two English Education lecturers and piloted with one student outside the interview sample.

Table 2. Interview Instrument

No	Focus	Purpose	Item Number	Adapted From
1.	Actual Use of ChatGPT	To explore how students use ChatGPT in academic writing	1-4	(Kasneci et al., 2023)
2.	Explanation of Quantitative Findings	To explain differences across usage profiles, writing proficiency, verification practices, dependence, and authorship	5-8	(Pallivathukal et al., 2024)
3.	Overall Experience	To obtain a general description of students' overall experience using ChatGPT	9	(Creswell, 2013)

Data collection occurred in two stages. First, the questionnaire was distributed online to 80 respondents. Eight students representing contrasting ChatGPT-use and proficiency profiles were then interviewed in Indonesian for 20–40 minutes. The interviews were recorded with consent, transcribed verbatim, translated into English, and checked by a bilingual English lecturer. Participants' identities were replaced with codes, and the data were stored in a password-protected folder.

Descriptive statistics and simple linear regression were used to examine the association between ChatGPT use and self-reported writing

proficiency. Confidence and other perceived outcomes were analyzed separately. The interview transcripts were analyzed through deductive and inductive thematic analysis. Initial codes included agency, authorship, feedback literacy, evaluative judgment, self-regulation, verification, and dependence. Peer checking and an audit trail were used to support trustworthiness. A joint display was then used to integrate the statistical findings and qualitative themes.

RESULTS

1.4. Result

Eighty university students who had taken academic writing courses and had used ChatGPT in their writing work took part in this study. Questionnaire data were gathered and then checked for completeness and consistency before the analysis proceeded.

1.4.1. Demographic Respondent

Table 3 sets out the demographic profile of the respondents:

Table 3. Respondent Demographic

Indicators	Type	Frequency	Percentage
Gender	Female	61	76.3%
	Male	19	23.8%
Age	18 years old	11	13.8%
	19 years old	31	38.8%
	20 years old	15	18.8%
	21 years old	14	17.5%
	22 years old	5	6.3%
	24 years old	1	1.3%
	25 years old	1	1.3%
	27 years old	1	1.3%
	29 years old	1	1.3%
Year of Study	First year	26	32.5%
	Second year	33	41.3%
	Third year	21	26.3%
Duration of ChatGPT Use	Less than 3 months	7	8.8%

Indicators	Type	Frequency	Percentage
	3–6 months	13	16.3%
	6–12 months	12	15.0%
	More than 1 year	48	60.0%

Table 3 indicates that most respondents were female (76.3%), aged 19 years (38.8%), and in their second year of study (41.3%). In addition, 60.0% had used ChatGPT for more than one year, suggesting substantial prior exposure to the tool. These demographic characteristics were examined descriptively as possible boundary conditions of the findings. The predominance of female and second-year students may limit the extent to which the results represent students from other gender groups or academic levels. Differences in prior academic writing course exposure and duration of ChatGPT use may also influence students' familiarity with academic writing and their perceptions of ChatGPT-assisted writing. Therefore, the findings should be interpreted within the demographic and educational context of this sample.

1.4.2. Descriptive Statistics Results

Descriptive statistics were calculated to describe the distributions of ChatGPT use and students' academic writing development. All questionnaire items were rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The descriptive values presented in Table 4 represent mean item scores obtained by dividing each respondent's total score by the number of items in the corresponding variable.

Table 4. Descriptive Statistics

Variabel	Item	N	Min	Max	Mean	Std. Deviation
ChatGPT Use (X)	39	80	1,38	5,00	3,90	0,886
Students' Academic Writing (Y)	7	80	1,43	5,00	3,90	0,847

As shown in Table 4, the mean item scores for ChatGPT use ranged from 1.38 to 5.00, with an overall mean of 3.90 (SD = 0.886). This result indicates a relatively high level of ChatGPT use among the respondents. The mean item scores for students' academic writing development ranged from 1.43 to 5.00, with an overall mean of 3.90 (SD = 0.847), indicating generally positive perceptions of academic writing development.

Although Table 4 presents mean item scores for ease of interpretation, the regression analysis was conducted using total composite scores. The 39 ChatGPT use items were summed to produce scores with a

theoretical range of 39–195, while the seven academic writing development items were summed to produce scores with a theoretical range of 7–35. Thus, the intercept and regression coefficients were expressed in total-score units.

1.4.3. Validity Test

Corrected item–total correlations were used as a preliminary item-analysis procedure rather than as proof of validity. In the 30-participant pilot test, all items exceeded the minimum correlation criterion of 0.361 and were therefore retained for the main study. Content validity was established through review by three experts in English education, academic writing, and educational measurement, who assessed the relevance, clarity, and alignment of each item with its intended construct. In the main sample, item performance was examined separately within each subscale. Because item–total correlations alone do not establish construct validity, the results are interpreted as preliminary evidence of item consistency rather than confirmation of the complete measurement model.

Table 5. Validity Test Results

Variable	Item	<i>Corrected Correlation</i>		Description
		r-count	r-table	
ChatGPT Use (X)	X.1	0,756	0,220	Valid
	X.2	0,738	0,220	Valid
	X.3	0,843	0,220	Valid
	X.4	0,833	0,220	Valid
	X.5	0,755	0,220	Valid
	X.6	0,791	0,220	Valid
	X.7	0,790	0,220	Valid
	X.8	0,847	0,220	Valid
	X.9	0,831	0,220	Valid
	X.10	0,767	0,220	Valid
	X.11	0,794	0,220	Valid
	X.12	0,807	0,220	Valid
	X.13	0,788	0,220	Valid
	X.14	0,778	0,220	Valid

Variable	Item	Corrected Corelation		Description
		r-count	r-table	
	X.15	0,782	0,220	Valid
	X.16	0,818	0,220	Valid
	X.17	0,819	0,220	Valid
	X.18	0,775	0,220	Valid
	X.19	0,812	0,220	Valid
	X.20	0,824	0,220	Valid
	X.21	0,802	0,220	Valid
	X.22	0,796	0,220	Valid
	X.23	0,810	0,220	Valid
	X.24	0,838	0,220	Valid
	X.25	0,747	0,220	Valid
	X.26	0,698	0,220	Valid
	X.27	0,810	0,220	Valid
	X.28	0,792	0,220	Valid
	X.29	0,789	0,220	Valid
	X.30	0,814	0,220	Valid
	X.31	0,827	0,220	Valid
	X.32	0,847	0,220	Valid
	X.33	0,791	0,220	Valid
	X.34	0,761	0,220	Valid
	X.35	0,824	0,220	Valid
	X.36	0,777	0,220	Valid
	X.37	0,756	0,220	Valid
	X.38	0,849	0,220	Valid

Variable	Item	Corrected Correlation		Description
		r-count	r-table	
	X.39	0,773	0,220	Valid
Students' Academic Writing (Y)	Y1	0,833	0,220	Valid
	Y2	0,840	0,220	Valid
	Y3	0,872	0,220	Valid
	Y4	0,870	0,220	Valid
	Y5	0,805	0,220	Valid
	Y6	0,811	0,220	Valid
	Y7	0,828	0,220	Valid

All items proved valid, since their corrected correlation values sat above the r-table figure of 0.220. Every item measuring ChatGPT Use and Academic Writing Development therefore cleared the validity bar and was fit for further analysis.

1.4.4. Reliability Test

Internal consistency was assessed using Cronbach's alpha, with a coefficient of at least 0.70 considered acceptable. Reliability was evaluated separately for each subscale because the questionnaire measured several conceptually different dimensions.

Table 6. Reliability Test Results

Variabel	Item	Cronbach Alpha	Description
ChatGPT Use (X)	39	0,985	Reliabel
Students' Academic Writing (Y)	7	0,929	Reliabel

The overall ChatGPT-use scale produced a Cronbach's alpha of 0.985, while the seven-item academic writing outcome scale produced an alpha of 0.929. Although both coefficients indicate very high internal consistency, they do not confirm that the items represent single unidimensional constructs. The 0.985 coefficient may reflect redundancy among the 39 heterogeneous ChatGPT-related items. Similarly, the 0.929 coefficient for the academic writing outcome combines self-reported writing proficiency and writing confidence, which should be examined as separate subscales. Therefore, reliability was interpreted at the subscale level before further analysis.

1.4.5. Normality Test

The normality assumption was assessed using the regression residuals rather than the raw variables. The results are presented in Table 7.

Table 7. Normality Test Results

Test	<i>Asymp. Sig.</i>	Description
<i>One-Sample Kolmogorov Smirnov</i>	0.200	Normal

The Kolmogorov–Smirnov test produced a significance value of .200 ($p > .05$), indicating no substantial departure from normality. Visual inspection of the Q–Q and P–P plots also showed that the residuals generally followed the expected diagonal line.

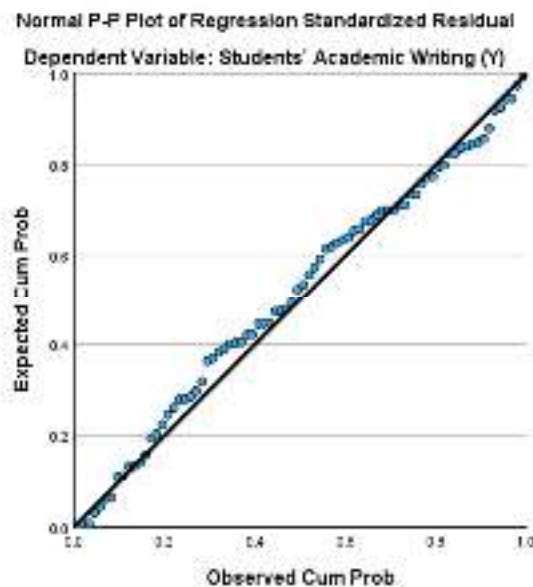


Figure 1. Normality Test Results

1.4.6. Multicollinearity Test

A multicollinearity check made sure the independent variables in the model were not too closely correlated with one another, using the Variance Inflation Factor (VIF) and Tolerance values as the diagnostic. The results are shown below.

Table 8. Multicollinearity Test Results

Variabel	<i>Collinearity Statistics</i>		Description
	<i>Tolerance</i>	VIF	

ChatGPT Use (X)	1.000	1.000	No Multicollinearity
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For ChatGPT Use (X), the Tolerance value came out at 1.000 and the VIF at 1.000. With Tolerance above 0.10 and VIF below 10, the regression model can be said to be free of multicollinearity.

1.4.7. Heteroscedasticity Test

A heteroscedasticity test looked at whether the residual variance stayed constant across observations, examined here through a scatterplot of residual points against predicted values. The results follow below.

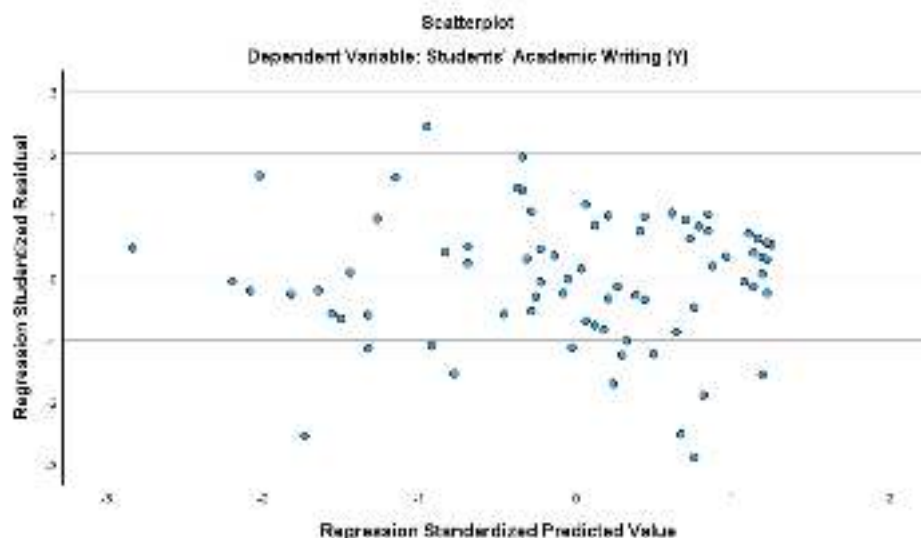


Figure 1. Heteroscedasticity Test Results

Figure 1 shows that the residuals were distributed relatively randomly above and below the zero line, with no clear funnel-shaped pattern. However, visual inspection alone does not confirm homoscedasticity.

1.4.8. Simple Linear Regression Analysis

Simple linear regression served as the main analytic technique, chosen to test the effect of ChatGPT Use (X) on Students' Academic Writing (Y). It fit the study well since only one independent and one dependent variable were involved, and it let the researchers pin down the direction, strength, and significance of the relationship between the two. The results appear below.

Table 9. Simple Linear Regression Predicting Self-Reported Academic Writing

Predictor	B	SE	β	95% CI for B	t	p
(Constant)	7.112	1.911	--	[3.307, 10.917]	3.721	<0.001
ChatGPT Use (X)	0.133	0.012	0.775	[0.109, 0.157]	10.836	<0.001

Model summary: $RI = .601$, adjusted $RI = .596$, $F(1, 78) = 117.427$, $p < .001$, $N = 80$.

Table 9 yields the following simple linear regression equation:

$$Y = 7.112 + 0.133X$$

The equation can be read as follows:

1. A positive constant of 7.112 means that, holding ChatGPT Use (X) at zero, Students' Academic Writing (Y) would still sit at 7.112.
2. The positive regression coefficient ($B = 0.133$) indicates that each one-point increase in the total ChatGPT Use score is associated with a 0.133-unit increase in the predicted self-reported academic writing score. This relationship is associative rather than causal.

Table 9 puts the R Square value at 0.601, meaning ChatGPT Use (X) accounts for 60.1% of the variation in Students' Academic Writing (Y). The remaining 39.9% comes down to factors sitting outside this research model.

The regression model was statistically significant, $F = 117.427$, $p < .001$, indicating an association between ChatGPT use and self-reported academic writing development. However, statistical significance alone does not establish the direction, practical importance, or causal nature of this relationship. The result should be interpreted cautiously because both variables were measured through self-report questionnaires, creating possible measurement overlap and common-method variance. Reverse direction is also plausible, as students with stronger writing skills may use ChatGPT more frequently and strategically. Therefore, the finding indicates a statistical association rather than evidence that ChatGPT directly improves academic writing ability.

The t-test returned a t-value of 10.836 for ChatGPT Use (X), again at a significance level under 0.001. Since that falls below 0.05, the hypothesis stands accepted, confirming a positive and significant effect of ChatGPT Use on Students' Academic Writing (Y).

DISCUSSION

1.5. Self-Reported Academic Writing Development Associated with ChatGPT Use

The findings showed that higher composite scores for ChatGPT use were significantly associated with higher self-reported academic writing scores. This result does not indicate that more frequent use directly produced writing gains because the predictor included frequency, purposes, and use across writing stages, while the outcome was based on students' perceptions. The association may reflect perceived support for grammar, sentence structure, vocabulary, and clarity of expression, consistent with earlier studies of ChatGPT-assisted language support for EFL students (Al-Obaydi et al., 2025; Ekizoğlu & Demir, 2025; Munawwaroh & Fahreza, 2025). However, the conceptual overlap between some questionnaire dimensions may have strengthened the observed relationship.

ChatGPT may also support students in generating ideas and organizing academic texts. EFL students often experience difficulty beginning writing tasks, developing arguments, and connecting ideas coherently. ChatGPT can provide topic suggestions, outlines, and examples

during the early writing stages (Jelson et al., 2020; O'Brien-Melford & Gador, 2025; Zhan & Yan, 2025). These functions mainly reflect planning support and task efficiency rather than direct evidence of durable writing competence (Marsevani et al., 2025).

Students also perceived benefits during revision and language polishing. Comparing their drafts with ChatGPT-generated suggestions may increase their awareness of coherence, sentence construction, and academic register (Laila & Lestari, 2026; Lubis et al., 2025). Immediate feedback may also improve confidence and make writing tasks more manageable (Al-Harashseh et al., 2025; Sarwanti et al., 2024). Nevertheless, language polishing, efficiency, and confidence should be distinguished from strategic learning and the ability to write independently without AI assistance.

Therefore, the positive association should be interpreted cautiously. Strategic learning may occur when students evaluate suggestions, identify the reasons for revisions, and apply what they learn to later tasks. In contrast, accepting AI-generated content without critical evaluation may reduce cognitive engagement and independent authorship (Ahmadi, 2025; Massoud & Zhang, 2025; Tian & Zhang, 2025). Because the study used self-reported cross-sectional data, reverse direction is also possible: students with stronger writing competence may use ChatGPT more strategically. The findings therefore indicate perceived support rather than objectively measured or causal writing development.

1.6. Students' Perceptions of Academic Writing Development through ChatGPT Use

As presented in the Results section, the interview findings identified ChatGPT as a writing partner that supported reflection and idea development. All participant names, including Tasya, Kila, and Gabby, are pseudonyms. This theme appeared across several participants, although their experiences were not identical. Some students used ChatGPT to evaluate ideas and identify weaknesses in their drafts, whereas others relied more directly on its suggestions. These similar and contrasting accounts show that ChatGPT may support reflection when students retain control over writing decisions, but may substitute for thinking when its output is accepted uncritically (Jelson et al., 2020; O'Brien-Melford & Gador, 2025; Zhan & Yan, 2025).

Brainstorming and organizing ideas came up often as uses for ChatGPT. Kila said, "I usually use ChatGPT for brainstorming, choosing topics, and making the structure of what I should write first." Gabby, in much the same vein, said it helped her narrow broad ideas down into more specific points. Together these accounts suggest ChatGPT helps students plan and structure their texts when they are not yet sure how to begin.

Students also found ChatGPT useful for building academic vocabulary, paraphrasing, translation, and grammar. Kila noted, "Sometimes my vocabulary is limited, so I ask ChatGPT to make it more academic. From there, I learn new vocabulary used in academic writing." This backs up the idea that ChatGPT works as linguistic support for EFL students who already have something to say but struggle to say it properly in English (Laila & Lestari, 2026; Lubis et al., 2025).

At the revision stage, most students said they wrote their own draft first before asking for feedback. Tasya explained, “I usually write my own version first, then ask ChatGPT whether the flow is logical or whether there is something missing.” That habit let students judge coherence, paragraph organization, and academic style for themselves rather than handing that judgment entirely over to AI-generated text (Laila & Lestari, 2026; Lubis et al., 2025).

Confidence and efficiency both got a boost from ChatGPT, according to participants. Kila said it helped her figure out what to write about next, and Tasya said it saved her time when working through articles and building supporting ideas. These accounts fit with studies showing ChatGPT can make academic writing faster and easier to manage (Al-Harashseh et al., 2025; Sarwanti et al., 2024; Susanti et al., 2024; Vo & Ho, 2026).

Participants also associated ChatGPT with confidence and efficiency. It helped them identify what to write next, locate supporting ideas, and complete writing tasks more quickly. These findings confirm the survey dimensions related to confidence and task efficiency (Al-Harashseh et al., 2025; Sarwanti et al., 2024; Susanti et al., 2024; Vo & Ho, 2026). However, increased confidence while using ChatGPT does not necessarily indicate stronger self-efficacy when students must write without technological assistance.

The interviews also raised important issues of AI literacy and academic integrity. Participants recognized that ChatGPT could generate inaccurate journal information, links, or DOIs, demonstrating the need for source verification. This awareness reflects evaluative judgment, but the interviews did not show that verification practices were equally systematic across all usage profiles. Students who critically checked information and rejected unsuitable suggestions demonstrated stronger agency and responsibility, whereas uncritical acceptance increased the risks of inaccurate citation and weakened authorship (Ekizoğlu & Demir, 2025; Pitychoutis, 2024).

Dependence emerged as an important negative or qualifying case. Kila’s account that writing without ChatGPT felt incomplete suggests that the tool may increase confidence during use while weakening confidence and autonomy when it is unavailable. This finding complicates the generally positive survey results because high perceived usefulness may coexist with dependence, reduced self-efficacy, and weaker independent decision-making. ChatGPT may therefore support immediate task performance without necessarily strengthening long-term writer autonomy (Marsevani, Slikker, et al., 2024).

Taken together, the qualitative findings confirmed the quantitative results regarding perceived support for planning, language use, revision, confidence, and efficiency. They expanded the survey findings by explaining how students used ChatGPT at different writing stages and complicated them by identifying inaccurate information, dependence, and reduced autonomy. The mixed-methods meta-inference is that ChatGPT use is positively associated with self-reported academic writing outcomes, but its perceived contribution depends on students’ agency, evaluative

judgment, verification practices, and ability to maintain authorship. Thus, ChatGPT is more likely to support strategic learning when students critically evaluate its output rather than use it as a substitute for independent writing.

CONCLUSION

The findings showed that higher composite scores for ChatGPT use were associated with higher self-reported academic writing outcomes. The composite reflected frequency, purposes, use across writing stages, and students perceived experiences rather than frequency alone. Students reported that ChatGPT supported idea generation, argument organization, language refinement, revision, efficiency, and writing confidence. However, these perceived benefits should not be interpreted as evidence of objective or causal improvement in writing competence. Excessive reliance may also weaken students' independence, evaluative judgment, and authorship. ChatGPT should therefore complement rather than replace students' own writing processes. Pedagogically, universities should integrate AI literacy into academic writing instruction. Students need guidance on evaluating AI-generated content, verifying sources, revising suggestions critically, maintaining authorship, and using ChatGPT as a scaffold rather than a substitute for independent thinking. This study has several limitations. It involved a purposively selected and self-selected sample from one university, limiting the transferability of the findings. The cross-sectional design and reliance on self-reported data prevented the study from establishing causal relationships or actual changes in writing ability. No direct assessment of students' written texts was conducted. Conceptual overlap among ChatGPT use, perceived improvement, confidence, and learning may also have inflated the observed association and introduced common-method bias. In addition, the qualitative phase involved only eight participants, so it may not represent the full range of student experiences. Future studies should examine the constructs separately, include objective writing assessments and longitudinal designs, recruit larger multisite samples, and investigate the long-term effects of ChatGPT use on writing competence, learner autonomy, and critical thinking.

ACKNOWLEDGMENTS

The authors sincerely thank the student participants for sharing their experiences and acknowledge everyone who provided guidance and support throughout the study.

AUTHOR CONTRIBUTION STATEMENT

MM led the conceptualization, study design, data collection and analysis, and initial manuscript preparation. HH supported the methodology, interpretation of findings, and manuscript revision. Both authors reviewed and approved the final manuscript.

AI DISCLOSURE STATEMENT

The authors used OpenAI's ChatGPT to assist with language editing, grammatical refinement, and clarity during manuscript preparation. All AI-assisted content was carefully evaluated and revised by the authors, who assume full responsibility for the final manuscript.

COMPETING INTERESTS STATEMENT

The authors declare no competing interests.

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