

# Research Writing Skills of Ph.D. Scholars Across Engineering Disciplines: Supervisors' Perceptions of Writing Difficulties

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**Key Words:** Writing skills, Writing difficulties, Engineering research reports, Ph.D. theses, Supervisors' perceptions

## Abstract

Drafting research reports for a Ph.D. thesis or a publication pose challenges to many researchers. This study assesses the writing skills of 56 Ph.D. research scholars from three leading engineering colleges in Tamil Nadu, India, using a standardised test scale (CEFR). It also presents the perceptions of 48 supervisors on the writing skills of the research scholars and the difficulties faced by them. The data has been analysed quantitatively. Finally, the study proposes recommendations for improving the writing skills of Ph.D. scholars.

## Introduction

One of the crucial aspects of conducting and publishing research is adhering to conventions of research writing. This type of writing entails drafting technical documents; synthesizing earlier research; presenting the data analysed and the results inferred; drawing conclusions; making recommendations; composing research reports with clarity and finesse; and adhering to conventions of grammar, style and other aspects of academic writing. Generally, scholars in the sciences and engineering tend to receive less practice in academic writing as compared to those in humanities and social sciences (Kayfetz & Almeroth, 2008).

Various studies have examined the writing difficulties faced by engineering students (Evangeline & Ganesh 2016; Gengsheng & Xin, 2015). These studies report that engineering students make grammatical errors and lack the vocabulary required to present their ideas. For instance, according to Evangeline and Ganesh (2016), many students do not understand the difference between 'remember' and 'remind'. The motivation for this research stems from such findings on writing difficulties. We presume that an examination of the writing skills of scholars and the perceptions of their supervisors will offer some insights into the writing difficulties faced by them.

## Literature Survey

Aliotta (2018) lists some of the typical conventions of academic writing: a well-defined, recognizable structure, a formal tone free from colloquialisms, writing centred on objectives and experimental evidence, an accurate choice of words that avoid ambiguity, an analytical approach that presents a logical and a

sequential flow of argument. Hyland (2002) highlights the variations in academic writing based on genre as well as on disciplines.

Acknowledging the importance of writing in English across different disciplines, scholars in India talk of the need to revamp the English curriculum (Evangeline & Ganesh, 2014) to focus more on building technical writing skills rather than on the literature. Although we had some knowledge of the writing difficulties faced by students, nevertheless, we wanted to assess writing skills in the context of Tamil Nadu, expecting that the findings would throw some light on the competencies as well as the problems that are barriers to effective research-writing, and provide directions for improvement. While most of the studies are from the researchers' viewpoint, this study considers the supervisors' perception of the difficulties as well.

To assess the written competencies of students, this study uses the international benchmark standards of the Common European Framework of Reference (CEFR). This scale classifies language proficiency into six levels which are regrouped into three broad levels, namely, Basic (A1, A2); Independent (B1, B2); and Proficient (C1, C2) levels. Each level is accompanied by descriptive statements of abilities that the test-takers at a certain level display.

## Research Questions

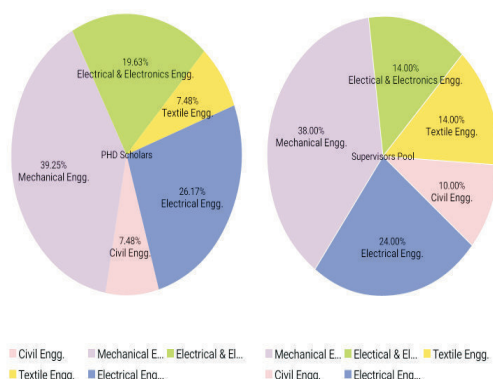
The study addressed the following research questions:

- a) What are the writing competencies of Ph.D. scholars according to the CEFR levels?
- b) What are the supervisors' perceptions of the writing problems that the scholars face?

## Research Design

The participants consisted of 56 research scholars and 48 Ph.D. supervisors from three engineering colleges, namely, PSG College of Technology and Coimbatore Institute of Technology (CIT), both located in Coimbatore, and Bannari Amman Institute of Technology, Sathyamangalam, Tamil Nadu. The distribution of the sample is given in Pie Chart 1. The participants enrolled voluntarily following due ethical processes.

Pie Chart 1  
*Distribution of the Participants*



IELTS Tasks 1 and 2 were chosen because science or engineering reports require scholars to interpret graphs or describe their findings and argue for their point of view in the discussion section of their thesis or a research paper. The third was a summarizing task from PTE and was chosen because scholars are required to read written research and summarize the findings. The fourth task, an IELTS Task 2 on a general topic was given to assess knowledge of generic conventions of writing and the ability to build a cogent argument. We presumed that the responses of the candidates to these tasks would give a fair sample of the writing abilities of the scholars.

## Assessing Supervisors' Perception of the Writing Difficulties Faced by Students

Research supervisors are primarily responsible for correcting the papers of the research scholars. In this study, the supervisors were asked to rate the frequency with which they come across problematic areas in their students' writing on a ten-point scale for the seven criteria, namely, (i) Vocabulary (Technical and General), (ii) Flow Cohesion and Clarity, (iii) Grammar, (iv) Meta-discoursal aspects (summing up, raising reader expectation on what will come), (v) Formal academic style, (vi) Sentence structure and word order, (vii) Mechanics of writing (Punctuation, numbering and the use of abbreviations). A rating of 1 was given to the most frequently encountered difficulty and a rating of 10 was for the least frequently encountered difficulty

## Test Items

The following tasks from the official print and online sources of two widely accepted standardized tests, the International English Language Testing System (IELTS) and Pearson Test of English (PTE) was administered to assess and determine the writing levels of Ph.D. scholars.

- Interpretation of a graph (IELTS Academic Task 1)
- Interpretation of a process diagram (IELTS Academic Task 1)
- Summarizing Task (PTE Academic)
- Essay talking about the advantages and disadvantages (IELTS Academic Task 2)

## Findings: Assessment Using the CEFR Framework

The written responses of the scholars were assessed by three experienced language professionals, who had a good understanding of CEFR scales. The results of the assessment have been presented in Table 1, as follows:

Table 1  
*Results of CEFR Levels of Writing Skills of the Research Scholars*

CEFR levels: A brief description	CEFR levels of research scholars	Percentage of research scholars
A1: Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type.	A1	0%
A2: Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.	A2	2%
	Between A1 and A2	3%
B1: Can produce simple connected text on topics which are familiar, or of personal interest. Can describe experiences and events, dreams, hopes and ambitions, and briefly give reasons and explanations for opinions and plans.	B1	86%
B2: Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.	B2	8%
	Between B1 and B2	Nil
C1: Can produce clear, well-structured, detailed text on complex subjects showing controlled use of organizational patterns, connectors and cohesive devices.	C1	1%
C2: Can summarize information from different spoken and written sources and reconstruct arguments and accounts in a coherent presentation.	C2	0%
Can express themselves spontaneously, very fluently and precisely, and differentiate between finer shades of meaning even in complex situations.		

Table 1 clearly shows that out of the 58 research scholars, 86 per cent show B1 Level competency; 8 per cent show B2 level competency. Although B1 and B2 levels share similar competencies, B2 level is more advanced. Students at this level provide a more detailed descriptions and make nuanced arguments about the advantages and disadvantages of various options. Very few (1 per cent) have a C1 level competency wherein their text on complex subjects are organized with connections and use of appropriate cohesive devices. This is the mastery level

of language competency. These findings show that most of the research scholars are independent users of English and need to work towards mastery level.

## Findings: Perception of Supervisors

The ratings of the supervisors help us to understand their perceptions of the difficulties faced by the scholars. A rating of 1 was given to the most frequently encountered difficulty and a rating of 10

was for the least frequently encountered difficulty. The results of this appraisal are presented in Table 2, the last column of which gives the weighted average, which is more accurate than the general

average. The sum row presents the sum of weighted rankings, i.e.,  $(17 \times 1 + 13 \times 2 + 4 \times 3 + \dots = 135)$  divided by adding the ranks assigned for difficulty  $(1+2+3+4+5+6+7+8+9+10=55)$ .

Table 2  
*Frequency of Difficulties in Students' Writing According to Supervisors' Perceptions*

Criteria	#1 (most frequent difficulty)	#2	#3	#4	#5	#6	#7	#8	#9	#10 (least frequent difficulty)	Sum	Weighted average (percentage in brackets)
Vocabulary	17	13	4	4	3	3	2	1	1	0	135/55	2.45 (24.5)
Flow, cohesion and clarity	12	15	5	5	4	2	0	1	3	1	154/55	2.80(28)
Grammar	9	11	7	5	5	4	5	0	1	1	175/55	3.18 (31.8)
Metadiscoursal aspects	0	1	1	3	3	3	9	7	9	11	360/55	6.55 (65.5)
Formal academic style	3	1	2	4	8	6	0	11	6	7	315/55	5.73 (57.3)
Sentence structure and word order	0	4	5	8	8	4	6	7	6	0	271/55	4.93 (49.3)
Mechanics of writing	0	0	1	1	0	0	3	2	6	35	448/55	8.15(81.5) (81.5)

The findings show that according to the supervisors, vocabulary was the most problematic area for students, followed by flow, cohesion and clarity, and then by grammar. The frequency of difficulties in the remaining areas are considerably lower, with the mechanics of writing being the least problematic. The finding that vocabulary is the most difficult aspect of writing for engineering students is like the findings reported by Evangeline and Ganesh (2016). Most of the students in this study have reached the B1 level of competency. To meet the expectations of technical and academic writing, they must make a leap from B1 to at least B2 level, after which they can enrol for customized programmes on research

writing to equip them with advanced level research-writing skills.

## Conclusions and Recommendations

Considering the criticality of writing in engineering courses, the performance of the researchers in this sample show a scope for improvement. If the English course in engineering colleges does not prepare students for writing scientific and technical texts, then the employability of students are drastically reduced. The inadequate English language competencies of the students will also act as a barrier to contributing to the field

of engineering. As mentioned in the beginning, what is needed is a change in the curriculum and CEFR gives a direction to the change based on the benchmark. It articulates the expectations at various levels and suggests what needs to be done for students to go to the next level. Tono (n.d.) discusses three e-tools or apps that can be used to address the vocabulary problem in accordance with the CEFR levels. These are:(i) The Flash Card Vocabulary Builder, (ii) The Can-Do-Sentence Builder and (iii) The Can-Do Task-Based Spoken/Written Corpus Collection Tool. Students can use these tools to learn independently. Some scholars have made a plea for redefining English curriculum in accordance with the CEFR framework, so that students are guided through the different levels of competencies (Üstünlüoğlu, Zazaoğlu, Keskin, Sarayköylü & Akdoğan, 2012; Arslan, 2017). The intention of this study is not to suggest that this is the only direction available to improve English language competencies of engineering students. A few other solutions could be introducing an intensive course in academic writing with due credits in the course work, setting up writing centres in institutions with the help of language departments, assigning language mentors, etc.It is emphasized that

cosmetic changes may not be feasible. Instead a systematic, structured framework not only guides the assessment of competencies, but also suggests the steps for improvement.

## Limitations of the Study and Scope for Future Work

For assessment purposes, we used only tests that were available in the exam materials and not under very strict exam conditions A more intensive and reliable real-time test under a strictly timed exam would have yielded more reliable test scores. Further, level testing could have been done more than once to ascertain the proficiency levels of the scholars. In some cases, supervisors themselves were mainly at the B2 level, with a very few at borderline C1 Level. Hence, it is difficult to know if they could articulate the difficulties faced by the students in their entirety. Future research work can focus on testing broader samples. A strategy study on the efforts made by scholars to hone their research skills during multiple revisions of their drafts could be another area of study.

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