Comparing AI-Based and Peer-Based Feedback in Teaching the CaRS Model: A Quasi-Experimental Study on Postgraduate Academic Writing

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***Abstract*—This study investigates the effectiveness of Artificial Intelligence (AI)-generated and peer-based feedback in enhancing postgraduate students' ability to apply the Create-a-Research-Space (CaRS) model when writing research article introductions. Although automated feedback has gained increasing attention, its impact compared with peer review in genre-based writing instruction remains underexplored. Employing a quasi-experimental design, the study involved 41 postgraduate students of Islamic education at an Indonesian state Islamic university. Class B (*n* = 20) received AI feedback via ChatGPT with structured CaRS-based prompts, while Class C (n = 21) engaged in peer review using a CaRS checklist. Data were collected through pre-test and post-test scores assessed with an analytic rubric, complemented by an open-ended perception survey. The results showed significant improvements in both groups (Artificial intelligence (AI) group: mean score 2.75 → 4.35; peer group: 2.33 → 4.19), with no statistically significant difference between them. Perception data revealed that students valued the clarity of AI feedback and the contextual relevance of peer comments, though both modes had limitations. The findings suggest that AI and peer feedback are comparably effective and can complement each other in supporting genre competence. The study highlights the importance of integrating AI tools into academic writing pedagogy while cultivating students' feedback literacy to maximize the benefits of diverse feedback sources.**

***Keywords*—Artificial intelligence (AI) feedback, peer feedback, Create-a-Research-Space (CaRS) model, postgraduate writing, academic writing pedagogy**

I. INTRODUCTION

Academic writing has become a central component of postgraduate education, as students are required to demonstrate not only mastery of their subject matter but also the ability to communicate their research in academically acceptable ways. In Indonesia, postgraduate students must publish their work before graduation, a policy that aims to raise research quality but also heightens demands on writing competence [1]. For many, producing well-structured academic texts remains challenging, especially in the introduction section of research papers.

Studies have shown that postgraduate students often experience difficulties not only in grammar and vocabulary but also in organization, coherence, and rhetorical clarity [2, 3]. These challenges are most apparent in research article introductions, where students are expected to frame their study, identify a problem, and justify its contribution. The Create-a-Research-Space (CaRS) model (Swales, 1990) [4] offers a systematic framework for this process through three rhetorical moves: establishing a territory, identifying a niche, and occupying that niche. Research in the Indonesian context confirms that many students fail to apply these moves consistently; Students often provide background information without identifying a clear gap or present a topic without a strong rationale [4–6]. This indicates a need for more explicit instructional and feedback practices that help students master rhetorical structures.

Feedback is a central element of writing instruction and has long been recognized as a catalyst for student improvement [7, 8]. Teacher feedback, while authoritative, is often constrained by limited time and resources [9]. Peer feedback provides collaborative opportunities and fosters critical reflection, yet it can vary in quality and depth depending on students' feedback literacy [10, 11]. In postgraduate Islamic education contexts, where students typically have strong disciplinary knowledge but limited experience with academic writing, these constraints are even more visible.

The rise of artificial intelligence offers new possibilities for writing feedback. Tools such as ChatGPT can generate rapid, structured responses on issues of coherence, clarity, and organization. Research suggests that AI feedback can enhance students' rhetorical awareness and provide more consistent guidance than novice peer reviewers [11–13]. However, concerns remain about the superficial nature of AI responses [14], with effectiveness largely depending on prompt quality and students' critical engagement [15].

Despite increasing attention to AI in education, a significant gap remains. Most studies of AI-generated feedback focus on general writing improvement, such as grammar correction, vocabulary enrichment, or essay writing, rather than on genre-specific rhetorical structures. Similarly, while teacher and peer feedback have been studied in relation to academic writing, there has been little systematic comparison of AI and peer feedback within the CaRS model framework. This gap is particularly relevant in Indonesian postgraduate contexts, where students face high writing and publication demands but have limited access to sustained academic writing support. To address this gap, the present study investigates the comparative effects of AI-generated and peer-based feedback on postgraduate students' ability to construct research article introductions using the CaRS model. Specifically, the study seeks to answer the following research question: "To what extent does AI-generated feedback differ from peer feedback in supporting postgraduate students' ability to construct effective research article introductions within the CaRS framework"?

This research offers several contributions to the scholarship on academic writing pedagogy. First, it moves beyond a focus on surface-level linguistic features and directs attention to the rhetorical organization of research article introductions, using the CaRS model as a framework for assessing feedback effectiveness. Second, it presents empirical evidence from a relatively underexplored setting, Indonesian postgraduate Islamic education, where students face the dual challenge of meeting international publication standards while navigating limited institutional support. Third, by placing AI-generated and peer-provided feedback in direct comparison, the study sheds light on the respective strengths and constraints of these two approaches within genre-based instruction. Lastly, the combination of statistical outcomes and student perceptions provides a more comprehensive picture of how learners engage with feedback, offering practical implications for enhancing writing support in resource-limited higher education contexts.

II. Literature Review

A. Genre-Based Instruction and the CaRS Model

Swales's Create-a-Research-Space (CaRS) model (1990) [4] remains foundational in teaching the structure of research article introductions through three rhetorical moves: establishing a research territory, identifying a niche, and occupying that niche (see Fig. 1). Genre-based instruction grounded in this framework has been empirically shown to enhance graduate students' rhetorical awareness and structural competence, making their academic writing more persuasive and aligned with publication expectations [5, 6].

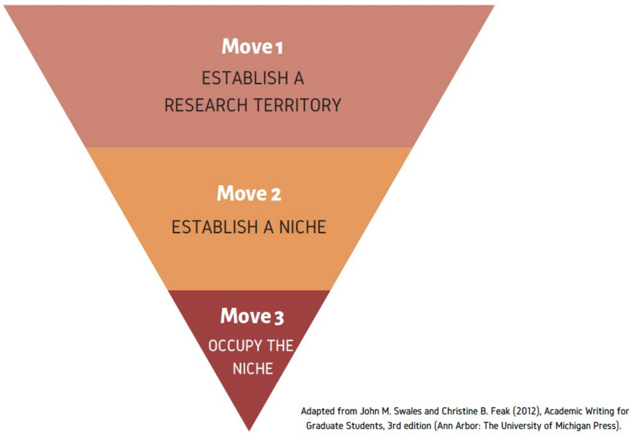

Fig. 1. Swale's CaRS model (1990).

B. Peer Feedback in Academic Writing

Peer feedback interventions in academic settings yield multiple benefits: enhanced critical thinking, increased motivation, social learning, self-regulatory revision, and genre awareness. Longitudinal studies with medical and English major students in China revealed that peer-reviewed writing led to significant improvements in coherence, cohesion, lexical richness, and accuracy over time [10]. Experimental evidence further demonstrates that when students are trained in feedback literacy and use structured rubrics, peer feedback can outperform traditional instructor-only feedback in advancing academic writing quality [8].

C. AI-Based Feedback Using ChatGPT

The rapid integration of ChatGPT as a feedback tool in writing education has sparked both enthusiasm and skepticism. Barrot [16] found that ChatGPT-generated feedback on coherence and cohesion in ELL essays tended to be abstract and generic, lacking specificity required for deeper revision. Conversely, Ozdere [15] reported that combined with targeted prompt training, ChatGPT can significantly boost writing motivation, self-efficacy, and organizational structure among EFL learners. A randomized control study using AI-generated feedback systems also showed substantial improvements in organization and content development, supporting the intervention's effectiveness in critical writing contexts [17].

D. Comparing Peer vs AI Feedback

Empirical comparisons show nuanced trade-offs. Almegren *et al.* [18] found that with optimal prompting, ChatGPT can generate feedback with greater clarity and specificity than some human novices. However, Steiss *et al.* [19] compared 200 essays reviewed by humans and ChatGPT and concluded that while ChatGPT performed similarly in criterion-based feedback, human reviewers provided richer contextual and genre-specific guidance overall.

E. Identified Gap and Justification

Recent advances in writing instruction have brought increased attention to the use of both AI-generated and peer feedback. However, studies comparing their specific impact on students' ability to apply rhetorical structures—such as the CaRS model—are still scarce. Most research to date has concentrated on general writing skills, grammatical accuracy, or learner motivation, typically involving undergraduate students or mixed-genre assignments. What remains largely underexplored is how these feedback strategies influence postgraduate learners in producing well-structured introductions, particularly in academic settings where publishing is a graduation requirement and English is not the students' first language.

III. Materials and Methods

A. Research Design and Approach

This research adopted a quasi-experimental approach by working with two intact groups of postgraduate students who were taking an academic writing course. The primary objective was to examine how AI-generated feedback, provided through ChatGPT, compared with peer-based feedback in helping students develop stronger research article introductions. Both forms of feedback were evaluated in relation to students' use of the CaRS (Create a Research Space) model introduced by Swales in Narjes [20], which outlines key rhetorical moves for structuring academic introductions.

B. Participants

The study involved 41 postgraduate students (S2 level) from the Islamic Education Study Program (PAI) at a state Islamic university on Lombok Island, Indonesia. They were enrolled in the Seminar Proposal and Academic Publication course during the second semester of the 2024/2025 academic year. The course was structured into two main segments: meetings 1–8 focused on research proposal writing, while meetings 9–16 emphasized academic publication. The present research was conducted during meetings 9–12, when students were working on drafting the introduction section of a research paper.

Participants were selected through convenience sampling, since the study relied on intact classes that were already formed as part of the course structure. Class B (n = 20) was assigned to the experimental group, which received AI-generated feedback through ChatGPT, while Class C (n = 21) served as the control group and participated in peer review activities facilitated by their classmates under lecturer guidance. All students were in their second semester and had previously taken an introductory course on academic writing, but none had received formal instruction in applying the CaRS model. Random reallocation was not feasible due to administrative and ethical considerations. Using intact classes ensured that the intervention was integrated naturally into ongoing instruction.

The research activities were integrated into the students' regular course sessions so that participation aligned naturally with their academic tasks. Prior to the study, all participants were informed about the research procedures and voluntarily provided their consent to participate.

C. Instruments

The quality of the students' introductions was assessed using an analytic rubric adapted from Narjes [20]. The rubric contained three major categories aligned with the CaRS moves: (1) Establishing a Territory, (2) Identifying a Niche, and (3) Occupying the Niche. Each move was rated on a 4-point scale (0 = absent, 1 = weak, 2 = adequate, 3 = strong). Table 1 presents a summary of the rubric. This scale was selected to balance simplicity and sensitivity; it is widely used in genre-based assessments because it allows raters to apply consistent judgments while still capturing meaningful distinctions in students' rhetorical performance. Using this scale also helped maintain inter-rater reliability and minimize ambiguity in scoring.

Table 1. Rubric for assessing research article introductions

CaRS Move	Descriptor	Score Range
Establishing a Territory	Provides background, significance, and general context	0–3
Identifying a Niche	Highlight gap, limitation, or problem in prior research	0–3
Occupying the Niche	State the purpose, objectives, or contribution of the study	0–3

To ensure scoring reliability, two independent raters with expertise in academic writing were recruited. Inter-rater reliability was calculated using Cohen's kappa, yielding a coefficient of 0.82, which indicates strong agreement. Discrepancies were resolved through discussion.

Besides the analytic rubric used to assess the quality of students' introductions, an open-ended perception survey was also administered to explore how students experienced the feedback process. The survey items were adapted from previous studies on student perceptions of feedback in academic writing [14, 21]. The guiding questions were as follows:

1) What did you find most helpful about the feedback you received?
2) What challenges did you face when revising your draft after receiving feedback?
3) How did the feedback influence your understanding of the CaRS model?

The survey was distributed at the end of the intervention (meeting 12), and students completed it in Indonesian. Their responses were then analyzed thematically to identify recurring patterns and representative perspectives.

D. Procedures

The study was conducted over four class meetings within the Seminar Proposal and Academic Publication course (see Fig. 2). In the first meeting, students submitted their initial draft of the introduction, which was treated as the pre-test. The following two meetings were devoted to instruction and feedback activities. After receiving an overview of the CaRS model from the lecturer, students engaged in feedback sessions according to their group assignment.

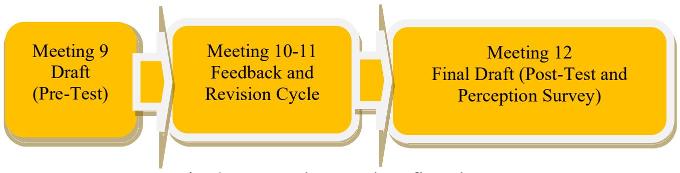

Fig. 2. Research procedure flowchart.

Table 2. Research procedure

Meeting	Activities	Steps	Treatments
9	At the end of class, the teacher asked students to bring a draft of their article introduction to the meeting 10.	Both classes.	Pre-test (First draft of Introduction)
10	All students were introduced to the rhetorical structure of research article introductions using the CaRS model. Then, students from both classes learnt from feedback to improve the introduction draft quality from the lens of CaRS model (Swales, 1990) [20].	Class B: Students brought their initial drafts and were instructed on how to use ChatGPT for rhetorical feedback. The researcher provided a prompt: "Anda adalah penulis artikel jurnal berpengalaman. Tolong periksa apakah artikel ini sudah memenuhi moves dari CaRS Model (Swales, 1990) [20]? Jika belum, berikan saran perbaikannya." Students used ChatGPT to evaluate and revise their drafts accordingly.	AI-based feedback
		Class C: Students exchanged drafts with peers, reviewed each other's use of the CaRS moves, and gave written feedback. The lecturer also gave verbal guidance.	Conventional peer feedback
11	Students rechecked the draft again and learnt from feedback to improve the introduction	Class B: Students submitted their revised drafts and rechecked them using ChatGPT. Final revisions were made based on the second round	AI-based feedback

	draft quality from the lens of CaRS model (Swales, 1990) [20].	of AI feedback.	
		Class C: Students submitted revised drafts, received lecturer feedback, and completed final revisions.	Conventional peer feedback
12	All students submitted their final drafts, and their CaRS model fulfillment was scored by two independent raters. Students also filled out the open-ended perception survey.	Both classes	Post-test (Final draft of Introduction)

The experimental group (Class B) used ChatGPT to obtain rhetorical feedback on their drafts. A structured prompt was provided to guide the AI in evaluating the completeness of the introduction with respect to the three CaRS moves. Students then revised their drafts based on this feedback and repeated the process in a second cycle. The control group (Class C) participated in peer review activities. Working in pairs, they exchanged drafts and applied a checklist adapted from the CaRS framework to identify strengths and weaknesses, with additional verbal guidance from the lecturer.

In the final meeting, students submitted their revised drafts, which were evaluated using a CaRS-based analytic rubric by two independent raters. Inter-rater reliability was established to ensure consistency in scoring. Students also completed an open-ended perception survey to capture their reflections on the feedback process. The details of the procedures are prescribed in Table 2.

E. Data Analysis

The quantitative data were analyzed by comparing the pretest and posttest scores of both groups. Before running the main analysis, tests for normality and homogeneity of variance were carried out to ensure the data met the assumptions for parametric testing. To determine whether there was a significant difference in students' final draft scores between Class B (which received AI-generated feedback) and Class C (which received peer feedback), an independent-samples t-test was performed. All statistical analyses were conducted using SPSS version 24.

The qualitative data were drawn from the open-ended perception survey administered in the final meeting of the intervention. Student responses were examined using thematic analysis [22]. Two researchers independently coded the data to identify recurring themes, and differences in coding were discussed until consensus was reached. The analysis focused on how students described the clarity and usefulness of the feedback, the challenges they experienced during revision, and the extent to which the process supported their understanding of the CaRS model. To illustrate these themes, representative excerpts from student responses are presented in the results section.

F. Ethical Considerations

Ethical approval was obtained from the university's ethics committee. Students were informed of the research objectives and their rights to anonymity and voluntary participation. The use of ChatGPT was transparent and guided by educational purposes. No part of the writing submitted for grading was generated by AI; the tool was used solely for feedback and revision purposes. Confidentiality of student responses and work was strictly maintained.

IV. Result

A. Test of Assumptions: Normality and Homogeneity

Before conducting statistical comparisons, assumption tests were performed to ensure the appropriateness of the chosen statistical analyses. The Levene's Test for homogeneity of variance (Table 3) indicated that the data met the requirement of equal variances across groups, with $p > 0.05$ in all approaches (e.g., based on mean: $F = 0.890$, $p = 0.351$). This suggests that the variance in CaRS scores was comparable between the experimental (AI-based) and control (peer-based) groups.

Furthermore, the Shapiro–Wilk test results (Table 4) confirmed that all datasets were normally distributed. The pretest and posttest scores in both groups yielded p-values above 0.05, indicating no significant deviation from normality (e.g., Pretest B EXP: $p = 0.079$; Posttest C CTRL: $p = 0.231$). These results justify the use of parametric tests in the subsequent analysis.

Table 3. Test of homogeneity of variance

Robust Tests of Equality of Means	Levene Statistic	df1	df2	Sig.
Based on Mean	0.890	1	39	0.351
Based on Median	0.708	1	39	0.405
Based on Median and with adjusted df	0.708	1	38.85	0.405
Based on trimmed mean	0.931	1	39	0.341

Table 4. Test of normality

Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest C (CTRL)	0.214	21	0.098	0.886	21	0.119
Pretest B (EXP)	0.275	20	0.056	0.864	20	0.079
Posttest C (CTRL)	0.218	21	0.171	0.897	21	0.231
Posttest B (EXP)	0.238	20	0.104	0.868	20	0.091

a. Lilliefors Significance Correction

B. Comparative Effectiveness between AI-Based and Peer-Based Feedback

While both feedback strategies significantly improved student performance, the independent-samples t-test (Table 5) was used to determine whether there was a significant difference in the effectiveness between the two groups at posttest. The result showed no significant difference in posttest scores between the experimental (AI-based) and control (peer-based) groups: $t(39) = -0.482$, $p = 0.633$. This indicates that AI-based feedback was as effective as peer feedback in helping postgraduate students apply the CaRS model in academic writing. The mean difference of −0.16 (AI group slightly higher) was not statistically meaningful, suggesting pedagogical equivalence between both approaches in this context.

Table 5. Independent samples test

Independent Samples Test	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.04	0.162	−0.482	39	0.633	−0.160	0.331	−0.829	0.510
Equal variances not assumed			−0.487	34.537	0.630	−0.160	0.328	−0.825	0.506

C. *Effect of AI-Based Feedback on CaRS Scores*

The experimental group (Class B), which received AI-based feedback via ChatGPT, showed a substantial improvement in their CaRS model scores from pretest to posttest. As shown in Table 5, the mean pretest score was 2.75, while the mean posttest score rose to 4.35. The paired-samples t-test (Table 6) revealed that this difference was statistically significant: $t(19) = -6.532$, $p < 0.001$. This indicates that the use of ChatGPT feedback significantly enhanced students' ability to incorporate rhetorical moves in the introduction section of their research articles.

D. *Effect of Peer-Based Feedback on CaRS Scores*

Similarly, students in the control group (Class C), who received peer-based feedback, also demonstrated notable gains in performance. The mean score improved from 2.33 in the pretest to 4.19 in the posttest (Table 6). The paired-samples t-test in Table 7 reported a statistically significant improvement: $t(20) = -8.832$, $p < 0.001$. These results confirm the effectiveness of peer-based feedback in supporting students' mastery of the CaRS model.

Table 6. Paired samples statistics

Pairs	Tests	Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_C_CTRL	2.33	21	0.913	0.199
	Post_C_CTRL	4.19	21	1.250	0.273
Pair 2	Pre_B_EXP	2.75	20	0.786	0.176
	Post_B_EXP	4.35	20	0.813	0.182

Lastly, to synthesize the statistical findings and facilitate interpretation, Table 8 presents a concise summary of the key quantitative results. It compiles the mean differences, t-values, *p*-values, and interpretations from both within-group (pretest vs. posttest) and between-group (posttest) comparisons. This summary highlights the extent to which AI-based and peer-based feedback contributed to students' ability to apply the CaRS model, and whether one approach proved more effective than the other in supporting postgraduate academic writing performance.

Table 7. Paired samples test

Pairs	Tests	Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre_C_CTRL Post C_CTRL	−1.857	0.964	0.210	−2.296	−1.419	−8.832	20	0.000
Pair 2	Pre_B_EXP - Post_B_EXP	−1.600	1.095	0.245	−2.113	−1.087	−6.532	19	0.000

Table 8. Summary of quantitative findings

Comparison	Mean Difference	t-value	*p*-value	Interpretation
Pre vs Post (AI Group)	1.6	−6.532	0	Significant improvement
Pre vs Post (Peer Group)	1.86	−8.832	0	Significant improvement
Post-AI vs Post-Peer (Between)	−0.16	−0.482	0.633	No significant difference

E. *Student Perceptions of Feedback*

In addition to the quantitative results, the open-ended survey provided insights into how students experienced the feedback process. Thematic analysis of the responses revealed three recurring themes: clarity and usefulness of the feedback, challenges in applying the feedback, and its impact on understanding the CaRS model.

First, students from both groups highlighted the clarity and usefulness of the feedback they received. Several students in the AI group appreciated how ChatGPT explicitly pointed out missing rhetorical moves in their drafts. For example, one student noted: *"ChatGPT showed me that my introduction lacked a clear niche, which helped me revise more directly"*. (Student B7). Similarly, students in the peer group valued peer comments that made them reconsider their background sections: *"My classmate reminded me that my background was too general, so I had to make it more specific"*. (Student C12).

Second, students also mentioned challenges in revising their drafts after receiving feedback. AI group students explained that while the feedback was detailed, it was sometimes too general to apply without further guidance. One student admitted: *"The AI feedback was helpful, but I still needed the lecturer's explanation to understand how to improve my arguments"*. (Student B11). Meanwhile, peer group students reported variability in the quality of feedback: *"Some peers gave very short comments, so it was hard to know what exactly to fix"*. (Student C5).

Third, both groups agreed that the feedback process improved their awareness of the CaRS model. The AI group emphasized how the repeated checks made them more systematic in structuring their introductions. As one student stated: *"After using ChatGPT twice, I understood better how to organize my introduction into three moves"*. (Student B14). Likewise, peer group students reported that the discussions with classmates deepened their reflection on rhetorical structures: *"By reading my friend's draft, I realized what was missing in my own introduction"*. (Student C9). Table 9 presents a summary of the themes identified in the survey responses with selected representative quotes.

Table 9. Themes from student perceptions of feedback

Theme	AI Group (Class B) Example Quote	Peer Group (Class C) Example Quote
Clarity and usefulness	"ChatGPT showed me that my introduction lacked a clear niche." (B7)	"My classmate reminded me that my background was too general." (C12)
Challenges in revision	"The AI feedback was helpful, but I still needed more explanation." (B11)	"Some peers gave very short comments, so it was hard to know what to fix." (C5)
Awareness of CaRS model	"After using ChatGPT twice, I understood better how to organize moves." (B14)	"By reading my friend's draft, I realized what was missing." (C9)

After presenting representative excerpts, a group-wise frequency analysis was conducted to capture how common each theme was across the two groups. The results are summarized in Table 10.

Table 10. Frequency of themes in student perceptions by group

Theme	AI Feedback (Class B, $n = 20$)	Peer Feedback (Class C, $n = 21$)
Clarity and usefulness	15 (75%)	11 (52%)
Challenges in revision	8 (40%)	10 (48%)
Awareness of CaRS model	12 (60%)	10 (48%)

A group-wise analysis showed that students in both groups perceived the feedback as helpful, though with different emphases. In the AI group, three-quarters of students (75%) noted that ChatGPT provided clear direction on missing rhetorical moves, while just over half of the peer group (52%) highlighted the usefulness of classmates' comments. Challenges were also reported in both groups, with AI students describing the feedback as sometimes generic (40%), and peer students pointing to variability in comment depth (48%). Awareness of the CaRS model improved in both groups, with a slightly higher proportion in the AI group (60%) compared to the peer group (48%).

V. Discussion

The findings of this study reveal that both AI-generated and peer-based feedback significantly improved postgraduate students' ability to apply the CaRS model in writing research article introductions. As shown in Table 6, the AI group improved from a mean score of 2.75 to 4.35, while the peer group improved from 2.33 to 4.19. Although the peer group achieved slightly higher gains, the difference was not statistically significant, indicating that both feedback types are comparably effective in enhancing students' application of rhetorical moves.

This outcome reinforces the established notion in genre pedagogy that explicit instruction and focused feedback can improve students' rhetorical awareness and academic writing performance [6, 23]. The AI group's success supports recent studies showing that ChatGPT, when paired with well-designed prompts, provides timely and structured responses. Such feedback guides learners toward more cohesive and purpose-driven writing [13, 24, 25]. Students' survey responses echo this finding: as summarized in Table 8, 75% of the AI group reported that ChatGPT highlighted missing rhetorical moves with clarity, with one student stating, *"ChatGPT showed me that my introduction lacked a clear niche, which helped me revise more directly"* (Student B7). These results demonstrate that AI can function as a metacognitive support system for revision when integrated into genre-based instruction, not merely as a grammar checker. This aligns with Ozdere [26], who argued that the effectiveness of AI feedback depends on instructional scaffolding and learners' feedback literacy.

At the same time, the qualitative data shed light on the limitations of AI feedback. About 40% of the AI group noted that comments were sometimes too generic, requiring further clarification from the lecturer (Table 8). This critique echoes Barrot [16], who cautioned that ChatGPT often produces abstract suggestions unless guided by genre-sensitive prompts. However, the current study challenges this view by showing that targeted CaRS-based prompting can mitigate such limitations.

These findings align with Hyland [21], who emphasized that students value feedback not only for its informational content but also for its clarity and tone [21]. In this study, the AI group's appreciation of ChatGPT's clarity aligns with that observation, as students felt guided by explicit signals about missing rhetorical moves. At the same time, the peer group's recognition of contextual relevance echoes the point made by Little *et al.* and Wei and Liu [8, 27] that dialogic interaction fosters deeper reflection and ownership of revision. However, the concerns raised by both groups, generic comments from AI and variable quality from peers, mirror Almegren *et al.* [18] findings that students' uptake of feedback is mediated by their confidence in the source. Taken together, these parallels highlight that feedback effectiveness is shaped as much by learners' perceptions and engagement as by the inherent quality of the comments themselves.

Peer feedback was also shown to be effective, with students achieving substantial gains from pre- to post-test. As reflected in Table 8, 52% of the peer group valued the contextual relevance of classmates' feedback, even if the quality varied. One student observed, *"My classmate reminded me that my background was too general, so I had to make it more specific"* (Student C12). This finding is consistent with earlier studies showing that peer review fosters dialogic interaction and reflective learning, even in the absence of expert authority [8, 10, 18, 28]. Still, nearly half of the peer group (48%) pointed out variability in comment quality, as noted by one student: *"Some peers gave very short comments, so it was hard to know what exactly to fix"* (Student C5). This underscores a well-known limitation of peer review identified in Little *et al.* [27] and confirmed in subsequent studies.

Beyond confirming the effectiveness of AI and peer feedback, this study makes a unique contribution by directly comparing the two modes within a genre-based writing context, focusing specifically on the CaRS model. Most prior research on AI feedback has emphasized grammar or stylistic corrections [29, 30], often overlooking the structural and rhetorical dimensions of academic writing. By demonstrating that both AI and peer feedback can effectively support postgraduate students in mastering CaRS moves, establishing a territory, identifying a niche, and occupying the niche, this study responds to calls for more genre-sensitive evaluations of feedback tools in EFL and postgraduate contexts.

The pedagogical implications are substantial, particularly within the Indonesian Islamic university context. Postgraduate students are required to produce publishable research outputs, yet many lack sustained academic writing support. The integration of ChatGPT into instruction can democratize access to feedback in resource-limited institutions, while peer review provides opportunities for collaborative learning and mutual reflection. Rather than privileging one form over the other, the findings suggest that combining AI and peer feedback may offer the most effective approach. AI offers immediate, structured guidance on missing rhetorical elements, while peer feedback contextualizes revisions and fosters discussion. Together, these approaches reflect Tsai's *et al.* [31] argument that optimal feedback integrates multiple sources.

Finally, the study underscores that feedback effectiveness depends not only on its source, human or AI, but also on the clarity of evaluation criteria, the learners' ability to interpret comments, and the instructional conditions under which feedback is provided. Teachers thus have a critical role in cultivating students' feedback literacy, training them both to use AI tools effectively and to provide constructive peer responses. This dual approach may be especially valuable in postgraduate Islamic education programs, where students must engage with international academic discourse while navigating local resource constraints. Future research could extend this investigation by exploring affective and cognitive dimensions of student engagement with feedback and by applying the AI–peer comparison to other sections of research writing beyond introductions.

VI. Conclusion

This study set out to examine whether AI-generated feedback differs from peer-based feedback in helping postgraduate students apply the Create-a-Research-Space (CaRS) model when writing research article introductions. The findings demonstrate that both feedback modes significantly improved students' rhetorical performance, with no statistically significant difference between groups. This indicates that ChatGPT feedback, when scaffolded by structured prompts, can be as effective as peer review in supporting postgraduate academic writing. The findings show that both feedback types are pedagogically comparable and, when combined, can complement each other to strengthen students' genre competence.

Despite these contributions, the study has certain limitations. The sample size was small and limited to one institution, which constrains generalizability. The study focused only on introductions and did not examine affective or cognitive aspects of student engagement with feedback.

Future research could address these limitations by employing larger and more diverse samples across institutions, extending the analysis to other parts of research articles, and examining emotional as well as cognitive engagement with AI and peer feedback. Such directions would provide a more holistic understanding of how different feedback modes shape academic writing development.

The implications are both pedagogical and practical. In resource-constrained contexts, integrating AI tools like ChatGPT offers scalable, structured feedback that complements peer review and reduces reliance on limited instructor input. At the same time, developing students' feedback literacy remains essential to ensure that both AI-generated and peer-provided comments are interpreted critically and applied effectively. Together, these strategies can foster independent, reflective, and rhetorically competent postgraduate writers.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

The authors shared the responsibilities. Nurul Lailatul Khusniyah conducted the research; Lukman Hakim analyzed the data; Afif Ikhwanul Muslimin conducted the research as well as wrote the paper; all authors had approved the final version.

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