

Exploring Industrial Engineering Students' Difficulties in Understanding English Technical Vocabulary: A Descriptive Qualitative Study

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Abstract

Mastery of technical vocabulary plays an important role for Industrial Engineering students because it can help students understand academic literature and prepare for future careers. However, many students still struggle to understand English technical terms. This study analyses the challenges encountered by the students, the factors underlying the challenges, and the strategies students used to master technical vocabulary. A descriptive qualitative approach was employed, involving ten Industrial Engineering students selected through purposive sampling. Data were obtained through semi-structured interviews and analysed using the interactive model proposed by Miles, Huberman, and Saldaña. The findings reveal that difficulties arise when students read journal articles, access reference books, and operate industry software written in English. Students frequently struggle not merely to translate unfamiliar terms, but also to link terms to their disciplinary concepts. These difficulties stem from limited general vocabulary, inconsistent learning habits, and insufficient exposure to technical terms during academic study. To cope, students engage in self-directed learning, draw on digital technology and artificial intelligence, and discuss unfamiliar terms with peers and lecturers. These findings highlight the need for more contextual instruction to strengthen the mastery of technical vocabulary.

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1. INTRODUCTION

The advancement of science and technology requires students not only to master the concepts of their discipline, but also to access a wide range of information sources in English. In the Industrial Engineering department, most literature, such as textbooks, international journal articles, industry standards, software documentation, and equipment manuals, is written in English. This condition positions the mastery of technical vocabulary as a vital competence that underlies students' success in understanding course material, keeping up with disciplinary developments, and preparing themselves for professional settings.

Theoretically, technical vocabulary refers to words used specifically within a discipline and carrying meanings more specific than those of general vocabulary [1]. Mastering technical vocabulary therefore goes beyond knowing a word's meaning; it also involves understanding its usage, context, and the conceptual relationships within the field [2]. For engineering students, including Industrial

Engineering students, this competence forms the foundation for comprehending academic texts, conducting research, and communicating in professional contexts [3]. Therefore, technical vocabulary competence is not merely an additional language skill; it is an essential component that supports engineering students in meeting both academic and professional demands.

To acquire and memorize vocabulary, learners rely on various strategies. Schmitt [4] classifies vocabulary learning strategies into five groups: determination strategies, which help learners discover the meaning of unfamiliar words independently; social strategies, which involve learning through interaction with others; memory strategies, which strengthen retention by linking new words to existing knowledge; cognitive strategies, which emphasize practice and repetition through activities such as note-taking and reviewing; and metacognitive strategies, which involve planning, monitoring, and evaluating one's own learning. Meanwhile, Nation [1] emphasizes the importance of repeated exposure and meaningful use of words to help new vocabulary be retained in long-term memory. This perspective positions learning strategies not as a supporting tool, but as a factor that determines students' success in mastering technical terms.

For non-English department students, English instruction is developed through the English for Specific Purposes (ESP) approach, which is designed to meet learners' academic and professional needs [5], [6]. This approach places the mastery of discipline-specific vocabulary among its central goals [7]. Therefore, the achievement of ESP instruction is measured not only by general communicative ability, but also by students' accuracy in understanding and using specific terms of their discipline.

However, previous studies reveal that a continuing challenge in mastering technical vocabulary is still encountered by most ESP students. In their research, Son and Ly [8] reported that insufficient vocabulary makes it difficult for ESP students to understand academic literature, especially field-specific terms. Other researchers, Rusmaladewi et al. [9], found that students still depend largely on online translators, digital dictionaries, and vocabulary notes to understand unfamiliar terms. A similar finding was also reported by Elkhadiri [3], who found that dictionary use and contextual guessing (inferencing) are the strategies that are most closely associated with engineering students' success in learning technical terminology. Overall, these studies indicate that many students still struggle to master the technical vocabulary that is required in their field of study.

With the advances of technology, students now use various strategies to learn technical terminology, from digital dictionaries and learning applications to peer discussion and artificial intelligence. Some research shows integrating technology into ESP instruction can both encourage student engagement and help them comprehend technical vocabulary through more authentic or real-world contexts [10]. Nursi et al. [11] also showed that mobile vocabulary learning applications equipped with gamification and progress tracking features can encourage students to engage in self-directed learning. These findings highlight that the success of technical language acquisition is influenced by both the frequency of studying and effective learning strategies.

Earlier studies on ESP instruction, vocabulary learning strategies, and technology use in language learning have been widely explored [8], [9], [10]. However, many of those studies focused on the effectiveness of particular learning strategies or adopted a quantitative approach, as conducted in Elkhadiri [3]. In contrast, experiences of Industrial Engineering students have not been explored in detail, especially the challenges in understanding technical terms, some factors affecting the

challenges, and strategies used to overcome these challenges. This gap is important since technical vocabulary in Industrial Engineering has its distinctive features; it is different from general English. Therefore, it needs further attention since technical terms in Industrial Engineering are closely associated with discipline-specific knowledge and are regularly used in academic and professional communication. Considering the issue, the study aims to investigate types of challenges experienced by Industrial Engineering students of Universitas AKPRIND Indonesia in mastering English technical vocabulary, the factors underlying the challenges, and to explain the strategies used by the students to overcome them. It is expected that the findings will provide empirical evidence to support improvement of ESP instruction that is more relevant to the needs of Industrial Engineering students.

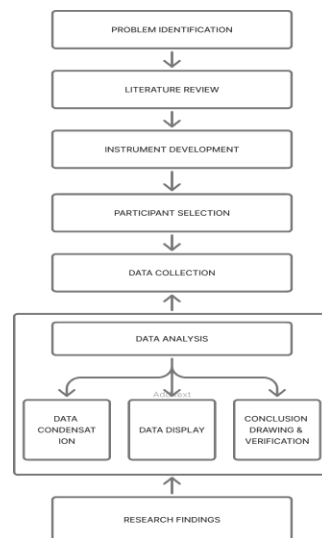
2. METHOD

A descriptive qualitative approach was applied in this study to gain a deep understanding of difficulties experienced by Industrial Engineering students in mastering English technical vocabulary. This approach was selected because it enables the researcher to investigate students' experiences, perceptions, and strategies within their own learning context [12].

There are ten Industrial Engineering students involved in this study. They were selected through purposive sampling based on the following criteria: taking an ESP class, having used English-language references in industrial engineering courses, and willingness to participate in the study.

Data were collected through semi-structured interviews. The interview guide was developed to explore three main aspects focusing on the type of difficulties, the factors underlying difficulties, and the strategies used by the students to master technical vocabulary. Instrument development was based on the concept of technical vocabulary [1], English for Specific Purposes [5], and vocabulary learning strategies [4].

Data analysis was conducted using the interactive model proposed by Miles, Huberman, and Saldaña [13] that involves data condensation, data display, and conclusion drawing and verification. The research procedure is presented below:



Research Procedure

3. RESULTS AND DISCUSSION

Context of English Use and Student Awareness

Data from the interviews indicated that respondents had used English during their academic tasks. English was most often used for reading research journals, finding academic references, understanding learning materials, and working with software used in their discipline. One respondent (R2) explained, *“I often use English when working on assignments that require references from English-language journals or books”*. They also stated that mastering technical vocabulary is an essential competence. According to them, knowledge of technical terms makes it easier to understand journals, course materials, and software while strengthening their readiness for professional work. This opinion was illustrated by R8, who stated, *“Mastering technical vocabulary is very important both for coursework and for entering professional work.”*

The findings reveal that English has become an integral part of Industrial Engineering students' learning process, particularly as a means of accessing academic resources. This result is in line with Basturkmen [5] and Suri and Saripa [6], who emphasize that English instruction is designed to meet the academic and professional needs of a specific field of study. The findings also support Nation's [1] view that technical vocabulary develops through continuous exposure to authentic texts relevant to students' disciplines. In other words, the more frequently students engage with English-language learning resources, the greater their opportunity to become familiar with and understand technical terms.

Types of Difficulty in Mastering *Technical Vocabulary*

Nearly all respondents reported that they experienced difficulty whenever they encountered unfamiliar technical terminology. Their challenge is not simply recognizing the meaning of a word; many also struggled to grasp the technical concept that the term represented. As R1 explained, *“I often look up the meaning of the term first. But sometimes I still don't understand what it means when it's used in the course material.”* Similarly, R5 noted, *“When there are many technical terms in a single paragraph, I tend to focus more on translating than on understanding the content.”* These experiences show that students' principal obstacle is not merely a limited vocabulary, but difficulty in connecting technical terms to the concept being studied, which slows down the reading process. This is in line with Nation [1], who argues that mastering technical terms includes understanding their meaning, function, and context of use within a discipline. Elkhadiri [3] reported a similar pattern: engineering students are more often obstructed when technical terms appear within complex academic text.

Difficulty also arose most frequently when students used software whose menus and instructions were written in English and delivered presentations containing many technical terms. *“When using software, I sometimes get confused understanding the menus or instructions written in English because the terminology differs from what was explained in class,”* said R8. It means that the students get different instructions in class that do not match the students' real needs. This finding illustrates a key ESP principle: instruction should follow the real communicative needs of a learner's discipline rather than general English, since the specialized language they need is found in their field's own texts and settings [5], [14], and Nation's [1] argument that vocabulary knowledge develops through frequent exposure to meaningful language use in authentic materials. In other words, frequent interaction with authentic materials will help the students acquire technical vocabulary more effectively.

Factors Underlying the Difficulty

Internal Factors

Each student's ability is shaped by differing backgrounds and study habits. Most respondents admitted that their *general vocabulary* remained limited, which frequently made it difficult to understand new terms. *"I still often re-read passages because I'm not yet familiar with many terms,"* said R2. In addition, some students only studied technical terms when facing an assignment or an exam. This means that the vocabulary they learned was not used continuously and was easily forgotten when the same term reappeared.

These results highlight that students' mastery of technical terminology depends not only on their English proficiency but also on how consistently they use English-language learning resources. This finding is consistent with Nation [1], who holds that vocabulary mastery develops through repeated exposure and meaningful use, and with Schmitt [4], who identifies consistent study habits as an important factor. Elkhadiri [3] reported a similar tendency: engineering students who actively read and revisited terms demonstrated better mastery of technical vocabulary than those who studied only when necessary.

External Factors

The learning environment also shapes students' mastery of technical terms. Some respondents felt that opportunities to use technical terms during coursework were limited; they encountered such terms mainly while reading journal articles or completing assignments, while in-class practice had not yet provided sufficient scaffolding for gradual understanding. *"I encounter those terms more often while reading journal articles than during in-class practice,"* said R6. *"The software we use is often in English, but the terminology is rarely discussed in detail,"* added R8.

These experiences suggest that students need more opportunities to use technical terms in academic contexts closely. When a term appears only occasionally, students tend to memorise it without truly understanding its meaning. On the other hand, repeated exposure through discussion, journal analysis, case studies, and software use helps students connect terms to the concepts they represent.

Strategies Students Use to Overcome the Difficulty

Self-Directed Learning

Most students cope with these difficulties through self-directed learning: looking up term meanings using digital dictionaries or Google Translate, using artificial-intelligence-based applications, recording new vocabulary, and re-reading journal articles or course material. *"When I find unfamiliar terms, I usually look them up in a dictionary or with AI; sometimes I write them down so I won't forget them,"* said R4. These practices show that students do not rely solely on lecturers' explanations but try to seek out their own learning resources. Schmitt [4] explains that the use of varied strategies helps learners acquire, store, and recall new vocabulary; Similarly, Son and Ly [8] and Nursi et al. [11] found that ESP students tend to use digital technology as the most practical means of learning technical vocabulary. Furthermore, Hasanah and Anwar [15] explain that instruction integrating authentic resources and technology helps students develop vocabulary relevant to their professional field.

Learning through Interaction with Others

Besides relying on technological tools for self-directed learning, students also interacted with their peers and lecturers to overcome difficulties in understanding technical vocabulary. Some respondents found it easier to grasp a term's meaning after discussing it with peers or asking a lecturer, since, according to them, discussion offers an opportunity to confirm their understanding of how a term is used in the Industrial Engineering context. *"We enjoy studying together because we can discuss unfamiliar terms with friends,"* said R3. This finding reflects Schmitt's [4] classification of questioning and discussion as social strategies for vocabulary learning. Wahyuni et al. [16] and Rusmaladewi et al. [9] also confirmed that collaboration among students enhances their comprehension of academic and technical vocabulary by making the learning process more interactive and providing immediate feedback.

Student Expectations for Instruction

Most respondents expressed a desire for instruction that gives more opportunities to use technical terms. They hoped lecturers would not only explain a term's meaning, but also demonstrate its use through journal articles/books, case studies, or relevant software. *"When I encounter a technical term in a real case or while using software, I can understand it more easily, and it stays longer in my memory,"* said R5. This expectation emphasizes students' preference for learning experiences that reflect the realities of the academic and professional situations they will face. It is in line with the principles of ESP by Basturkmen [5], which emphasize learning in meaningful contexts. This view is further supported by Hasanah and Anwar [15], who found that learning through authentic resources, technology, and practical experience produces better outcomes and is more effective than instruction that relies primarily on memorisation.

Discussion

Overall, the findings indicate that the students' difficulty with technical vocabulary is mainly a problem of understanding the concept, not only of remembering the word. Many respondents could translate a term but still struggled to use it, because the term was not yet linked to the concept it represents. This is consistent with Nation [1], who states that technical vocabulary involves a word's function and context within a discipline. Elkhadiri [3] reported a similar finding that comprehension breaks down when technical terms appear in complex texts.

Several factors contribute to this difficulty. Internally, students' limited general vocabulary and inconsistent study habits hinder their ability to acquire technical vocabulary. As a result, newly learned terms do not receive sufficient repeated and meaningful exposure, which is consistent with the findings of Nation [1] and Schmitt [4]. Externally, students frequently encounter technical terms in academic literature, journal articles, and software, yet these terms are rarely explained in class. As a result, exposure to technical vocabulary is not accompanied by sufficient instructional support, making memorisation alone ineffective. This finding is consistent with Basturkmen's [5] view that ESP instruction should reflect the authentic demands of a professional field. It is also supported by Hasanah and Anwar [15], who found that integrating authentic resources and technology into instruction strengthens students' understanding of technical vocabulary.

The strategies students use can be seen as a response to this problem. They learn independently through digital dictionaries, translation tools, AI applications, note-taking, and re-reading, and they also discuss terms with peers and lecturers. These strategies reflect Schmitt's [4] cognitive and social strategies and are supported by Son and Ly [8] and Nursi et al. [11] for technology use, and by

Wahyuni et al. [16] and Rusmaladewi et al. [9] for collaboration. The students' hope that lecturers would show terms in use, through journals, cases, or software, further confirms that their real need is to understand the concept, not simply to memorise the word.

4. CONCLUSION

This study shows that Industrial Engineering students recognise the importance of mastering technical vocabulary as a foundation for academic success and for entering professional work. However, they still encounter difficulty in understanding technical terms, particularly when reading journal articles, reference books, and English industrial software. These difficulties are influenced by internal factors, such as limited general vocabulary and study habits, as well as external factors related to limited exposure to technical terms during coursework. To address these challenges, students employ a combination of self-directed learning and discussion with peers and lecturers. These findings confirm that mastery of technical terms depends not only on English proficiency, but also on repeated opportunities to use the technical terms within relevant academic contexts. Accordingly, instruction in technical vocabulary within the Industrial Engineering department should draw more extensively on authentic learning resources- scientific journals, case studies, and discipline-specific software. For future research, a wider range of respondents or a combination of qualitative and quantitative approaches should be applied to obtain a more comprehensive picture of technical vocabulary mastery among engineering students.

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