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Abstract: This study aims to explore the major challenges encountered by teachers in teaching English vocabulary to engineering students, as well as the methods employed to overcome these challenges. It further evaluates the effectiveness of various vocabulary teaching techniques through teacher and student feedback. The participants consisted of both teachers and engineering students at Namangan State Institute of Foreign Languages. A combination of research instruments including student surveys, diagnostic vocabulary tests, classroom observations, error analyses of both written and oral work, vocabulary journals, logs, concept mapping, and word association exercises were utilized. The results demonstrate that teachers commonly face similar obstacles such as linguistic barriers, contextual difficulties, and pedagogical constraints, with technical terminology proving particularly problematic for students. The study also reveals that interactive and context-based teaching strategies can significantly improve vocabulary acquisition outcomes.

Keywords: challenges, questionnaires, diagnostic tests, classroom observations, error analysis, vocabulary journals, concept mapping.

Introduction

Vocabulary acquisition is a cornerstone of language learning, playing an especially crucial role in specialized academic fields such as engineering. Unlike general English vocabulary, engineering vocabulary comprises highly technical, abstract, and subject-specific terms, which pose unique difficulties for learners, particularly non-native English speakers. Mastery of this specialized lexicon is

essential for engineering students not only to comprehend course materials but also to communicate effectively in their future professional contexts. However, teaching such vocabulary presents numerous challenges. Engineering terms often lack direct equivalents in students' native languages, leading to significant linguistic barriers. Additionally, the abstract nature of technical terms makes contextualization within real-world scenarios difficult, limiting students' ability to internalize and apply new vocabulary. Pedagogical approaches commonly used in general language instruction may be inadequate for addressing these domain-specific needs, necessitating tailored methodologies. Vocabulary acquisition is a cornerstone of successful language learning and communication, particularly in specialized fields such as engineering. For engineering students, the mastery of technical vocabulary is not merely an academic requirement but a fundamental skill that directly impacts their ability to understand complex concepts, engage in professional communication, and apply theoretical knowledge in practical contexts. Unlike general English vocabulary, the vocabulary used in engineering is highly specialized, often comprising terms that are abstract, domain-specific, and context-dependent. These technical terms frequently do not have direct equivalents in students' native languages, which adds an extra layer of difficulty to the learning process. The importance of vocabulary in engineering education extends beyond language proficiency; it plays a vital role in students' overall academic success and future professional performance. As engineering disciplines advance rapidly with continuous innovation, students must keep pace with new terminology and concepts, making vocabulary learning an ongoing and dynamic challenge. Moreover, engineering students often face the dual task of learning both the language and the subject content simultaneously, which requires instructional strategies tailored to meet their unique needs. However, teaching vocabulary to engineering students poses several significant challenges. Linguistic barriers such as unfamiliar pronunciation patterns, complex word forms, and lack of contextual understanding can hinder students' ability to fully grasp and retain new terms. Furthermore, engineering vocabulary is often highly technical and

abstract, making it difficult to relate to students' everyday experiences. This contextual challenge is compounded by pedagogical limitations, where traditional teaching methods—such as rote memorization and isolated word lists—fail to engage students or foster deep understanding. Research in the field of English for Specific Purposes (ESP) has consistently emphasized the need for integrative and context-based approaches to vocabulary teaching. According to Nation (2001), vocabulary learning is most effective when words are presented within meaningful contexts that relate directly to students' fields of study. Schmitt (2010) highlights various strategies such as repetition, association, and conceptual mapping as essential tools for helping learners internalize complex vocabulary. Despite these insights, there remains a gap in understanding the practical difficulties teachers face when implementing such methods, especially in non-native English speaking environments. In the context of engineering education in Uzbekistan, this study seeks to explore these challenges in detail by focusing on the experiences of both teachers and students at the Namangan State Institute of Foreign Languages. It aims to identify the primary obstacles in vocabulary instruction, investigate the effectiveness of current teaching practices, and propose strategies that can enhance vocabulary acquisition tailored to engineering students' needs. By addressing these issues, the study contributes to improving the quality of English language education for engineering faculties, ultimately supporting students' academic achievement and professional readiness. Previous research has identified these challenges in various contexts. Nation (2001) highlighted the importance of learning vocabulary within relevant subject contexts, while Schmitt (2010) emphasized the use of strategies such as repetition, association, and contextualization to enhance vocabulary retention. Coxhead (2000) discussed the difficulty students face with academic words, many of which are similarly complex in engineering disciplines. Moreover, Hyland and Tse (2007) pointed out that technical vocabulary's polysemous nature can cause confusion, and Mohan and van Naerssen (1997) stressed the need for better integration of language and content teaching. Despite this, there is a relative scarcity of studies focused specifically on the

challenges faced by teachers instructing engineering vocabulary in non-native contexts. This study aims to address this gap by investigating the obstacles encountered by teachers at Namangan State Institute of Foreign Languages and proposing effective strategies to enhance vocabulary teaching for engineering students.

Methods

The study involved 15 experienced English teachers specializing in English for Specific Purposes (ESP) and 150 engineering students across various academic years at Namangan State Institute of Foreign Languages. Teachers were selected based on their active involvement in teaching technical English vocabulary, while students represented diverse engineering disciplines to ensure broad data applicability.

2. Instruments

Student Surveys and Questionnaires: Designed to collect students' perspectives on the difficulties they face in learning technical vocabulary and their attitudes towards different teaching methods.

Diagnostic Vocabulary Tests: Administered at the beginning and end of the semester to quantitatively assess students' knowledge of engineering-specific vocabulary.

Classroom Observations: Conducted to analyze teaching approaches and classroom dynamics, highlighting contextual challenges in real-time.

Error Analysis: Performed on students' written assignments and oral presentations to identify common vocabulary-related errors and misconceptions.

Vocabulary Journals and Logs: Maintained by students to document new terms learned and reflect on their understanding and usage.

Concept Mapping and Word Association Exercises: Used as interactive tools to explore students' cognitive connections with technical vocabulary and facilitate deeper learning.

3. Procedure

Data were collected throughout a full academic semester. Teachers employed a variety of vocabulary teaching techniques, including traditional and innovative methods, and recorded their observations. Students took diagnostic tests, filled out surveys, and consistently updated their vocabulary journals. Pre- and post-semester surveys helped evaluate shifts in student attitudes and vocabulary

proficiency. Classroom sessions were regularly observed to monitor instructional practices and student engagement. This study employed a mixed-methods research design, combining both quantitative and qualitative approaches to achieve a comprehensive understanding of the challenges encountered in teaching vocabulary to engineering students, as well as to explore effective strategies to overcome these challenges. The mixed-methods approach allowed the collection of rich, multifaceted data, providing deeper insights into both the measurable outcomes of vocabulary teaching and the contextual factors influencing the teaching-learning process.

1. Participants The research involved a total of 165 participants from the Namangan State Institute of Foreign Languages, including 15 English language teachers and 150 engineering students. The teachers selected for the study had prior experience in teaching English for Specific Purposes (ESP), particularly focusing on engineering students. The student participants represented various academic years within the engineering faculty, ensuring a diverse sample that reflects different levels of vocabulary knowledge and language proficiency. This diversity enabled the study to capture a broad spectrum of challenges and instructional needs across different stages of the engineering curriculum.

2. Instruments. Several data collection instruments were employed to gather comprehensive information: **Student Surveys and Questionnaires:** These tools were designed to collect students' perceptions regarding the difficulties they face when learning technical vocabulary. The surveys included both closed-ended and open-ended questions to capture quantitative data as well as qualitative feedback. **Diagnostic Vocabulary Tests:** Administered at the beginning of the semester, these tests assessed students' existing knowledge of engineering-related terms, serving as a baseline for measuring progress and identifying specific areas of weakness. **Classroom Observations:** Structured observations of English classes were conducted to document teaching practices, interaction patterns, and the contextual environment in which vocabulary instruction took place. These observations helped to identify pedagogical strengths and limitations. **Error Analysis:** Students' written assignments and oral presentations were analyzed to detect

common vocabulary-related errors. This analysis provided insight into the specific linguistic challenges that hinder students' vocabulary acquisition and usage.

Vocabulary Journals and Logs: Students were encouraged to maintain personal vocabulary journals throughout the semester. These journals included new words learned, definitions, example sentences, and reflections on usage, allowing for longitudinal tracking of vocabulary development. **Concept Mapping and Word**

Association Exercises: These cognitive tools were integrated into classroom activities to explore how students mentally organize and relate new technical vocabulary to existing knowledge. Concept maps and word association tasks provided qualitative data on students' conceptual understanding. **3. Procedure** Data collection was carried out over the course of one academic semester. At the outset, students completed the diagnostic vocabulary tests and initial surveys to establish baseline data. Throughout the semester, teachers implemented various vocabulary teaching strategies, including traditional and interactive methods such as rote learning, concept mapping, and contextual exercises. Classroom observations were conducted regularly to monitor instructional approaches and student engagement. Students maintained vocabulary journals, recording new terms and their reflections after each lesson. At the end of the semester, follow-up surveys and vocabulary tests were administered to evaluate changes in students' vocabulary knowledge and attitudes. Teachers also provided feedback through questionnaires and informal interviews to share their perspectives on the teaching process and challenges faced. **4. Data**

Analysis Quantitative data from diagnostic and final vocabulary tests, as well as surveys, were analyzed using descriptive statistics to identify patterns of vocabulary acquisition and shifts in student perceptions. Comparative analysis of pre- and post-test results enabled assessment of the effectiveness of the teaching methods employed. Qualitative data from classroom observations, vocabulary journals, error analyses, and open-ended survey responses were analyzed using thematic analysis. This involved coding data to identify recurring themes related to linguistic barriers, contextual difficulties, and pedagogical challenges. The triangulation of quantitative

and qualitative findings provided a nuanced understanding of the challenges in teaching vocabulary and informed recommendations for improving instructional practices. Data Analysis Quantitative data from surveys and tests were analyzed using descriptive and inferential statistics to identify trends and measure improvement. Qualitative data from observations, journals, and error analyses were subjected to thematic analysis, enabling identification of recurring challenges and effective teaching practices.

Results

The study's findings underscore several prominent challenges:

1. **Linguistic Barriers** Students frequently struggled with the pronunciation and spelling of engineering terms, many of which lacked equivalents in their native Uzbek or Russian languages. This often resulted in confusion and demotivation, slowing vocabulary acquisition.
2. **Contextual Challenges** Limited exposure to authentic engineering contexts—such as industry-specific texts, real-life case studies, and practical applications—reduced students' ability to contextualize and retain new vocabulary. The classroom environment, at times, failed to simulate realistic situations where students could practice technical language use effectively.
3. **Pedagogical Limitations** Many teachers initially relied on rote memorization and traditional vocabulary drills, which proved ineffective for complex technical terminology. However, when more interactive methods such as concept mapping and word association exercises were integrated, students showed improved comprehension and retention. The study also observed that teachers who adapted their instruction by incorporating visual aids, contextual examples, and collaborative activities fostered higher student engagement and vocabulary acquisition. The analysis of data collected from both teachers and students revealed several significant challenges in the process of teaching and learning vocabulary within the engineering faculty. These challenges were categorized into linguistic barriers, contextual difficulties, pedagogical limitations, motivational issues, and resource constraints.

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Below is a detailed discussion of the key findings: **1. Linguistic Barriers** The majority of teachers (87%) reported that linguistic difficulties constituted the most prominent obstacle in teaching technical vocabulary. Students struggled particularly with the pronunciation of specialized engineering terms, many of which contained complex phonetic structures unfamiliar to non-native English speakers. Spelling errors were also pervasive, affecting students' ability to accurately record and recall new vocabulary. Moreover, many technical terms lacked direct equivalents in the students' native language, leading to confusion and misunderstanding. From the students' perspective, 80% confirmed difficulties in decoding the meaning and correct usage of such terms, further complicating their learning process. **2. Contextual Challenges** Contextual factors emerged as another critical issue, with 80% of teachers emphasizing the lack of authentic contexts in which students could apply technical vocabulary. Observations indicated that classroom instruction often remained theoretical, with insufficient integration of real-world engineering scenarios or practical examples. Consequently, students found it difficult to relate abstract vocabulary items to concrete applications. A similar percentage of students (77%) expressed that limited exposure to industry-specific language outside the classroom hampered their vocabulary retention and overall comprehension. **3. Pedagogical Limitations** Traditional teaching approaches, such as rote memorization and repetitive drilling, were reported by 67% of teachers as ineffective, especially when dealing with complex and abstract engineering terms. Classroom observations and teacher feedback highlighted a reliance on teacher-centered instruction, which reduced student engagement and hindered deeper cognitive processing of vocabulary. The study's findings also revealed that students preferred interactive and contextualized learning methods, which were only sporadically employed. Approximately 73% of students reported that pedagogical strategies emphasizing meaningful usage and contextualization significantly enhanced their understanding and retention. **4. Motivational Issues** Both teachers and students pointed out motivational factors influencing vocabulary learning. Around 60% of teachers

observed that the perceived difficulty of engineering terminology often demotivated students, leading to lower participation and effort in vocabulary tasks. Correspondingly, 63% of students acknowledged feelings of frustration and anxiety when encountering challenging terms, which negatively affected their willingness to engage actively with vocabulary learning activities.

5. Resource Constraints A further challenge identified by 53% of teachers was the limited availability of specialized teaching materials tailored to the engineering context. The scarcity of updated textbooks, authentic reading materials, and digital resources constrained the variety of instructional techniques that could be implemented. Students also reflected on this issue, with 57% expressing a desire for more interactive and multimedia resources to support autonomous vocabulary learning.

6. Positive Outcomes of Interactive Strategies Despite the challenges identified, the study also documented improvements in vocabulary acquisition linked to the adoption of innovative teaching strategies. Teachers who incorporated concept mapping, word association exercises, and contextualized vocabulary tasks observed higher student engagement and better vocabulary retention. Error analysis showed a reduction in common vocabulary errors over the semester, indicating progress in students' technical language proficiency. These findings suggest that active learning techniques can mitigate many of the

Challenge Category	Description	Teachers Reporting (%)	Students Reporting (%)	Examples/Indicators
Linguistic Barriers	Difficult pronunciation, spelling errors, no direct translation for terms	87%	80%	Mispronounced terms, spelling mistakes, misunderstandings

challenges faced in engineering vocabulary instruction.

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Contextual Challenges	Lack of real-world application and exposure to technical language outside class	80%	77%	Limited practical examples, no industry context
Pedagogical Limitations	Ineffective traditional methods like rote memorization	67%	73%	Teacher-centered, low student engagement
Motivational Issues	Low student motivation due to difficulty and frustration	60%	63%	Student anxiety, lack of participation
Resource Constraints	Insufficient specialized teaching materials and digital tools	53%	57%	Lack of updated textbooks, multimedia resources
Positive Impact of Interactive Strategies	Use of concept mapping, word associations improved retention	N/A	N/A	Increased engagement, fewer errors over time

Discussion

The results of this research are consistent with established theories and prior studies emphasizing the integration of language and content learning (Snow, Met, & Genesee, 1989). Concept mapping, in particular, proved a valuable tool by visually linking new vocabulary to familiar concepts, supporting Novak and Gowin's (1984) assertions on meaningful learning. Despite these positive outcomes, the study

identified a persistent underuse of authentic, real-world materials in vocabulary teaching, which could further enhance contextual understanding. To address the identified challenges, the study recommends: **Blended Learning Models:** Combining face-to-face instruction with digital tools and online resources tailored to engineering vocabulary to provide richer contexts and interactive practice. **Teacher Professional Development:** Focused training on ESP pedagogy and innovative vocabulary teaching methods to equip educators with effective strategies. **Curriculum Enhancement:** Integrating authentic industry case studies, technical manuals, and project-based learning to contextualize vocabulary within real engineering tasks.

Discussion

The findings of this study provide valuable insights into the multifaceted challenges faced by teachers and students in teaching and learning engineering-specific vocabulary. These challenges align with existing literature, confirming that vocabulary acquisition in technical fields requires specialized pedagogical approaches that address both linguistic and contextual complexities. Firstly, the prominence of **linguistic barriers** observed in this study echoes the research of Coxhead (2000) and Hyland and Tse (2007), who emphasize the complexity of technical vocabulary due to its phonological and semantic characteristics. The difficulty students faced with pronunciation and spelling, compounded by the lack of direct translations, suggests a need for more targeted phonetic training and bilingual glossaries or support materials. These tools could help bridge the gap between students' native language and technical English, reducing confusion and promoting more accurate comprehension. Secondly, the **contextual challenges** identified reinforce Nation's (2001) argument regarding the importance of embedding vocabulary learning within relevant subject matter. The absence of authentic, real-world applications in the classroom limited students' ability to internalize and effectively use new terms. This finding suggests that vocabulary instruction should be

closely integrated with engineering content and supplemented with case studies, simulations, and industry-specific examples. Such approaches would not only improve retention but also increase student motivation by demonstrating the practical relevance of vocabulary. The study also highlighted significant **pedagogical limitations** in current instructional practices. The reliance on traditional, teacher-centered methods such as rote memorization appears inadequate for mastering complex engineering terminology. This finding supports Schmitt's (2010) advocacy for learner-centered strategies that involve active engagement, repetition, and contextualization. The positive outcomes associated with interactive techniques such as concept mapping and word association exercises demonstrate the effectiveness of these approaches in enhancing vocabulary acquisition. These methods enable students to visualize relationships between concepts and create cognitive links that facilitate deeper learning. Moreover, **motivational issues** emerged as a notable barrier, with students experiencing anxiety and frustration related to the difficulty of technical vocabulary. These affective factors can impede learning, as suggested by research on second language acquisition. To combat this, it is crucial to create a supportive learning environment that fosters confidence and encourages risk-taking in language use. Incorporating gamified activities and collaborative learning could serve as motivational tools, helping students overcome fear and develop a positive attitude toward vocabulary learning. Additionally, **resource constraints** were identified as a limiting factor. The scarcity of specialized, up-to-date teaching materials and digital tools restricts teachers' ability to diversify their instructional methods. This is a common issue in many educational contexts but can be mitigated through the use of open educational resources (OER) and digital platforms that offer engineering-specific language materials. Training teachers to effectively utilize these resources is equally important to maximize their benefits. Finally, the study underscores the necessity of integrating language instruction with engineering content, a concept supported by Mohan and van Naerssen (1997) and Snow, Met, and Genesee (1989). This integrated approach ensures that vocabulary teaching does not occur in isolation

but as part of meaningful learning within students' academic and professional domains. **Recommendations** emerging from this discussion include adopting blended learning models that combine face-to-face instruction with digital and industry-related materials, increasing teacher professional development focused on ESP methodologies, and designing curricula that emphasize contextualized and interactive vocabulary learning. Future research should examine the long-term effects of these approaches on students' vocabulary retention and their ability to apply technical language in real-world engineering contexts. By implementing these strategies, educators can mitigate linguistic and pedagogical barriers and better prepare engineering students for academic success and professional communication.

Conclusion

Teaching vocabulary to engineering students is a complex and demanding task that presents distinct challenges, including linguistic difficulties, contextual limitations, and pedagogical constraints. This study has highlighted that students often struggle with pronunciation, spelling, and comprehension of specialized technical terms, which are compounded by the absence of direct translations and insufficient exposure to authentic language use. Furthermore, traditional teaching methods such as rote memorization prove inadequate for facilitating deep and lasting vocabulary acquisition in this specialized field. The findings emphasize the importance of employing interactive and learner-centered strategies, such as concept mapping and word association exercises, which have been shown to enhance students' engagement and improve their understanding of technical vocabulary. Moreover, integrating vocabulary instruction with engineering content and real-world applications fosters more meaningful learning experiences and increases motivation. Addressing these challenges requires a multifaceted approach that includes updating teaching materials, incorporating digital resources, and providing ongoing professional development for teachers, particularly in English for Specific Purposes (ESP). A blended learning model that combines traditional instruction with modern,

technology-enhanced methods appears promising in overcoming many of the identified obstacles. In conclusion, by adopting targeted and innovative teaching approaches that consider the unique linguistic and contextual needs of engineering students, educators can significantly improve vocabulary acquisition and better prepare students for academic success and professional communication in their future careers. Future research should continue to explore the effectiveness of these approaches over longer periods and across different engineering disciplines to further refine best practices in technical vocabulary instruction.

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