

## **Exploring the Challenges of Developing Speaking Skills in Mechanical Engineering ESP Students: Insights from State Polytechnic of Subang**

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<b>Keywords</b>	<b>Abstract</b>
English for Specific Purposes, Needs Analysis, Mechanical Engineering, Vocational Education, Speaking Skills.	The increasing demands of the global industrial sector require Mechanical Engineering graduates to possess specialized oral English proficiency, positioning English for Specific Purposes (ESP) as a critical component of vocational higher education. This research aimed to analyze the professional communicative needs, skill deficiencies, and instructional preferences related to speaking skills among students within the Indonesian polytechnic context. A convergent parallel mixed-methods design was employed at State Polytechnic of Subang, involving a validated Likert-scale questionnaire administered to 100 first-semester students and semi-structured interviews with a purposive subsample of 15 participants. The findings highlighted a high perceived necessity for technical oral genres, particularly technical presentations and the description of mechanical blueprints. Despite this necessity, students reported significant deficiencies in fluency and technical vocabulary. These linguistic challenges were further complicated by affective barriers, such as speaking anxiety, and cognitive struggles regarding memory retrieval and idea formulation under pressure. Consequently, students expressed a strong preference for instructional methods centered on authentic simulations, Task-Based Learning (TBL), and the Genre-Based Approach (GBA). This study concludes that bridging the speaking proficiency gap necessitates a shift toward highly contextualized, practice-based methodologies that integrate affective support strategies to reduce learner anxiety. Implementing such a framework is essential for equipping vocational engineering graduates with the specialized communicative competence required to succeed in high-stakes professional environments.

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### **INTRODUCTION**

The integration of English for Specific Purposes (ESP) has become essential within modern technical education, particularly in vocational disciplines such as mechanical engineering. Amidst accelerating globalization and technological evolution, oral English proficiency is now widely recognized as a critical professional requirement for engineering graduates (Masaji, 2020; Ferdian et al., 2022). Contemporary employers across international supply chains mandate that professionals possess sound communication skills alongside technical expertise to ensure effective coordination and the practical application of knowledge (Arar, 2022). This expectation necessitates that engineering students develop specialized communicative competence—including sociolinguistic awareness and discourse management—to translate complex concepts, lead technical discussions, and maintain professional credibility (Gomathi et al., 2023; Prihandoko et al., 2022). Consequently, English speaking skills function as a non-negotiable asset, serving as the vital bridge between specialized technical knowledge and its real-world implementation.

Despite this criticality, empirical evidence consistently demonstrates a significant proficiency gap in oral English among technical graduates entering the workforce (Yacoub, 2022). Many graduates struggle to articulate ideas or collaborate effectively with international

teams, often leading to negative perceptions of their professional competence during high-stakes tasks like job interviews. This deficiency is rooted in multidimensional barriers, including linguistic constraints, performance-related difficulties, and pronounced psychological factors such as speaking anxiety and low confidence (Tami et al., 2024; Ferdian, 2026). These affective barriers increase cognitive load, which not only impairs communicative performance but also diminishes learner motivation (Zhang, 2024). Furthermore, non-native speakers often require significantly more time to prepare oral presentations than native peers, creating a professional inefficiency and competitive disadvantage (Amano et al., 2023). For mechanical engineering students at vocational institutions like State of Polytechnic of Subang (Politeknik Negeri Subang), where engagement with technical materials and industrial partners is mandatory, this deficiency acts as a direct impediment to both academic achievement and career readiness.

A systematic review of the field reveals that ESP scholarship has historically maintained a written-oriented focus, often neglecting the specific pedagogical challenges of oral communication (Prihandoko et al., 2022; Assassi et al., 2024). While studies have highlighted the importance of Technical Oral Presentations (TOP), much of this research has been conducted in generalized engineering contexts or traditional four-year university programs. Such findings often lack the ecological validity required for vocational institutions, which operate under different curricula, industry expectations, and student demographics. Previous research frequently generalizes language needs without accounting for crucial contextual variables, such as specific classroom conditions and the unique linguistic backgrounds of Indonesian polytechnic students (Runggo & Hendriyani, 2025). Consequently, there is a critical research gap concerning micro-level, qualitative investigations into the lived experiences and specific communicative needs within specialized vocational technical majors.

Therefore, the current research is essential to mitigate the misalignment between ESP course content and learners' authentic communicative demands, which is a known cause of instructional inefficacy (Yacoub, 2022; Prihandoko et al., 2022). A thorough needs analysis is the foundational step required to ensure that instruction is tailored, relevant, and aligned with professional requirements (Maisarah, 2024). This study provides a localized contribution by focusing explicitly on the speaking skills of mechanical engineering students at State Polytechnic of Subang, bridging the divide between abstract ESP theory and classroom execution. The primary aim is to explore the professional needs and communicative challenges faced by these students. By adopting a student-centered approach, the findings intend to yield data-driven recommendations that align ESP instruction with the localized requirements of Indonesian polytechnic graduates, contributing to the broader global discourse on vocational curriculum responsiveness.

## **METHOD**

### **3.1 Research Design**

This study employed a convergent parallel mixed-methods design, characterized by the simultaneous collection and analysis of quantitative and qualitative data. This design was chosen to facilitate methodological triangulation, allowing the researcher to corroborate statistical trends from a large cohort with in-depth qualitative insights, thereby providing a comprehensive understanding of the ESP needs in a vocational setting.

### 3.2 Research Setting and Participants

The research was conducted at State Polytechnic of Subang, specifically within the Mechanical Engineering Department. The population consisted of 100 first-semester students (N=100) enrolled in the compulsory ESP course. For the qualitative phase, purposive sampling was utilized to select a sub-sample of 15 students (N=15). These participants were selected based on their initial questionnaire results to ensure a representative distribution of students with varying perceived proficiency levels.

### 3.3 Research Instruments

Two primary instruments were used to ensure data depth and breadth:

- A. **Likert-Scale Questionnaire:** This quantitative instrument was used to measure students' perceptions across three dimensions of Needs Analysis: *necessities* (professional requirements), *lacks* (proficiency gaps), and *wants* (learning preferences).
- B. **Semi-Structured Interview Protocol:** Developed using the Interview Protocol Refinement (IPR) framework, this qualitative tool explored nuanced issues such as affective barriers (anxiety), cognitive struggles, and the lived experiences of students in speaking tasks.

To ensure content validity, both instruments underwent expert validation by two ESP specialists and one mechanical engineering subject matter expert. A pilot test was conducted with a non-participating group of students to ensure clarity and reliability.

### 3.4 Data Analysis Technique

Data analysis followed the principle of convergence:

- A. **Quantitative Analysis:** Data from the questionnaires were analyzed using descriptive statistics (mean, standard deviation, and percentages) to identify the magnitude of perceived needs and deficiencies.
- B. **Qualitative Analysis:** Interview transcripts were analyzed using Thematic Analysis, following the phases of familiarization, open coding, and theme development. This process focused on identifying psychological and performance-related challenges.

Finally, the findings were integrated by comparing the statistical results with the emerged themes, providing a holistic view of the students' communicative competence and instructional requirements.

### 3.5 Methodological Limitations

While this study offers localized insights, the focus on a single department at State Polytechnic of Subang limits the statistical generalizability of the results to other disciplines. Furthermore, as the data is self-reported, it reflects the participants' perceptions, which may vary from objective performance metrics.

## RESULTS AND DISCUSSION

The research findings are categorized into three primary thematic areas: Professional Necessity, Perceived Proficiency Lacks, and Pedagogical Preferences. These results synthesize quantitative data from student questionnaires and qualitative insights from semi-structured interviews.

### 4.1 Professional Necessity and Future Communication Tasks

Table 1 outlines the students' perceptions regarding the importance of English-speaking skills for their future careers in mechanical engineering.

**Table 1.** Perceived Importance of Professional Communication Tasks

No	Statements	Combined Percentage of Strongly Agree and Agree Responses
1	Formal Technical Oral Presentations	82.6%
2	Communication in Job Interviews	73.8%
3	Collaboration with Multi-disciplinary/International Teams	76.7%
4	Negotiating Technical Specifications/Contracts	75.7%
5	Explaining Complex Mechanical Blueprints/Systems	69.9%
6	Accessing Global Research and Webinars	79.6%

The data indicates a high level of instrumental motivation among students. The highest priority is placed on Technical Oral Presentations (82.6%) and accessing global research (79.6%), suggesting that students view English not merely as a conversational tool but as a critical medium for professional knowledge acquisition and dissemination. The significant agreement on negotiation and international collaboration reflects an awareness of the globalized nature of the modern engineering industry.

#### 4.2 Perceived Proficiency Lacks and Challenges

Table 2 summarizes the self-reported linguistic and psychological barriers students face when speaking English in a technical context.

**Table 2.** Students' Perceived Speaking Challenges

No	Statements	Combined Percentage of Strongly Agree and Agree Responses
1	Struggles with Speaking Fluency (Pauses/Hesitation)	61.1%
2	Lack of Sufficient Technical Vocabulary	62.1%
3	Grammatical/Structural Errors Impairing Accuracy	64.1%
4	High Anxiety or Fear of Mistakes in Class	57.3%
5	Difficulty Articulating Complex Mechanical Ideas	64.1%
6	Lack of Self-Confidence to Initiate Conversation	56.3%

The findings reveal a tension between the perceived necessity of the language and the students' current abilities. Interestingly, grammatical errors (64.1%) and the articulation of complex ideas (64.1%) were cited more frequently than general anxiety. This suggests that the primary barrier is cognitive-linguistic—students struggle to bridge the gap between their technical knowledge and their ability to encode that knowledge into English structures.

#### 4.3 Instructional Wants and Curricular Recommendations

Table 3 presents student preferences for pedagogical approaches within the ESP framework.

**Table 3.** Pedagogical Preferences and Course Alignment

No	Statements	Combined Percentage of Strongly Agree and Agree Responses
1	Relevance of ESP Content to Professional Future	81.5%
2	Preference for Task-Based Learning (TBL) Activities	70.9%

No	Statements	Combined Percentage of Strongly Agree and Agree Responses
3	Desire for Genre-Based Technical Discourse Training	67.0%
4	Need for Technology/Digital Media Integration	62.1%
5	Sufficiency of Current Authentic Engineering Context	77.6%

From the table 3, it can be determined that while students largely validate the relevance of current course content (81.5%), there is a clear demand for more active, task-based methodologies (70.9%).

The qualitative interview data further refined these findings, highlighting four specific areas of need:

1. **Deep-Seated Challenges:** Beyond linguistics, students suffer from a "self-confidence deficit" and high cognitive load when trying to recall technical terms under pressure.
2. **Effective Tasks:** Presentations and video-based assignments were rated highly because they allow for preparation and self-correction, which mitigates immediate performance anxiety.
3. **Technical Specificity:** There is a critical demand for mastering the pronunciation and usage of specific machine components (e.g., shafts, bearings, gear ratios).
4. **Real-World Integration:** Students recommend "Professional Role-Plays" and "Authentic Simulations" that mimic industrial troubleshooting or client meetings.

#### 4.4 Pedagogical Implications and Contributions to ESP Practice

The findings have contributed to the field of vocational education by demonstrating that ESP for Mechanical Engineering must move beyond general English proficiency toward Contextualized Task-Driven Pedagogy. To address these results, the following concrete instructional strategies are suggested:

- **Scaffolded Task-Based Learning (TBL):** Teachers should implement simulations of "Equipment Troubleshooting Reports." By using a phased approach—pre-task (vocabulary building), task (the simulation), and post-task (feedback)—instructors can reduce the cognitive load reported by students.
- **Genre-Based Oral Training:** Rather than teaching general speaking, the curriculum should focus on the rhetorical organization of technical presentations. Providing "formulaic expressions" for describing machine functions can help students overcome disfluency.
- **Strategic Vocabulary Immersion:** To mitigate memory retrieval issues, instructors should utilize digital media and "Spaced Repetition" tools focused specifically on mechanical nomenclature.
- **Affective Support through Video Tasks:** Utilizing video-recorded presentations allows students to build confidence in a low-stakes environment before transitioning to spontaneous live interactions, directly addressing the fear of judgment identified in the interviews.

## DISCUSSION

The findings of this study provide a critical look at the specific communicative needs and challenges of mechanical engineering students in a vocational setting. In alignment with the

research objectives, the results demonstrate a sharp contrast between students' high professional aspirations and their current linguistic and psychological readiness.

#### **4.1 Interpretation of Professional Needs and Challenges**

The high perceived necessity for Technical Oral Presentations (82.6%) and accessing global research (79.6%) underscores a strong instrumental motivation among students. This confirms the assertions of Masaji (2020), Ferdian et al. (2022), and (Arar, 2022) that oral proficiency is now a non-negotiable requirement in the globalized industrial sector. However, the data reveals that the "proficiency gap" identified by Yacoub (2022) is not merely a lack of general English knowledge but a specific struggle to encode complex technical concepts into accurate English structures. This is evidenced by the fact that grammatical accuracy and the articulation of complex ideas (64.1%) were cited as greater hurdles than general anxiety. This indicates that students' struggles are rooted in the "encoding" process—bridging the gap between their technical expertise and the English structures needed to describe it. This finding extends the work of Yacoub (2022), suggesting that in vocational contexts, the challenge is specifically related to technical nomenclature and discourse management.

This study contributes new insights by highlighting the unique "cognitive-linguistic" barrier faced by vocational students—a group often overlooked in traditional ESP scholarship, which tends to be written-oriented or focused on general university contexts. Unlike generalized studies, this research identifies that for Indonesian polytechnic students, the challenge is deeply rooted in "memory retrieval" and "cognitive load" during spontaneous technical speech. This extends the work of (Tami et al., 2024) by pinpointing that these affective barriers are specifically triggered by the high-stakes nature of mechanical engineering tasks, such as explaining machine components or reporting equipment failures. Additionally, contrasting broader studies conducted in traditional four-year universities, this study highlights the ecological validity of the State Polytechnic of Subang context, where students must balance immediate industrial troubleshooting with academic requirements. The preference for Task-Based Learning (TBL) (70.9%) and Genre-Based Approaches (GBA) confirms a shift away from abstract grammar toward contextualized, practice-based methodologies.

#### **4.2 Practical Benefits and Pedagogical Implications**

The practical benefit of this research lies in its potential to align vocational ESP curricula with authentic industrial demands. Based on the findings, ESP instruction must shift from theoretical grammar to a Contextualized Task-Driven Pedagogy.

To implement this, teachers should adopt the following concrete strategies:

- A. **Scaffolded Task-Based Learning (TBL):** Use a three-phase simulation (pre-task vocabulary building, the troubleshooting simulation, and post-task feedback) to mitigate the cognitive load reported by students.
- B. **Genre-Based Oral Training:** Provide "formulaic expressions" specifically for technical descriptions (e.g., describing gear ratios or shaft mechanisms) to improve fluency and rhetorical organization.
- C. **Affective Anchoring through Video:** Implement video-recorded presentation tasks as a low-stakes precursor to live interactions, allowing students to build confidence and self-correct their pronunciation of specialized nomenclature.

## CONCLUSION

This research concludes that while mechanical engineering students at State Polytechnic of Subang recognize the critical importance of English for their future careers, they are significantly hindered by linguistic deficiencies and cognitive-affective barriers. The study successfully answered its objectives by identifying a high demand for technical oral genres—particularly presentations and technical descriptions—alongside a pronounced need for instructional methods that reduce cognitive load and performance anxiety.

The study lies in its focus on the micro-level lived experiences of vocational students, offering an "ecological validity" that generalized ESP research often lacks. For instructors and curriculum developers, these findings serve as a data-driven mandate to move away from general English toward highly contextualized, practice-based methodologies like Task-Based Learning (TBL) and the Genre-Based Approach (GBA). Broadly, the study implies that vocational higher education in Indonesia must integrate psychological support strategies—such as video-based self-correction—within technical language training to ensure graduates are truly industry-ready.

This study is limited by its focus on a single department and its reliance on self-reported data. Future research should employ longitudinal designs or objective performance metrics to measure the actual effectiveness of the suggested TBL and GBA interventions across multiple vocational disciplines.

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