Writing Difficulties for Research Scholars Pursuing PhDs in Engineering: A Case Study

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Abstract
This study explored engineering graduates' academic writing challenges while pursuing their doctoral degrees in information technology, electronics and communication engineering, mechanical engineering, and textile engineering. The focus was on grammar, vocabulary, syntax, coherence and cohesion difficulties. Data were collected by a survey to gain first-hand information from 88 PhD researchers in these colleges of engineering. Results revealed that these graduates needed help in syntax, general vocabulary and discourse functions in writing. Punctuation was one of the least problematic of all areas under examination. In light of these findings, some remedial measures are suggested to develop a better sense of cohesion and coherence in scientific-technical discourse. Understanding and applying organizational strategies in writing facilitated through peer reviews and tutor reviews would be a source of support. Paraphrasing strategies is another area in which scholars need plenty of practice. They need to be taught to apply all these strategies without abandoning source material for want of paraphrasing skills.

Keywords: Academic Writing, Coimbatore, Engineering Scholars, Grammar, Graduates, Vocabulary

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Introduction

For more than a decade, there has been a steady mounting pressure on research scholars and academicians to increase the number and quality of publications for tenure extensions, career advancements and other promotion-related reasons. With most institutions and ranking systems fixing quality research publications as one of the chief ranking parameters, publishing requirements are now compelling scholars to consider generating quality publications (Du, 2020; Dubicki, 2015; Gupta et al., 2022; Kotamjani et al., 2018; Lin & Morrison, 2021; Zahra & Haniyeh, 2020). With most national-level ranking systems holding publications as a significant parameter for ranking and assigning a chunk of its scores to publications, most administrators have been whipping up the quality and quantity of scholarly publications.

As a ripple effect, academicians have also been facing the heat for both academic and psychological reasons - with increasing peer pressure and the refrain of “publish” echoing in all aspiring academic institutions. Many EAL doctoral students face numerous scholarly writing challenges (Pidgeon & Andres, 2005). The complexities related to scholarly writing are further compounded at the doctoral level due to the expectation of systematic understanding and comprehensive knowledge of the field of study, mastery of research methods associated with that field, and ability to communicate complex ideas with peers, the larger scholarly community and society in general. This pressure is also partly psychological— a conscientious/reputation-conscious academician cannot generally afford to be complacent with a poor publication profile. Outsiders and administrators generally perceive this as a lack of academic interest or slackness, which is not a welcome sight.

As part of their research work, scholars, now more than ever, face pressure to convert their experiments and findings into quality research publications. This has also made institutions reconsider supporting scholar’s efforts through quality training programs.

Writing Difficulties

The ability to write clearly and fluently is undoubtedly one of the more critical skills (Abdulkhalek & Al-Khulaidi, 2022; Torrance et al.,1994), and this ability is a prerequisite to writing dissertations which demand cogent writing. Several studies have been conducted to understand scholars’ and supervisors’ perceptions (Linda & Morrison, 2021; Kalpana & Lavanya, 2021; Xiao & Chen, 2015). Most of the existing literature on this topic touched on academic writing difficulties. For instance, Kotamjani et al. (2018) investigated international postgraduate students’ perceptions of difficulty with academic writing in Malaysian public universities. Findings revealed more difficulties in language than academic writing skills. Regarding language-related skills, the participants ranked writing coherent paragraphs, summarizing and paraphrasing, applying appropriate lexical phrases, and utilizing proper academic language and vocabulary as the most challenging areas in writing. However, they thought that the most difficulties in academic skills consist of reviewing and criticizing the literature, writing the introductions, and researching the gap. The findings implied that international postgraduate students who graduated from non-English medium instruction universities should be supported in terms of English for Academic Purposes (EAP), critical thinking skills and language-related skills to become self-directed in learning to write.

Likewise, Zahra and Haniyeh (2020) discussed the difficulties that postgraduate students face when writing the literature review section of their thesis. The study used a mixed-method design to evaluate 40 completed master theses. The results indicated that most students, even proficient ones, needed help synthesizing, critiquing, or explaining the literature in their writing. They mainly focused on summarizing other researchers’ findings and interpretations. Other problems dealt with a lack of sufficient knowledge.
and time to complete their literature review and the deliberate dereliction of some supervisors and professors who did not fulfil their obligations to provide the students with sufficient information about writing it. Solving these problems can not only change students’ negative feelings and experiences in writing their literature review section but also enhance their motivation to write any writing pieces effectively.

Similarly, Lin and Morrison (2021) investigated academic writing challenges that postgraduate engineering students encountered and the strategies they developed to address these issues. Findings revealed similarities and differences related to topics previously identified in the literature. The primary concern of most of the participants related to challenges at the sentence level (i.e. local language features), whereas that of most faculty was challenges at the discourse level (i.e. global language features). The study also revealed that some student strategies for managing academic writing challenges (e.g. employing Google Translate) do not fully meet faculty expectations. These findings have significant pedagogical implications, for example, the need to provide appropriate writing models and writing interventions for L2 graduate students in engineering.

In the same body of research, Gupta et al. (2022) explored the academic writing challenges of international doctoral students and their supervisors at a research-intensive post-secondary university in Canada. The study recommended that academic writing should be integrated into the formal training of doctoral graduate students from the beginning of the program. Both students and faculty members shared that discipline-specific training was required to ensure success in academic writing, which could be provided in the form of a formal course specifically designed for doctoral students wherein discipline-specific support is provided by faculty supervisors and editing support is provided by English language experts.

One more research on difficulties is that of Du (2020), who described and discussed Chinese engineers’ writing difficulties. The study found that Chinese engineers’ writing difficulties varied from vocabulary and syntax to textual organization and, most of all, their need for a greater understanding of workplace writing and its purpose and process. The study also explained how the Chinese engineers’ understanding of good writing formed in China affected their writing practices in the workplace. It concluded that providing appropriate writing models and writing interventions for graduate students in engineering is necessary to ensure success in academic writing.

In another similar context, Dubicki (2015) discussed students’ conceptualization of the research process, describing the strategies they used and the successes and challenges they encountered. The study analyzes 76 undergraduate and graduate students’ essays. Many participants needed help writing a rigorous research paper, even though they had previously completed research assignments for other classes. There was a clear indication that instruction and support from librarians continue to be valuable, even for experienced students. The students’ reflections provided a better perspective on how students conduct their research for upper-level research papers and new insights on optimal timing for support services. The findings shared with faculty and librarians could improve students’ research papers.

Research problem

The existence of writing difficulties is evident in various contexts across disciplines (Abdulkhalek & Al-Khulaidi, 2022; Dubicki, 2015; Gupta et al., 2022; Liudmila et al., 2020; Xiao et al., 2015). Along with the difficulties, researchers have studied the reasons behind academic writing problems. Hinkel (2004) argued that inadequate knowledge of second language grammar and vocabulary and the complexity of writing the dissertation are major reasons for the lower quality of theses written by non-native speakers compared to native speakers in general. Other researchers attribute this to a lack of balanced syllabus and teaching technologies (Liudmila et al., 2020). As an
extension of the existing research and as a step towards gaining further insights, this paper intends to identify specific language difficulties that scholars face while writing research papers in these sub-branches of engineering: information technology, electronics and communication engineering, mechanical engineering, and textile engineering. To draw a roadmap for the investigation, the researchers drew on prior research that has undertaken academic writing challenges in some other context (Abdulkhalek & Al-Khulaidi, 2022; Al-Kadi, 2019; Xiao et al., 2015). Besides, the authors, who are language teachers, have put their experiences into the investigation regarding familiarity with engineering students’ academic difficulties in writing.

Research questions
1. What are the specific linguistic difficulties aspiring PhD research scholars in Engineering encounter while writing research reports?
2. How do these research scholars generally perceive the very process of research writing?

Method
The study used a quantitative research design to examine the challenges engineering graduates face while pursuing a PhD in information technology, electronics and communication engineering, mechanical engineering, and textile engineering in Coimbatore, India. A qualitative design was chosen because the purpose was to count and report the number of times the difficulties were mentioned in the dataset, providing an indicator of the frequency of occurrence. According to Creswell (2014), “counting conveys a quantitative orientation of magnitude and frequency contrary to qualitative research” (p. 185).

Participants
A random convenience sampling of 88 research scholars pursuing their PhDs in various engineering fields suited the study’s purpose. Regarding gender, 41 were males and 47 were females, with an age average of 29. The questionnaire was routed through these participants, a few of whom were known through the researchers’ contacts. The entire sample belongs to first-generation learners of English and others from varying levels of language proficiency. They were 23-36 and belonged to seven engineering colleges in Tamil Nadu: information technology, electronics and communication engineering, mechanical engineering, and textile engineering.

Instrument
A questionnaire was used to capture writing difficulties through a well-defined set of questions. The questions were prepared in light of difficulties reported in previous studies that touched on difficulties related to grammar, vocabulary, syntax, coherence and cohesion, discourse functions in writing, punctuation and paraphrasing. In its first draft, the questionnaire was validated, and its reliability was measured. Upon feedback from this psychometric analysis, some questions were modified or deleted altogether. To fine-tune and capture more specific, narrowed-down responses, a pilot survey was conducted for interaction with those research scholars enrolled in the PSG College of Technology. Since some respondents came up with vague responses to a few questions and asked for clarification, the ambiguous questions were re-worded, and examples were given for participants to understand the questions better.

Data Analysis
The data collected through the questionnaire yielded data for analysis. All the responses were analyzed quantitatively by converting them into numerical values subject to statistical analysis. A percentage analysis of responses was
obtained and arranged as figures according to the questions in the questionnaire under shared themes.

**Results and Discussion**

The results are arranged graphically and described accordingly. Figure 1 displays that the major writing difficulties of writing a research paper for a PhD in engineering are related to vocabulary. The percentage of difficulty was 79% for general vs technical vocabulary. The figure summarizes vocabulary that seems problematic. To distinguish between the two, we had already included examples of what we meant by general words. The difficulty with general words could be because most engineering scholars need to spend more time reading different types of reading materials to understand precise vocabulary. Figure 2 shows that 62% of respondents need help with vocabulary, 21% have expressed problems with grammar, 4% stated that grammar is more complex, and 3% stated that they experience more vocabulary difficulties.

In a follow-up question, participants clarified that they found the plagiarism tools flagging their research reports. Also, another participant mentioned using standard language as the problem.

![Figure 1. Areas of Difficulty](image1.png)

![Figure 2. General Vs Technical Vocabulary](image2.png)

To detect the specific areas of vocabulary in which the respondents face problems, they were asked a question that covers aspects of vocabulary scholars find problematic because vocabulary is a generic term that covers synonyms, semantic fields, collocations, colligation, etc. Figure 3 illustrates the nature of the difficulties of using vocabulary. A limited repertoire of words is a problem with 57% of respondents, while 33% needed help locating appropriate synonyms. Another 10% of scholars expressed that they determine the word’s meaning even though they know it.

As for Grammar, Figure 4 displays the area of grammar that is the most challenging. To elicit a good sample of grammatical categories that scholars needed help with, we included some of the most basic types of grammar required to construct sentences and phrases. 43% of respondents have expressed problems with tense forms. In comparison, 29% of respondents had difficulties with prepositions. 9% of scholars responded that using articles is a problem, and 19% of respondents had difficulties with subject-verb concord.

![Figure 3. Nature of Difficulty with Vocabulary](image3.png)

![Figure 4. Areas of Challenges in Grammar](image4.png)
The analysis also covers active and passive voices. Most scientific and technical research articles still adhere to the conventional notion of using passive voice to avoid subjectivity. In Figure 5, 38% of respondents were unaware of the distinction between active and passive voice, and 21% expressed that they were aware of it. 24% responded that they know the distinction ‘sometimes’, and 38% have given tentative answers. A follow-up question for the answer “no” elicited answers on how these scholars decided to use active/passive voice forms. The open-ended question added for this purpose had the following responses: (a) I decided based on the sections, (b) I do it randomly, (c) I make on-the-spot decisions, and (d) To make it easy, I maintain a percentage—these many sentences in active voice and some in passive voice.

These responses indicate the need for understanding the governing principles behind the use of active and passive and the arbitrary way of introducing them in sentences. As in Figure 6, there are difficulties related to constructing long sentences. 36% of respondents had difficulty drafting long sentences, and 23% admitted facing challenges ‘sometimes’. 41% of respondents mentioned they are OK with this writing area. The findings of this question were crosschecked with the findings of the next question. These findings were found to be contradictory to the responses in Question 5.

In terms of coherence and cohesion, Figure 7 shows these two interrelated concepts that are part of any cogent writing and involve cohesive devices and other aspects of cohesion and coherence. The question related to coherence and cohesion was drafted to find the exact problems that scholars face while joining sentences. 33% of respondents mentioned having a limited repository of cohesive devices, while another 33% expressed needing help finding the correct connectives. Interestingly, 24% of respondents have stated that they need clarification on which part of the sentence should follow which part, indicating problems with coherence and syntax. 10% of respondents have mentioned they find combining sentences using connective devices problematic. The scholars who expressed that they did not have difficulty constructing long sentences in Question 5 referred to the difficulty in using connectors in Question 6.

Figure 8 shows problems while writing sentences in paragraphs. 83% of the respondents mentioned that writing long sentences requires help with which part of the sentence should come first and which part should come next. This could be due to a
need for more understanding of the principles of subordination and coordination. Conceptually, engineering reports analyze cause-effect relationships, and hence, associating results with causes and presenting the same in successive sentences involves subordination and coordination and placing words in the correct order. 17% of the respondents need help with syntax and employing subordination-coordination. They might be able to identify the cause and the result but must articulate that in sentences due to inadequate grammatical repertoire. This could be because of fundamental problems in coherence or in finding appropriate connectors.

The participants were asked if they were proficient in paraphrasing skills. This is a much-required skill, considering that most scholars report previous findings from source texts while drafting the review of literature, which is an integral part of any research paper. One of the most-opted methods to circumvent plagiarism is paraphrasing. In Figure 9, 45% of the respondents paraphrased ‘sometimes’ and 9% ‘rarely’. This could be because they deleted the parts highlighted by the plagiarism tools or restricted reporting of those studies they reviewed to avoid being flagged. As for paraphrasing words while writing your research reports, Figure 9 shows that 8% of the respondents hardly use paraphrasing. In comparison, 38% mentioned that they paraphrased ‘always.’

Figure 9. Paraphrasing in Writing Reports

A writer’s familiarity with writing mechanics is one of the least-researched areas, which involves punctuation marks, abbreviations, etc. Considering the study’s limited scope, the focus was on one of the most important aspects of mechanics, i.e., the use of punctuation marks. As in Figure 10, most respondents (close to 66%) responded that they have problems deciding on the correct punctuation marks, 17% of respondents expressed confidence in using punctuation marks, and 17% mentioned that they do not pay more attention to it. The latter category has yet to consider the importance of using them.

Figure 10. Difficulties with Punctuations

Figure 11. Areas of Paraphrasing
In response to a question about paraphrasing, most of the respondents mentioned they resorted to paraphrasing in the introduction and literature review sections. As outlined in Figure 11, a few respondents have also mentioned that they attempt paraphrasing in other sections, such as discussion and results, which usually do not demand paraphrasing skills because they involve analyzing data and interpreting results.

In response to the open-ended, difficulties in areas not covered by earlier questions were captured. The following responses reveal that most issues were related to vocabulary, cohesion, grammar and mechanics. Some of the responses are presented verbatim below:
- I have problems structuring my review of the literature
- Semicolons and colons are an issue
- I feel I lack paraphrasing skills
- When to use “sufficient”, “adequate”, & "enough", I am confused
- When to use “so”, “hence,” and “therefore” is one problem. Same with “if” and “whether”
- Using abbreviations like, i.e., viz, i.e., is always a problem

Although the difficulties reported in this study are not unique to the cohort of research scholars, they can be considered significant challenges to the authors of engineering research papers. Previous studies (Kotamjani et al., 2018; Zahra & Haniyeh, 2020; Lin & Morrison, 2021; Gupta et al., 2022) reported writing mechanism and coherence difficulties, but this study highlighted technical vocabulary and length of sentences being the most reported challenges by the case in focus. Perhaps engineering disciplines affect how engineers think and put ideas on paper, unlike authors in the humanities and social sciences (Abdulkhalek & Al-Khulaidi, 2022). In a relevant study, Demir and Al-Kadi (2023) contend that hard science writers, in some ways, think differently from writers of soft sciences such as literature, linguistics, and social studies, which is, according to the authors, because in humanities, authors take part in knowledge construction and thus integrate their voices into other authors’ ideas, unlike science writers who take a robust stance on their empirical results and deal with numbers more than words.

Limitations

With these findings, the study should admit some limitations. Any piece of writing is assessed for its coherence, cohesion, use of lexis and grammar. The present investigation did not focus on the research quality of papers because the authors (three of them being language teachers by profession) are neither competent to assess the same, nor does it fall under the scope of the study. The study focused solely on aspects of writing. The research quality of the paper should have been checked because the authors (being language teachers by professors) are neither competent to assess the same, nor does it fall under the scope of the study. This is one of the limitations of this study, the other being the limited sample size. Further, the proficiency levels of the scholars were not examined, which impacted their grasp of the fundamentals of language and, consequently, their responses.

Conclusion

This study presented difficulties in research writing, such as vocabulary, grammar, syntax, and mechanics. Some of the specific areas of difficulty captured through questions include finding suitable connectors employing coordination principles and subordination depending on discourse functions. Areas of mechanics also pose a considerable level of difficulty, as evident from the responses. Examining various aspects of writing carried out through this small-scale study has specific pedagogical implications. Generic academic writing programs or a technical English course do not
automatically equip scholars to write confidently for scholarly publications. Though essential grammatical items such as tense forms and other language items have been introduced to them even at the school level, scholars need help with these grammar items. As a remedial measure, even before scholars start with their experimentation process, as part of their course work, it would be beneficial if scholars were made to undergo a mandatory course on research writing. Such a course should ideally cover all aspects of writing – both at the holistic and analytical levels. We presume that training scholars on problematic areas of grammar (as identified by them) in specific contexts might also help them be confident with other areas of language. To help them understand more profound aspects of cohesion and coherence, these scholars need to be exposed to the discourse structures of various scientific and technical texts. Understanding and applying organizational strategies in writing facilitated through peer reviews and tutor reviews would be a massive source of support. Paraphrasing strategies is another area in which scholars need plenty of practice. They need to be taught to apply all these strategies without abandoning source material for want of paraphrasing skills.

**Disclosure Statement:**

We (the authors of this paper) hereby declare that research ethics and citing principles have been considered in all the stages of this paper. We take full responsibility for the paper’s content in case of a dispute. We confirm that the manuscript has been created by the author[s] and not an AI tool/Large Language Model (LLM).

**Conflict of interest:**

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**References**


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