AI-DRIVEN FEEDBACK FOR VOCABULARY EVELOPMENT: A BEFORE-AFTER ANALYSIS IN INDONESIAN TERTIARY EFL WRITING

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ABSTRACT

This study aims to analyze the effectiveness of AI-driven feedback in enhancing vocabulary development among Indonesian tertiary EFL (English as a Foreign Language) students. Using a before-after research design, the study involved 60 undergraduate English majors from a public university in Indonesia. Participants were asked to write two academic essays—before and after receiving automated feedback from AI-based platforms such as Grammarly and ChatGPT. The analysis focused on improvements in lexical complexity, vocabulary range, and appropriate collocation use. Quantitative data were examined through paired-sample *t*-tests, supported by qualitative analysis of the most influential feedback types contributing to lexical improvement. The findings revealed a significant increase in students' vocabulary range and depth after the application of AI-driven feedback, with a significance level of $p < 0.05$. Moreover, students reported that AI feedback offered more personalized, immediate, and exploratory learning compared to manual correction from lecturers. However, the study also identified limitations related to students' overreliance on automated suggestions without deeper linguistic understanding. The results suggest that integrating AI-driven feedback into EFL academic writing can serve as an effective strategy to foster lexical competence, provided it is complemented by appropriate pedagogical guidance from instructors.

Keywords: Artificial Intelligence, Automated Feedback, Vocabulary Development, EFL Learning, Academic Writing

UMPAN BALIK BERBASIS AI UNTUK PENGEMBANGAN KOSAKATA: ANALISIS SEBELUM-SESUDAH PADA PENULISAN EFL MAHASISWA INDONESIA

ABSTRAK

Penelitian ini bertujuan untuk menganalisis efektivitas umpan balik berbasis kecerdasan buatan (AI-driven feedback) dalam meningkatkan penguasaan kosakata pada mahasiswa EFL (English as a Foreign Language) tingkat perguruan tinggi di Indonesia. Dengan menggunakan desain penelitian sebelum-sesudah, studi ini melibatkan 60 mahasiswa program sarjana jurusan Bahasa Inggris dari salah satu perguruan tinggi negeri di Indonesia. Para peserta diminta menulis dua esai akademik—sebelum dan sesudah menerima umpan balik otomatis dari platform berbasis AI seperti Grammarly *dan* ChatGPT*. Analisis difokuskan pada peningkatan kompleksitas leksikal, keluasan kosakata, dan penggunaan kolokasi yang tepat. Data kuantitatif dianalisis menggunakan* paired-sample t-test*, yang dilengkapi dengan analisis kualitatif terhadap jenis umpan balik yang paling berpengaruh terhadap peningkatan leksikal. Hasil penelitian menunjukkan adanya peningkatan yang signifikan dalam keluasan dan kedalaman kosakata mahasiswa setelah penerapan umpan balik berbasis AI, dengan tingkat signifikansi $p < 0,05$. Selain itu, mahasiswa melaporkan bahwa umpan balik dari AI memberikan pembelajaran yang lebih personal, cepat, dan eksploratif dibandingkan koreksi manual dari dosen. Namun, penelitian ini juga mengidentifikasi adanya keterbatasan berupa ketergantungan berlebihan mahasiswa terhadap saran otomatis tanpa pemahaman linguistik yang mendalam. Temuan ini mengindikasikan bahwa integrasi umpan balik berbasis AI dalam penulisan akademik EFL dapat menjadi strategi yang efektif*

untuk mengembangkan kompetensi leksikal, asalkan disertai dengan bimbingan pedagogis yang tepat dari pengajar.

Kata Kunci: *Kecerdasan Buatan, Umpan Balik Otomatis, Pengembangan Kosakata, Pembelajaran EFL, Penulisan Akademik*

INTRODUCTION

The integration of Artificial Intelligence (AI) in language education has gained increasing attention as an innovative approach to improving language learning outcomes. Advances in natural language processing and machine learning have enabled AI tools such as Grammarly and ChatGPT to provide automated, adaptive feedback that supports EFL learners' writing performance, particularly in vocabulary development—an essential component of academic writing proficiency Miranty (et al., 2023)

Vocabulary mastery plays a vital role in determining learners' communicative competence and lexical richness. However, many Indonesian EFL students still face challenges related to limited vocabulary range, inappropriate word use, and lexical repetition Dewi, (2023). Teacher feedback, while beneficial, often suffers from time constraints and inconsistency Lestari & Rokhayati (2025). Consequently, AI-driven feedback offers a promising alternative by providing instant, individualized, and consistent support.

Previous studies indicate that AI-driven feedback not only enhances learners' ability to self-correct but also fosters lexical awareness and motivation to revise through personalized, data-driven suggestions (Wei et al., 2023); Petchprasert (2021). Its adaptive nature promotes reflective and autonomous vocabulary learning, positioning AI as not only a correction tool but also a pedagogical partner in EFL writingPetchprasert (2021). Despite the increasing use of AI in writing instruction, empirical research in Indonesia regarding its impact on vocabulary development within academic writing contexts remains scarce Afifah & Dewi (2025).

The disparity between students' receptive and productive vocabulary knowledge underscores the need for data-driven feedback that promotes lexical diversity and contextual appropriateness in EFL writing Saudin et al. (2017). Integrating AI tools can also redefine teacher roles—from sole evaluators to facilitators who guide students in interpreting AI feedback Nguyen (2023). This approach aligns with blended learning and learner autonomy principles.

Using a before-after design, this study measures vocabulary improvement after exposure to AI feedback and explores students' perceptions of the process Astutik et al. (2024) Grounded in constructivist and sociocultural theories, AI functions as a digital scaffold that provides just-in-time assistance (Wei et al. (2023). Nevertheless, overreliance on AI and its limitations in understanding context (Baskara, 2023).

In Indonesia's higher education landscape, where digital literacy and *Merdeka Belajar Kampus Merdeka (MBKM)* initiatives are emphasized, AI feedback aligns with national goals to promote self-directed and lifelong learning Rahman & Rizqy (2024). Therefore, this study aims to examine the effectiveness of AI-driven feedback in enhancing vocabulary development among Indonesian tertiary EFL students through a before-after analytical approach. The findings are expected to offer insights into how AI can be pedagogically integrated to enhance lexical

competence while maintaining the essential human element in language education.

RESEARCH METHODS

This study used a quantitative before-after research design to examine the impact of AI-driven feedback on vocabulary development among Indonesian tertiary EFL students. The design allowed for direct comparison of students' writing before and after receiving automated feedback, supplemented by qualitative reflections to enrich interpretation (Lestari & Rokhayati, 2025).

The research was conducted in the English Education Department of a public university during the 2024–2025 academic year, involving 60 undergraduate students enrolled in an academic writing course. Participants were selected purposively based on comparable English proficiency (TOEFL-equivalent 450–500) and limited prior exposure to AI-based writing tools.

The instruments consisted of two writing tasks, an AI feedback intervention, and a vocabulary assessment rubric. Students first wrote a 300-word argumentative essay without digital assistance (pre-test). They then received lexical-focused feedback from Grammarly and ChatGPT, including suggestions on word choice, collocation, and variation. The AI feedback was left unedited to maintain authenticity Petchprasert (2021). After revising their essays, students submitted the post-test version for analysis.

Both pre- and post-test essays were analyzed using Laufer and Nation's Lexical Frequency Profile framework. Two independent raters assessed lexical diversity, sophistication, and accuracy with inter-rater reliability (Cohen's Kappa = 0.89) confirming consistency. Quantitative data were analyzed using paired-sample *t*-tests ($p < 0.05$), while qualitative data from reflective journals were thematically coded to capture perceptions and learning strategies Nguyen (2023).

The four-week intervention included orientation, pre-test writing, AI feedback reception, and essay revision followed by reflection. Ethical clearance was obtained, and participants provided informed consent. All data were anonymized and securely stored Tram et al. (2024). Grammarly and ChatGPT were chosen for their accessibility and complementary feedback mechanisms Grammarly offering surface corrections and ChatGPT providing contextual explanations. Feedback was classified into lexical substitution, expansion, and correction. Triangulation through test scores, AI logs, and reflective data enhanced validity Baskara (2023).

Although the absence of a control group limited generalizability, the design provided practical insights into how AI-driven feedback supports vocabulary growth, learner autonomy, and pedagogical innovation in EFL writing. Combining quantitative rigor and qualitative reflection, the study contributes empirical evidence on the pedagogical value of AI integration in Indonesian higher education Miranty et al., (2023).

RESULTS AND DISCUSSION

The study investigated the impact of AI-driven feedback on students' vocabulary development using a before–after design. Table 1 shows that all vocabulary indicators improved significantly after students received feedback from Grammarly and ChatGPT. Lexical complexity increased by 5.47%, vocabulary range (type-token ratio) by 0.07, and appropriate collocation use by 9.69%. Lexical sophistication also improved by 4.71%, while

the overall vocabulary proficiency score rose by 8.05 points. All improvements were statistically significant at $p < 0.05$, indicating measurable enhancement in students' lexical performance across all dimensions.

Table 1. Paired-Sample T-Test Results of Vocabulary Development Indicators

No	Vocabulary Indicator	Mean (Before)	Mean (After)	Mean Difference	t-value	Sig. (p)	Interpretation
1	Lexical Complexity (Lexical Density %)	41.28	46.75	+5.47	4.12	0.000	Significant improvement
2	Vocabulary Range (Type-Token Ratio)	0.54	0.61	+0.07	3.89	0.001	Significant improvement
3	Appropriate Collocation Use (%)	62.15	71.84	+9.69	4.36	0.000	Significant improvement
4	Lexical Sophistication (Advanced Word Use %)	18.22	22.93	+4.71	3.44	0.002	Significant improvement
5	Overall Vocabulary Proficiency Score	67.35	75.40	+8.05	4.58	0.000	Significant improvement

N = 60

Significance level: $p < 0.05$

The qualitative findings in Table 2 summarize the types of AI feedback and their effects on students' vocabulary development. Lexical suggestions improved accuracy and academic tone, collocation correction enhanced fluency and idiomatic use, synonym recommendations promoted lexical variety, contextual explanations deepened understanding of meaning, and real-time correction motivated active revision. Students generally perceived AI feedback as clear, fast, and helpful for improving vocabulary use in academic writing.

Table 2. Qualitative Summary of AI Feedback Impact

Type of AI Feedback	Description	Example of Improvement	Student Perception
Lexical suggestion	AI tools suggested more precise or academic word choices.	"Big impact" → "Significant impact"	Increased awareness of academic vocabulary.
Collocation correction	Correction of unnatural word combinations.	"Do a research" → "Conduct research"	Helped improve fluency and idiomatic usage.
Synonym recommendation	Provided varied word options to avoid repetition.	"Important" → "Crucial," "Essential"	Encouraged lexical variety.
Contextual explanation	AI explained why certain words were inappropriate in context.	Feedback on "make an improvement" → "improve"	Deepened understanding of usage.
Real-time correction	Immediate visual feedback during writing process.	Highlighted repetitive word use.	Motivated active revision.

The findings confirm that AI-driven feedback significantly improved students' lexical competence in EFL academic writing. The quantitative results indicate consistent enhancement across all vocabulary indicators, suggesting that AI feedback effectively supports vocabulary learning by offering instant, personalized, and context-based guidance. These outcomes align with previous studies Miranty et al. (2023) showing that digital feedback tools contribute to richer and more accurate lexical use in student writing.The increase in lexical complexity and type-token ratio demonstrates that AI platforms encourage learners to expand their lexical repertoire and reduce repetition. Similarly, improvements in collocation accuracy and lexical sophistication reveal that students internalized academic and discipline-specific expressions more effectively. This reflects the function of AI as a *digital scaffold* Wei et al. (2023). that fosters awareness and self-regulation in vocabulary use. Through immediate feedback, learners can reflect on their lexical choices

and apply corrections independently—an essential feature of autonomous learning.

From a pedagogical perspective, these findings suggest that integrating AI feedback can complement traditional teacher assessment by handling repetitive lexical issues, allowing instructors to focus on higher-order writing concerns. The results also underscore the importance of critical engagement: while AI improves lexical diversity, overreliance may lead to superficial sophistication without deeper comprehension Dewi (2023). Therefore, the most effective approach combines AI-driven assistance with teacher mediation to ensure that feedback supports meaningful and contextually accurate learning.

Qualitative insights reinforce this conclusion. Students valued AI feedback for its immediacy, objectivity, and clear explanations, which reduced anxiety and encouraged experimentation with vocabulary. However, some learners exhibited dependence on automated suggestions, indicating the need for pedagogical scaffolding. Integrating reflective discussion sessions and peer review alongside AI feedback can help students analyze lexical choices critically and internalize patterns for future writing.

In sum, the results demonstrate that AI-driven feedback substantially enhances lexical diversity, accuracy, and sophistication in EFL writing. The discussion highlights that these gains stem from AI's adaptive and interactive nature, which promotes continuous learning cycles. The pedagogical implication is clear: AI tools, when used judiciously and under instructor guidance, can transform vocabulary learning into a more autonomous, reflective, and contextually grounded process.

CONCLUSION

This study investigated the impact of AI-driven feedback on vocabulary development among Indonesian tertiary EFL learners, focusing on lexical diversity, sophistication, and accuracy in academic writing. The before-after analysis revealed that AI-based tools such as Grammarly and ChatGPT significantly contributed to students' lexical improvement by providing immediate, adaptive, and context-sensitive feedback. Quantitative findings demonstrated measurable gains in lexical richness and precision, while qualitative data showed that learners became more aware of word choice, collocation patterns, and register appropriateness after interacting with AI feedback. These results suggest that the integration of AI technology can effectively complement traditional pedagogical approaches in enhancing vocabulary competence.

However, the study also highlighted several challenges in implementing AI feedback in EFL instruction. Many students exhibited dependency on automated corrections, limiting their critical engagement with lexical learning processes. Additionally, infrastructural limitations, unequal access to technology, and insufficient teacher training remain obstacles to the sustainable adoption of AI tools in Indonesian universities. The findings underscore that human mediation is indispensable; teachers must guide learners to interpret AI feedback critically, ensuring that technology supports rather than substitutes the learning process. Pedagogical strategies integrating reflective activities, collaborative revisions, and discussions of AI-generated feedback can strengthen metalinguistic awareness and learner autonomy.

In summary, AI-driven feedback offers substantial promise for advancing vocabulary development in Indonesian tertiary EFL contexts, provided it is integrated thoughtfully within a human-centered and ethically guided instructional framework. Future studies should examine the longitudinal effects of AI use on lexical retention and explore hybrid

feedback models combining artificial intelligence with teacher expertise to maximize learning outcomes and foster sustainable linguistic growth in digital-era EFL education.

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