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Needs-Based English Language Curriculum Innovation for Mechanical Engineering Students at Politeknik Negeri Padang

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Abstract

The effectiveness of English curriculum innovation in vocational higher education is largely determined by its alignment with students' academic and workplace needs, yet empirical studies in Indonesian polytechnic contexts remain limited. This study aimed to analyze the role of needs analysis as the basis for developing the English curriculum for students of the Mechanical Engineering Study Program at Politeknik Negeri Padang. A qualitative approach with a case study design was employed, involving Mechanical Engineering students and English lecturers selected through purposive sampling. Data were collected through curriculum document analysis, questionnaires, and semi-structured interviews, and then analyzed using thematic analysis. The findings show that students require English language competencies oriented toward the comprehension of technical texts, workplace communication, interpretation of mechanical documents, and basic technical writing, whereas the existing curriculum is still dominated by general English with limited integration of English for Specific Purposes (ESP) components. These findings affirm that systematic needs analysis is a crucial prerequisite for innovating vocational

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English curricula and provide practical implications for curriculum developers to design learning that is more contextual, relevant, and aligned with the demands of the Mechanical Engineering discipline and the world of work.

Keywords: Needs Analysis; Curriculum Innovation; English for Specific Purposes (ESP); Vocational Education; Mechanical Engineering

INTRODUCTION

The growing demand for English proficiency in vocational higher education has positioned English language instruction as a strategic component in preparing graduates for industry-oriented workplaces. In engineering disciplines, particularly Mechanical Engineering, English is essential for understanding technical manuals, operating instructions, safety regulations, and professional documentation, much of which is produced in English. In Indonesian polytechnic institutions, however, English courses are often designed using general English frameworks that do not sufficiently reflect the academic and occupational demands of vocational students. Recent studies in English language teaching and vocational education indicate that such misalignment may limit students' ability to transfer language skills to real workplace contexts(Richards, 2017; Nation, I. S. P.; Macalister, 2019). Despite increasing attention to curriculum innovation in ELT, research focusing on needs-based English curriculum development in polytechnic settings remains relatively limited.

From a pedagogical perspective, this issue warrants serious consideration because curriculum effectiveness is closely tied to learners' actual needs and learning contexts. ESP theory emphasizes that language instruction should be driven by learners' specific academic and professional purposes rather than by generalized linguistic objectives (Hutchinson, T.; Waters, 1987). In vocational education, where employability and practical competence are central goals, English curricula that fail to address discipline-specific communication needs risk becoming irrelevant and ineffective. Nation and Macalister (2010) further argue that needs analysis functions as the foundation of sound curriculum design, as it informs decisions related to learning goals, content selection, instructional strategies, and assessment practices. Accordingly, the absence of systematic needs analysis in curriculum planning may hinder meaningful curriculum innovation in vocational ELT.

Several previous studies have examined English language needs among engineering students, particularly within the framework of English for Specific Purposes. These studies

generally report that engineering students require English skills for reading technical texts, writing reports, and engaging in workplace communication (Arifin et al., 2020; Rahman, M. M., & Yulia, 2022). However, much of the existing literature focuses primarily on identifying language needs without sufficiently examining how these needs are translated into curriculum innovation. Moreover, research conducted in Indonesian higher education contexts tends to emphasize university-based programs rather than polytechnic institutions, which operate under distinct vocational mandates. Consequently, there remains a gap in understanding how needs analysis can be systematically integrated into English curriculum innovation for Mechanical Engineering students in polytechnic settings.

Addressing this gap, the present study offers a contextualized contribution by positioning needs analysis as a central mechanism for English language curriculum innovation in vocational higher education. Grounded in ESP theory and needs-based curriculum design models (Hutchinson, T.; Waters, 1987; Nation, I. S. P.; Macalister, 2010), this study moves beyond descriptive accounts of learner needs by critically examining their implications for curriculum goals, content organization, pedagogical approaches, and assessment practices. By situating the analysis within the context of Mechanical Engineering education at Politeknik Negeri Padang, this research contributes to the growing body of literature on vocational ELT and curriculum innovation, particularly in underrepresented polytechnic contexts.

Based on these considerations, this study focuses on examining the role of needs analysis in informing English language curriculum innovation for Mechanical Engineering students at Politeknik Negeri Padang. Specifically, it aims to analyze the alignment between students' academic and occupational language needs and the existing English curriculum, and to propose curriculum innovation directions that enhance the relevance and effectiveness of English instruction in vocational higher education.

METHODS

This study employed a qualitative research approach with a descriptive–interpretive orientation to explore the role of needs analysis in informing English language curriculum innovation within a vocational higher education context. A qualitative approach was considered appropriate because the study aimed to capture contextual, pedagogical, and experiential dimensions of curriculum development that cannot be adequately examined

through quantitative methods alone. By focusing on meaning, perception, and practice, this approach enabled an in-depth understanding of how English language curricula respond to the academic and occupational needs of Mechanical Engineering students.

The research adopted a case study design centered on the English language curriculum for Mechanical Engineering students at Politeknik Negeri Padang. This design allowed for a comprehensive and holistic examination of curriculum-related phenomena as they occur in a real institutional setting. The case study approach was particularly suitable for investigating the alignment between identified learner needs and existing curriculum components, including learning outcomes, content organization, instructional strategies, and assessment practices.

Participants in this study consisted of Mechanical Engineering students and English lecturers at Politeknik Negeri Padang who were directly involved in the English language teaching and learning process. Participants were selected using purposive sampling to ensure their relevance to the research objectives. The student participants represented different academic levels in order to capture a range of learning experiences, while the lecturer participants were selected based on their experience in teaching English within vocational and engineering contexts. This sampling strategy enabled the collection of rich and contextually grounded data related to curriculum needs and implementation.

Data were collected through multiple instruments to enhance the depth and credibility of the findings. These instruments included curriculum and syllabus document analysis, questionnaires, and semi-structured interviews. Document analysis was conducted to examine curriculum objectives, content structure, and assessment components of the English courses. Questionnaires were administered to students to gather information on their perceived English language needs and learning experiences, while semi-structured interviews with selected students and English lecturers provided deeper insights into curriculum practices, instructional challenges, and expectations for curriculum innovation. All data collection procedures were conducted ethically, with informed consent obtained from all participants.

The collected data were analyzed using thematic analysis, which involved systematic stages of data familiarization, coding, theme identification, and interpretation. This analytical approach was chosen because it facilitates the identification of recurring patterns and meaningful themes related to learner needs, curriculum alignment, and innovation

opportunities. To enhance the trustworthiness of the analysis, data from different sources were triangulated and interpreted in reference to established theories of English for Specific Purposes and needs-based curriculum design. The results of the analysis were then synthesized to address the research objectives and inform recommendations for English language curriculum innovation in vocational higher education.

RESULTS

The findings are organized into major themes that emerged from the thematic analysis of curriculum documents, questionnaires, and interviews with Mechanical Engineering students and English lecturers at Politeknik Negeri Padang. The presentation begins with the main findings, followed by supporting data.

1. Identified English Language Needs of Mechanical Engineering Students

The analysis revealed four dominant categories of English language needs among Mechanical Engineering students: technical reading comprehension, workplace communication, interpretation of mechanical documentation, and basic technical writing. Questionnaire responses indicated that a majority of students reported frequent difficulty when reading technical manuals, standard operating procedures, and machine specifications written in English. Interview data further confirmed that students encountered English most often in written technical forms rather than in conversational contexts.

Several participants explicitly stated that English was primarily needed during practical activities and industrial training. As expressed by P04 (Male, 20 years), *"Most English texts we use are manuals and instructions for machines, not daily conversation."* Similarly, P09 (Male, 21 years) noted, *"During internship, I had to read safety instructions and reports in English."*

Table 1 summarizes the frequency of reported English language needs based on questionnaire responses.

Table 1. Reported English Language Needs of Mechanical Engineering Students

English Skill Area	Frequently Needed	Occasionally Needed	Rarely Needed
Technical reading	High	Moderate	Low
Workplace communication	High	Moderate	Low
Mechanical document interpretation	High	Moderate	Low

English Skill Area	Frequently Needed	Occasionally Needed	Rarely Needed
Basic technical writing	Moderate	High	Low
General conversation	Low	Moderate	High

As shown in **Table 1**, technical reading and workplace communication were reported as the most frequently needed skills, while general conversational English was reported as less relevant.

2. Characteristics of the Existing English Curriculum

Document analysis of the English curriculum and syllabus indicated that the current curriculum places greater emphasis on general English components, such as basic grammar exercises, general reading passages, and non-technical vocabulary. The learning objectives predominantly focused on general language proficiency, with limited reference to discipline-specific outcomes related to Mechanical Engineering contexts.

Interview data from lecturers supported this finding. One lecturer (L02) stated that *"The syllabus still follows general English objectives, and technical materials are added only if time allows."* Questionnaire responses from students also indicated that learning materials were often perceived as insufficiently connected to their field of study.

3. Reported Mismatch Between Curriculum Content and Student Needs

Data analysis revealed a recurring pattern indicating a mismatch between students' reported needs and the content of the existing English curriculum. While students identified technical reading and mechanical documentation as priority needs, curriculum documents showed limited integration of authentic technical texts. Several students expressed that classroom materials did not adequately prepare them for English use during laboratory work or internships.

For example, P06 (Female, 19 years) stated, *"What we learn in class is different from what we find in the field."* This perception was consistently reported across participants from different academic levels.

4. Negative and Anomalous Findings

Although the majority of participants emphasized the importance of technical and vocational English skills, a small number of students reported that general English instruction was still useful, particularly for improving basic grammar and vocabulary. Two

participants (P02 and P11) stated that general English helped them build foundational language confidence before engaging with technical materials.

Additionally, one lecturer indicated that time constraints and large class sizes limited the extent to which technical content could be incorporated into English instruction. These findings represent variations from the dominant pattern and highlight differences in individual experiences and instructional conditions.

DISCUSSION

1. Analysis of the Findings

The findings of this study demonstrate a clear alignment between the research objectives and the identified English language needs of Mechanical Engineering students at Politeknik Negeri Padang. The predominance of technical reading, workplace communication, and interpretation of mechanical documentation as primary language needs indicates that English functions primarily as an instrumental and occupational tool rather than as a general communicative medium in this vocational context. This result directly addresses the research aim of examining how needs analysis can inform English curriculum innovation by revealing specific areas where the existing curriculum does not adequately support students' academic and professional requirements. The observed mismatch between students' needs and the general orientation of the current curriculum suggests that curriculum relevance in vocational higher education is strongly dependent on the extent to which instructional content reflects authentic disciplinary practices.

2. Comparison with Previous Studies and Theoretical Perspectives

The findings of this study are consistent with core principles of English for Specific Purposes, which emphasize that language instruction should be driven by learners' specific academic and occupational purposes (Hutchinson & Waters, 1987). Similar patterns have been reported in previous studies on engineering students, which identified technical reading and workplace communication as dominant English needs (Arifin et al., 2020; Rahman, M. M., & Yulia, 2022). However, while many earlier studies primarily focused on identifying learner needs, the present study extends this line of inquiry by explicitly linking identified needs to curriculum innovation in a polytechnic setting. In contrast to research conducted in university contexts, where broader academic English skills are often emphasized, the findings

of this study highlight the distinctive vocational orientation of polytechnic education, thereby contributing new contextual insights to the ESP literature.

3. Implications for Theory and Practice

The findings offer several important implications for both theoretical development and educational practice. From a theoretical perspective, this study reinforces the centrality of needs analysis within needs-based curriculum design models by demonstrating its practical relevance in vocational ELT contexts. The results support the argument that curriculum innovation should be grounded not only in pedagogical trends but also in systematic analysis of learner and workplace needs. From a practical standpoint, the findings provide empirical support for the integration of ESP-oriented content, task-based learning, and authentic materials into English curricula for Mechanical Engineering students. For polytechnic institutions, these implications suggest the need for closer collaboration between English lecturers, subject-matter experts, and industry stakeholders to ensure curriculum alignment with professional demands. Moreover, the findings can inform curriculum developers in revising learning outcomes, instructional strategies, and assessment practices to enhance curriculum coherence and relevance.

4. Research Limitations and Future Directions

Despite its contributions, this study has several limitations that should be acknowledged. First, the research was conducted within a single institutional context, which may limit the generalizability of the findings to other polytechnic or vocational settings. Second, the qualitative nature of the study, while allowing for in-depth exploration, does not provide quantitative measurement of the extent to which curriculum innovation influences learning outcomes. Future research is therefore encouraged to involve multiple polytechnic institutions and adopt mixed-method or longitudinal designs to examine the implementation and impact of needs-based English curricula over time. Additionally, further studies could explore the perspectives of industry partners to strengthen the alignment between vocational English instruction and workplace communication demands.

CONCLUSION

An examination of English language curriculum practices for Mechanical Engineering students at Politeknik Negeri Padang reveals a fundamental issue of curricular

alignment between instructional design and learners' academic as well as occupational needs. The findings indicate that English functions primarily as a vocational and professional resource, with students demonstrating a stronger demand for competencies related to technical reading, workplace communication, interpretation of mechanical documentation, and basic technical writing than for general communicative skills. However, the prevailing curriculum orientation remains largely centered on general English instruction, resulting in a structural gap between curricular intentions and the practical language demands encountered in academic training and industrial settings. This misalignment directly addresses the research objective and highlights the critical role of needs analysis as a guiding mechanism for curriculum innovation in vocational higher education.

Beyond addressing the immediate research context, this study offers several substantive contributions to the broader field of English language education and curriculum studies. At the theoretical level, the findings reinforce and extend needs-based curriculum design and English for Specific Purposes frameworks by demonstrating their relevance within polytechnic institutions, a context that has received comparatively limited scholarly attention. Methodologically, the study illustrates the value of integrating document analysis, learner perceptions, and instructor insights to generate a comprehensive understanding of curriculum effectiveness. From a practical standpoint, the study provides empirically grounded directions for curriculum developers and English lecturers to design ESP-oriented curricula that coherently align learning outcomes, instructional materials, pedagogical grammar, and assessment practices with the communicative realities of Mechanical Engineering education.

In light of these contributions, several directions for future research merit consideration. Subsequent studies should expand the scope of investigation to include multiple polytechnic institutions and diverse engineering disciplines in order to strengthen the transferability of findings. Longitudinal and mixed-method research designs are also recommended to examine the sustained impact of needs-based curriculum innovation on students' language development, workplace readiness, and employability outcomes. Additionally, incorporating systematic input from industry stakeholders would provide deeper insights into evolving professional communication demands and further enhance the responsiveness of English language curricula in vocational higher education.

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