



Linking Academic Vocabulary Use to Writing Quality in EFL Academic Essays: A Mixed-Methods Study

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Abstract. Academic vocabulary is central to effective academic writing, yet many EFL university students struggle to deploy such vocabulary appropriately in extended, genre-based tasks. This study investigates how final-year Indonesian EFL students use academic vocabulary in problem-solving essays, a genre that has received limited empirical attention in EFL contexts. Twenty essays were analysed using AntWordProfiler, an analytic writing rubric, and Pearson correlation analysis to examine (1) the extent of academic vocabulary use, (2) its relationship with writing quality, and (3) patterns of vocabulary deployment across rhetorical moves. AWL coverage varied substantially (1.30%–19.92%), with most students demonstrating only moderate lexical sophistication. A moderate, significant correlation emerged between AWL frequency and writing scores ($r = .458$, $p = .042$), indicating that academic vocabulary contributes meaningfully to writing performance. Qualitative analysis revealed that higher-performing writers used academic vocabulary more strategically and consistently across problem-solution structures, whereas lower-performing students relied heavily on general-service vocabulary and displayed limited functional control of academic lexical items. These findings highlight the need for explicit academic vocabulary instruction, genre-based writing support, and corpus-informed pedagogical practices to strengthen students' academic literacy development in EFL higher education.

Keywords: Academic Vocabulary, Academic Word List, EFL Writing, Problem-Solving Essay, Vocabulary Profiling.

1 Introduction

Academic vocabulary stands at the core of effective academic literacy, functioning as a crucial linguistic resource that enables writers to construct arguments, articulate complex relationships, and engage with disciplinary knowledge [1], [2]. In higher education contexts, academic writing places substantial lexical demands on learners, requiring not merely the production of grammatically correct sentences but also the deployment of precise, abstract, and discipline-neutral vocabulary characteristic of academic discourse

[3]. For many English as a Foreign Language (EFL) learners, however, acquiring academic vocabulary poses persistent challenges because such vocabulary is infrequent in everyday language, semantically dense, and often context-dependent [4], [5]. As a result, academic vocabulary has consistently been identified as a key lexical barrier to producing coherent and sophisticated written texts in university settings [6], [7].

In recent years, the role of academic vocabulary in shaping academic writing outcomes has attracted renewed scholarly attention, particularly with the increased availability of corpus tools that allow researchers to examine lexical sophistication at scale [8], [9]. International studies have shown that academic vocabulary use correlates with writing proficiency, quality, and genre performance, although the strength and consistency of these relationships vary across proficiency levels and task types [10], [11], [12]. A growing body of research also suggests that lexical sophistication contributes not only to surface-level linguistic quality but also to deeper rhetorical effectiveness, such as argument development and stance-taking [13], [14].

Despite these developments, research in EFL contexts—including in Southeast Asia—has demonstrated that university learners often rely heavily on general-service vocabulary, with limited use of the Academic Word List (AWL) or discipline-general academic items [15], [16], [17], [18]. Several studies have attributed this tendency to limited exposure to academic discourse, insufficient explicit instruction, and the dominance of exam-oriented pedagogies that prioritize grammatical accuracy over lexical sophistication [19], [20]. As such, academic vocabulary remains an underdeveloped skill even among advanced EFL learners who are completing their undergraduate studies.

Genre plays a central role in how academic vocabulary is deployed, yet much of the existing literature has focused on argumentative or expository writing, e.g., Qiu & Lin [8]; Pan et al. [9]. Problem-solving essays, which require writers to identify problems, analyze causes, evaluate consequences, and propose solutions, place distinct lexical and rhetorical demands on students. Effective performance in this genre requires not only topic-specific vocabulary but also the ability to employ academic vocabulary to signal problem-solution relationships, justify claims, and articulate evaluative judgments [21], [22]. However, empirical work examining how EFL learners mobilize academic vocabulary in problem-solving writing is extremely limited, creating an important gap in genre-based vocabulary research.

Vocabulary profiling tools—such as AntWordProfiler, Lexical Frequency Profile, and newer NLP-based systems—have facilitated more nuanced analyses of learners' lexical choices [23], [24]. These tools allow researchers to quantify lexical sophistication, diversity, and coverage. Research has shown that vocabulary profiling provides meaningful indicators of writing proficiency and can reveal how learners' vocabulary develops over time [25], [26]. More recent studies (2021–2024) highlight the need for examining not only lexical frequency distributions but also patterns of lexical deployment across rhetorical moves, as such patterns can reveal learners' strategic use—or lack thereof—of academic vocabulary [5], [13].

The relationship between academic vocabulary and writing quality has been widely researched, with many studies reporting positive correlations between lexical sophistication and holistic writing scores [10], [12], [27]. However, these correlations are far

from uniform. Some researchers found that lexical sophistication contributed modestly to writing quality once organizational and content features were accounted for [7]. Others argue that academic vocabulary may function as a threshold skill—essential for moving beyond basic proficiency but insufficient for distinguishing higher proficiency levels without accompanying improvements in coherence and argument structure [9]. These inconsistencies indicate the need for more context-specific studies that consider genre, proficiency level, and assessment criteria. In Indonesia, despite a growing interest in academic writing pedagogy, empirical studies linking academic vocabulary use to writing quality are scarce, and none have examined this relationship in the problem-solving essay genre.

Although the literature on academic vocabulary is extensive, three notable gaps remain: (a) *Genre-specific gaps*: existing studies overwhelmingly focus on argumentative or expository essays. Little to no research has examined how Indonesian EFL students use academic vocabulary specifically in problem-solving essays—a genre that is structurally and lexically unique. (b) *Correlation gaps*: while international studies frequently examine the relationship between lexical sophistication and writing quality, such research is sparse in Indonesia. No known study has employed vocabulary profiling to correlate AWL use with rubric-based writing quality at the undergraduate level. And (c) *Pattern-level gaps*: most studies measure the *amount* of academic vocabulary used but not the *patterns of deployment* (e.g., accuracy, distribution across essay moves, functional appropriateness). Recent research emphasizes the importance of move-based lexical analysis [14], yet this remains largely unexplored locally.

To address these gaps, this study investigates academic vocabulary use in problem-solving essays written by final-year Indonesian EFL university students. Specifically, it aims to:

1. determine the extent to which students apply academic vocabulary in their essays;
2. examine whether academic vocabulary frequency is significantly correlated with writing quality; and
3. identify patterns in how academic vocabulary is distributed and functionally employed across student texts.

By combining vocabulary profiling, rubric-based assessment, and qualitative pattern analysis, this study provides a more comprehensive account of academic vocabulary use than frequency analyses alone. The findings contribute to ongoing discussions on lexical sophistication in L2 writing, genre-based academic literacy development, and curriculum design for university-level EFL programs in Indonesia and comparable contexts.

2 Research Method

2.1 Research Design

This study adopted a mixed-methods descriptive correlational design to investigate how final-year Indonesian EFL university students employ academic vocabulary in problem-solving essays and how such use relates to writing quality. The design integrates (a) quantitative lexical profiling, (b) correlational analysis, and (c) qualitative pattern analysis, aligning with contemporary approaches to lexical research in L2 writing, e.g., Kim & Crossley [7]; Pan et al. [9]. The quantitative component examined the extent and frequency of academic vocabulary use and its statistical association with writing scores. The qualitative component explored how academic vocabulary was distributed and functionally deployed across students' essays. This methodological triangulation enhances interpretive depth and supports replicability across comparable EFL contexts.

2.2 Participants and Data

Participants were 20 final-year English Literature students enrolled in a compulsory academic writing course at Universitas 17 Agustus 1945 Surabaya, Indonesia. All participants had completed multiple writing-intensive courses prior to the study and were at an estimated upper-intermediate proficiency level based on course placement criteria. Participation was voluntary, and informed consent was obtained.

Data comprised 20 problem-solving essays, each ranging between 200–300 words, produced during a 60-minute, in-class timed writing assessment. The task prompt required students to identify a problem related to the increasing use of artificial intelligence (AI) in higher education, a significant pedagogical concern both globally and in Indonesia, e.g., Pariyanto et al. [28], making it a relevant and authentic writing prompt. It also required the students to analyze its causes or implications, and propose feasible solutions. This prompt was selected because it mirrors authentic academic writing tasks that demand both critical thinking and academic lexical deployment [22]. Essays were handwritten, subsequently transcribed verbatim, and anonymized prior to analysis.

2.3 Instruments

Academic Vocabulary Profiling

The AntWordProfiler software [23] was used to generate lexical profiles for each essay. Specifically, the program calculated the percentage of tokens belonging to the Academic Word List (AWL) [2]. AWL token percentage served as the operational measure of academic vocabulary use, following established practice in lexical profiling studies [8], [20].

Writing Quality Assessment

Writing quality was assessed using a six-criterion analytic rubric adapted from university writing standards and L2 writing assessment literature. The rubric included: (1)

task fulfillment, (2) organization and coherence, (3) lexical range and appropriateness, (4) grammatical accuracy, (5) argumentation quality, and (6) mechanics. Each criterion was scored on a 0–15 scale, yielding a maximum total score of 100. Two trained raters, both experienced writing instructors, independently evaluated all essays. Inter-rater reliability was evaluated using intra-class correlation coefficients (ICC). The resulting ICC value ($\geq .80$) indicated robust reliability consistent with recommended thresholds for writing assessment in applied linguistics research [29].

Semi-Structured Interviews

To complement quantitative findings, semi-structured interviews were conducted with six volunteer participants representing high-, mid-, and low-performing essay writers. The interview protocol elicited learners' perceptions of academic vocabulary, strategies for selecting lexical items, and challenges they encountered when writing problem-solving essays. Interviews were audio-recorded, transcribed verbatim, and coded thematically.

2.4 Data Collection Procedures

Data collection occurred across three phases:

- **Writing Task Administration**
The problem-solving essay task was administered under controlled classroom conditions. Participants were not permitted to use dictionaries or electronic devices to ensure natural lexical production.
- **Text Preparation and Transcription**
Student essays were transcribed manually by the researchers following standardized transcription conventions. All identifying information was removed to protect confidentiality.
- **Lexical Profiling**
Transcribed essays were uploaded into AntWordProfiler. AWL token percentages were extracted for each text and exported into an Excel file for further statistical analysis.
- **Writing Quality Scoring**
Two trained raters scored all essays independently using the analytic rubric. Discrepancies exceeding five points on the total score were resolved through discussion. Final scores were used in the correlational analyses.
- **Interview Data Collection**
Semi-structured interviews were conducted one week after the writing task. Each session lasted approximately 20–30 minutes.

2.5 Data Analysis

Quantitative Analysis

Quantitative data analysis was conducted using JASP (Version 0.18). Descriptive statistics (mean, SD, range) were calculated for AWL token percentages and writing

scores. The association between academic vocabulary use and writing quality was examined using Pearson's r correlation coefficient, following assumptions of normality verified through Shapiro–Wilk tests.

Qualitative Analysis

To analyze vocabulary use patterns, all essays were subjected to qualitative coding focusing on: (1) distribution of academic vocabulary across rhetorical moves (problem identification, analysis, solution); (2) lexical functions, such as signaling relationships, expressing evaluation, or forming nominalizations; and (3) collocational appropriateness and accuracy.

These categories were derived deductively from prior research [13], [14] and inductively from the dataset. Coding was performed by two researchers, and disagreements were resolved through consensus. Themes were triangulated with interview findings to produce a holistic interpretation.

2.6 Ethical Considerations

Ethical approval for the study was granted by the Faculty of Cultural Sciences Ethics Committee. Participation was voluntary, informed consent was obtained, and data were anonymized. Students' performance on the writing task did not affect their course grades.

3 Results

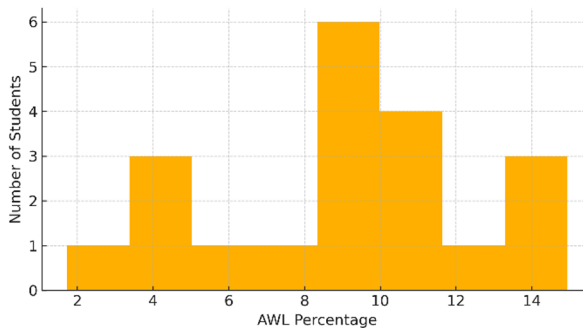


Fig. 1. Distribution of academic vocabulary use (AWL%)

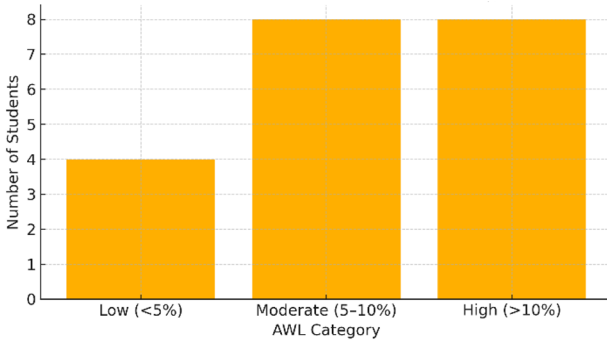


Fig. 2. Proportion of students by AWL category

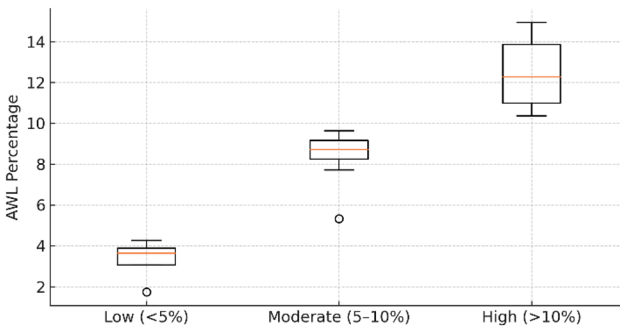


Fig. 3. AWL distribution across categories

3.1 Academic Vocabulary Use across Student Essays

As can be seen in Figure 1, Figure 2, and Figure 3, the lexical profiling analysis revealed substantial variation in students' academic vocabulary use. AWL token coverage ranged from 1.30% to 19.92%, with a mean of 8.47% (SD = 4.36). Only five students (25%) exceeded 10% AWL coverage, a benchmark often associated with higher lexical sophistication in undergraduate academic writing [20]. The majority (60%) fell within the 5–10% range, while four students (20%) produced essays with fewer than 5% AWL tokens.

A descriptive comparison suggested that higher-performing essays tended to distribute academic vocabulary more consistently across rhetorical sections (problem–cause–solution). In contrast, essays with lower AWL percentages frequently concentrated academic vocabulary in the introductory problem description, with limited use in the analytical and solution components.

These findings indicate variability in students' control over academic vocabulary and highlight inconsistencies in their ability to sustain academic lexical choices throughout a problem-solving text.

3.2 Correlation Between Academic Vocabulary Use and Writing Quality

Pearson's r correlation analysis revealed a moderate, statistically significant relationship between AWL token percentage and holistic writing scores, $r = .458$, $p = .042$. Essays with higher academic vocabulary frequency generally obtained higher rubric scores across lexical range, task fulfillment, argumentation quality, and coherence.

Table 1. Summary of the correlation result

Variable	Mean	SD	r	p
AWL %	8.47	4.36	.458	.042*
Writing Score	76.10	8.91	—	—

*Significant at $p < .05$

Although the correlation was moderate rather than strong, the result aligns with previous findings indicating that lexical sophistication contributes to L2 writing quality [7], [28]. However, several outliers were observed: two students produced relatively sophisticated essays with relatively low AWL percentages (<6%). Qualitative review indicated that these students demonstrated strong rhetorical control, suggesting that vocabulary sophistication alone does not fully account for writing quality.

3.3 Qualitative Patterns of Academic Vocabulary Deployment

Figure 4, Figure 5, and Figure 6 show the patterns of academic vocabulary deployment by students. The figures reveal clear contrasts in how high-, mid-, and low-performing writers distribute academic vocabulary, employ it for key rhetorical functions, and maintain collocational accuracy. These visualizations not only support the qualitative findings but also illustrate the multifaceted nature of academic vocabulary development in EFL problem-solving writing.

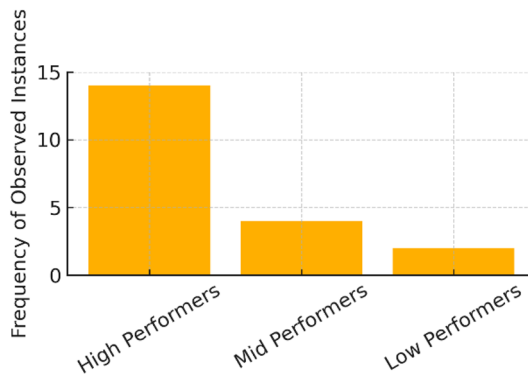


Fig. 4. Distribution across rhetorical moves

Higher-performing writers integrated academic vocabulary into all rhetorical moves—including justification of the problem, causal explanation, and the proposed solution. These essays frequently employed nominalizations (*regulation, evaluation, implementation*), analytical verbs (*indicate, require, examine*), and connective adverbials (*consequently, therefore, nevertheless*).

Lower-performing essays used academic vocabulary sparingly or repetitively and showed limited awareness of the rhetorical demands of each move. For example, solution sections often lacked the evaluative academic language needed to express feasibility or justification.

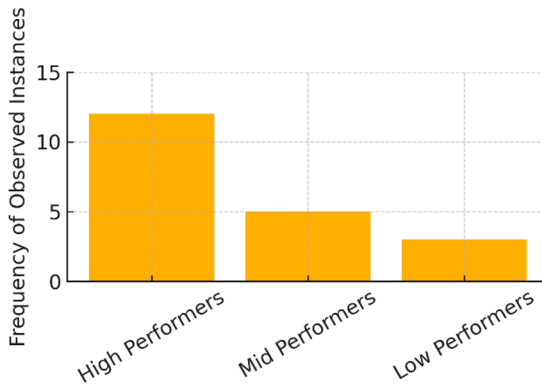


Fig. 5. Functional use of academic vocabulary

Academic vocabulary served three main functions: (1) Problem framing – terms such as *ethical concerns, misuse, dependency, and academic integrity violations*; (2) Argument building – terms such as *analysis, evaluation, justification*; (3) Proposing solutions – terms such as *regulation, monitoring, implementation*

High-performing writers used these items appropriately and with clear rhetorical intent, while low-performing writers misused verbs or overgeneralized adjectives (e.g., *AI is very bad*, rather than *AI raises significant pedagogical challenges*).



Fig. 6. Collocational accuracy

Collocational inaccuracy appeared frequently in mid- and low-performing essays (e.g., “take an evaluation,” “give a solution,” “increase plagiarism cases”). Such errors suggest that learners may possess receptive knowledge of academic vocabulary but lack productive collocational knowledge, a finding consistent with Jiang & Hyland [14].

4 Discussion

The results provide insights into how Indonesian EFL university students engage with academic vocabulary in a genre-specific writing task. First, the descriptive findings confirm prior claims that EFL learners often underuse academic vocabulary [16], [30]. Despite being final-year students with extensive writing experience, many participants used academic vocabulary inconsistently or minimally, indicating gaps in genre-specific lexical instruction.

Second, the moderate correlation between AWL coverage and writing quality supports the broader literature on lexical sophistication as a predictor of L2 writing success [10], [11]. Academic vocabulary appears to facilitate clearer reasoning, more precise stance-taking, and improved cohesion—key qualities of effective problem-solving writing. However, the presence of outliers suggests that writing quality is multidimensional; organization, reasoning, and rhetorical awareness can compensate for limited lexical sophistication.

Third, the qualitative analysis underscores the importance of not only vocabulary quantity but also vocabulary functionality. High-performing writers used academic vocabulary strategically to signal argumentative relationships, construct explanations, and justify solutions, reflecting genre awareness and discourse competence. This aligns with current perspectives in academic literacy research emphasizing the interaction between lexical resources and rhetorical moves [13], [22].

Finally, the frequent collocational inaccuracies suggest that learners may need more targeted instruction in phraseological competence. Academic vocabulary instruction in

Indonesian higher education has typically emphasized wordlists rather than corpus-based collocational practice [19]. The findings of this study reinforce the need for pedagogy that integrates vocabulary instruction with genre-based writing tasks.

It is important to note that the findings of this study must be interpreted within the broader sociolinguistic and educational context of Indonesian higher education, where English functions as a foreign language and exposure to academic English is largely mediated through classroom instruction. Unlike learners in ESL contexts, Indonesian university students have limited opportunities to encounter academic vocabulary in authentic settings, which may partly explain the generally low AWL coverage observed in the essays. This situational limitation aligns with Nation's [3] argument that meaningful lexical acquisition requires extensive input and opportunities for contextualized use—conditions that may not be routinely available in Indonesian university programs. Additionally, writing instruction in Indonesian tertiary institutions tends to be product-oriented and assessment-driven, emphasizing grammar and organization over lexical development [19]. Thus, the lexical constraints observed in the participants' writing are not solely individual deficits but may reflect systemic instructional priorities.

From a theoretical perspective, the results resonate with Laufer and Nation's Lexical Threshold Hypothesis [25], which posits that a certain level of lexical sophistication is necessary for producing effective academic writing. The significant correlation found between AWL coverage and writing quality suggests that learners who exceed this threshold are better equipped to articulate complex arguments and engage in academic reasoning—abilities that are crucial in problem-solving essays. Furthermore, the strategic deployment of academic vocabulary by higher-performing writers aligns with Hyland and Jiang's framing of academic vocabulary as a resource for constructing disciplinary identities and positioning oneself within academic discourse [14]. In this sense, lexical choices reveal more than linguistic ability; they reflect learners' epistemic engagement and rhetorical agency.

The results also echo findings from recent cross-national studies that highlight disparities in academic vocabulary mastery across proficiency levels. For instance, Kim and Crossley reported that advanced Korean EFL learners used significantly more academic vocabulary and exhibited more accurate collocations than intermediate peers [7]. Similarly, Pan et al. found that lexical sophistication was a stronger predictor of writing quality in academic genres than in narrative or personal writing [9]. The present study extends these findings to the Indonesian context, confirming that academic vocabulary—when used strategically and accurately—contributes positively to writing performance in cognitively demanding genres such as problem-solving essays.

However, unlike studies conducted in ESL contexts where academic vocabulary is regularly reinforced through disciplinary courses, e.g., Qiu & Lin [8], this study found notable inconsistencies in lexical deployment, even among higher-proficiency learners. Many participants displayed partial or receptive knowledge of academic vocabulary but struggled to produce accurate collocations or apply words functionally in analytical and evaluative contexts. This pattern is consistent with Jiang and Hyland's observation that learners often acquire academic vocabulary at the single-word level but lack the phraseological competence needed for effective academic communication [14]. The current

study's qualitative analysis underscores this gap, revealing that learners often used academic vocabulary incorrectly or repetitively and sometimes avoided discipline-neutral academic items altogether.

Another important discussion point concerns the nature of the writing task. Problem-solving writing, unlike argumentative writing, demands a particular sequence of cognitive operations—problem identification, causal explanation, solution proposal—and each stage demands specific lexical and rhetorical structures [21], [22]. The uneven distribution of academic vocabulary across these moves suggests that many students are unfamiliar with the lexical expectations of the genre. For example, while problem sections often included academic terms (e.g., *ethical issues*, *overreliance*, *plagiarism risks*), solution sections frequently lacked the formal lexical resources needed to express feasibility or justification. This finding aligns with Ding and Wen's observation that lexical proficiency interacts with genre knowledge, and both must be developed for learners to produce coherent, academically credible texts [13].

Overall, the findings highlight the multifaceted nature of academic vocabulary development. While quantitative measures such as AWL coverage capture important aspects of lexical sophistication, they do not fully reflect learners' ability to use vocabulary in contextually appropriate and rhetorically meaningful ways. The present study demonstrates that vocabulary quality—accuracy, collocational appropriateness, and functional deployment—plays a central role in differentiating higher- and lower-performing writers. This supports the growing consensus in L2 writing research that academic vocabulary instruction must move beyond frequency lists to incorporate corpus-based collocational analysis, genre awareness, and phraseological competence [5], [20].

5 Conclusion

This study shows that final-year Indonesian EFL students vary considerably in their use of academic vocabulary in problem-solving essays. While some demonstrate the ability to deploy academic lexical items strategically across rhetorical moves, many rely predominantly on general-service vocabulary and show limited phraseological control. The moderate positive correlation between AWL coverage and writing quality suggests that academic vocabulary contributes meaningfully to writing performance, though it operates alongside other factors such as organization and argumentation.

The qualitative findings further highlight that effective use of academic vocabulary depends not only on frequency but also on functional deployment within genre-specific demands. These insights underscore the value of integrating explicit academic vocabulary instruction, corpus-informed activities, and genre-based writing support into university writing curricula.

Although the study involved a small sample and a single writing task, it provides initial evidence on how academic vocabulary shapes EFL students' performance in problem-solving writing. Future research should expand the range of genres, lexical measures, and instructional interventions to better understand how academic vocabulary develops and supports academic literacy in EFL contexts.

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