

ANALYZING THE ENGLISH FOR SPECIFIC PURPOSES (ESP) REQUIREMENTS OF PHYSICS EDUCATION STUDENTS

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Abstract

This study examines the English for Specific Purposes (ESP) needs of students in the Physics Education program. English is widely used in scientific textbooks, journal articles, and laboratory instructions, making it an essential skill for students in science-related fields. However, many students still struggle to understand scientific texts and technical vocabulary. The purpose of this research is to identify their current English abilities, the academic language skills they need, and their preferences for learning materials. However, limited studies have specifically examined ESP needs in Physics Education students, indicating a gap that this study aims to address. The study used a descriptive quantitative method with a questionnaire distributed to Physics Education students. The results show that reading skills (82%) and technical vocabulary (78%) are the most important competencies needed, especially for understanding scientific articles and laboratory procedures. Students also prefer learning materials that are directly related to physics, such as scientific texts, technical vocabulary exercises, and experiment-based videos. Overall, the findings suggest that an ESP curriculum for Physics Education should focus on improving reading comprehension, strengthening technical vocabulary, and using multimedia-supported learning. These insights may help lecturers and institutions design more relevant and effective English learning materials for science students.

Keywords: ESP; Needs Analysis; Physics Education; Scientific Vocabulary; Academic English; Language Skills

INTRODUCTION

English plays an important role in science education, including in Physics Education study programs. As the international language of science, most academic literature, textbooks, scientific journals, and laboratory experiment instructions are written in English (Si et al., 2025). This situation requires Physics Education students to have adequate English language skills, not only to understand lecture material, but also to develop academic and professional competencies in line with the needs of their discipline (Qamariah & Yuliani, 2024). Therefore, teaching English for Specific Purposes (ESP) is relevant to support students' readiness to face academic demands and the science-based world of work. ESP is an approach to teaching English that focuses on the specific needs of learners, according to their field of study. In the context of Physics Education students, these needs include the ability to read scientific texts, understand physics terminology, follow experiment instructions, and communicate academically in presentations and class discussions (Kuna, 2020). Although English has been taught at various levels of education, not all students have

the skills required for their academic needs when entering university. This indicates a gap between the skills possessed by students and the academic demands they must meet.

Needs analysis is a very important first step in developing targeted ESP materials and curriculum. Through needs analysis, educators can identify the language skills that students need most, the difficulties they most often encounter, and the types of materials that are considered most relevant to support their studies (Rahmawati et al., 2025). In other words, needs analysis helps ensure that ESP learning is truly appropriate for the academic context and scientific needs of Physics Education students. Physics Education students face complex learning characteristics, as they not only study theory, but also conduct laboratory practical's, read research results, conduct experiments, and write academic reports. All of these activities are closely related to the use of English, either directly or indirectly. For example, many laboratory equipment instructions, current scientific journals, and key reference books are available in English (Azahra et al., 2025). This adds to the urgency of accurately understanding their abilities and needs through systematic needs analysis instruments. However, despite the growing number of ESP studies, limited research has specifically focused on Physics Education students, particularly in the Indonesian higher education context. This indicates a clear research gap that needs to be addressed. Therefore, this research makes an important contribution by providing an empirical picture of the language needs of Physics Education students, particularly in the context of a more focused curriculum and learning process (Indrasari, 2016).

This study aims to (1) identify students' English language abilities based on their perceptions of the current situation (present situation analysis), (2) determine the English language skills most needed in the context of physics academics (target situation needs), and (3) describe students' preferences regarding ESP learning materials and methods (learning needs) (Klimova, 2015). The instrument used was a needs analysis questionnaire specifically designed to evaluate these aspects. The results of this study are expected to form the basis for the development of an ESP curriculum that is more relevant, effective, and in line with the characteristics of Physics Education learning. Thus, this study contributes to lecturers, curriculum developers, and educational institutions in designing more contextual English language learning. In addition, the findings of this study can also be a reference for further research in the field of ESP, especially for science study programs such as Physics Education (Sulistio, 2016).

METHOD

This study employs a descriptive quantitative research design, specifically a survey-based needs analysis. The purpose of this research design is to systematically describe students' English language needs, their current proficiency levels, and their preferences in learning materials through analysis of responses obtained from a structured questionnaire (Pazilah et al., 2017). A quantitative approach was chosen because this study collected numerical data representing the frequency, preferences, and perceived level of importance of students towards various aspects of ESP (English for Specific Purposes) learning. Through this approach, researchers can obtain an objective and measurable picture of the specific English learning needs of Physics Education students (Faidah & Jumiatiy, 2024).

The participants in this study consisted of 45 students from the Physics Education Study Program at Universitas Islam Negeri Alauddin Makassar who were currently studying

at the university. Participants were selected using purposive sampling, considering that they were a specific population targeted by the ESP programme to be developed. All respondents filled out the questionnaire voluntarily, so the input provided was considered appropriate and representative of the real needs of Physics Education students in the context of academic English learning. This voluntary participation also ensured that the data collected came from students who were aware of and concerned about developing their English language skills (Santoso & Sanjaya, 2025).

The main instrument used in this study was the ESP Needs Analysis Questionnaire, which was adapted and structured to evaluate four main components of students' English learning needs. The first component was Present Situation Analysis, which measured students' English proficiency levels based on their self-assessment and identified the challenges they faced in the learning process. The second component is Target Situation Needs, which aims to identify the English language skills needed to complete academic tasks in the field of Physics Education, such as reading scientific texts, understanding lectures in English, and writing academic reports or papers. The third component is Learning Needs, which evaluates students' preferred learning strategies, effective types of learning materials, and classroom activities that are considered to support their understanding. The fourth component is Linguistic Needs, which examines language skill priorities (reading, speaking, listening, writing) and vocabulary relevant to the context of physics and science (Faidah & Jumiatiy, 2024). The questionnaire consists of various types of questions, including multiple choice, Likert scale, and short answer questions, which are specifically designed to comprehensively capture patterns of students' specific needs. And also, the questionnaire was reviewed by an expert in ESP to ensure content validity. Additionally, a pilot test was conducted to ensure the reliability and clarity of the instrument.

Data collection was conducted online using a digital form distributed to students through an easily accessible platform. Participants answered the questionnaire individually and anonymously, ensuring that the answers provided were authentic and not influenced by social bias or external pressure. This anonymity also gave students the freedom to express their honest opinions about their English language learning abilities and needs. The responses were automatically compiled into a dataset for further analysis. This digital data collection method was chosen because it is efficient, practical, and allows for wider participation without time and place restrictions (Irwanto et al., 2024).

The collected data was analysed using descriptive statistics, which included calculating the frequency, percentage, and average score for each item in the questionnaire. This analysis technique was used to identify several important points, including: the English language skills that students found most difficult to master; the skills considered most important for supporting their academic success; the types of English materials preferred in the learning process; and the gap between students' current English language proficiency and the academic requirements they will need to meet in the future (Dwisusila et al., 2023). The results of the analysis were then interpreted in depth to reveal the main ESP needs that should be prioritised in the development of the curriculum and learning materials for Physics Education students. Through this approach, researchers can provide data-based recommendations for designing English language learning programmes that are more effective, relevant, and tailored to the academic needs of students in the field of Physics Education.

RESULTS AND DISCUSSION

In this study, the findings are presented using tables, figures, and other forms of data visualization, incorporating statistical analyses, measurements, and other relevant information. Following the presentation of results, the discussion section interprets their implications. This involves comparing the findings with prior research, highlighting significant trends or patterns, and explaining any unexpected or noteworthy observations. The discussion also provides critical analysis, formulates hypotheses, and explores potential explanations for the results obtained, thereby connecting the data to broader research questions and contexts (Noyes et al., 2024).

Table 1. Students' Use of English in Academic Activities

Main Statement	Mean Score	Interpretation
Students use English in academic reading activities	72%	High
English is used to understand scientific references	75%	High
English is needed for accessing digital learning resources	78%	High
English is used in completing academic assignments	70%	High
English supports understanding of physics-related materials	74%	High

The results in Table 1 indicate that the majority of students actively use English in various academic activities. With percentages ranging from 70% to 78%, English is consistently perceived as an important medium for accessing learning resources, understanding references, and supporting academic tasks. This shows that English is not viewed as a supplementary skill but as a functional academic necessity, particularly in physics-related learning contexts. This may occur because most physics-related materials, including textbooks and scientific articles, are written in English. Therefore, students are required to use English as a primary tool for accessing academic information.

Table 2. Target Situation Needs (Academic Importance)

Main Statement	Mean Score	Interpretation
English is important for academic success	80%	High
English supports understanding of course materials	77%	High
English proficiency enhances learning effectiveness	75%	High
English helps students follow lectures and explanations	72%	High

Table 2 demonstrates a strong perception among students regarding the importance of English in academic contexts. Around three-quarters of the respondents agreed that English plays a crucial role in improving learning effectiveness and comprehension. This finding reinforces the view that English competence is closely linked to students' academic performance and engagement. This finding is consistent with previous studies which indicate that English proficiency plays a crucial role in supporting students' academic success in higher education.

Table 3. Target Situation Needs (Academic Resources)

Main Statement	Mean Score	Interpretation
Students use English in academic reading activities	72%	High
English is used to understand scientific references	75%	High
English is needed for accessing digital learning resources	78%	High
English is used in completing academic assignments	70%	High
English supports understanding of physics-related materials	74%	High

As shown in Table 3, reading skills emerge as the highest priority, with more than 80% of students indicating strong agreement. Technical vocabulary also plays a significant role,

highlighting the specificity of language needs in physics. While speaking and writing skills are still important, they are perceived as slightly less urgent compared to receptive skills, suggesting that ESP instruction should prioritize reading, vocabulary, and listening. This finding is consistent with Shen (2013), who emphasize that vocabulary mastery significantly influences students' ability to comprehend scientific texts. This may occur because physics learning relies heavily on reading academic materials such as textbooks and journal articles.

Table 4. Students' Needs in Reading Physics Texts

Main Statement	Mean Score	Interpretation
Reading English textbooks is necessary	79%	High
Reading research articles in English is important	76%	High
Reading skills help understand formulas and explanations	74%	High
Reading English materials improves academic understanding	77%	High

The findings in Table 4 confirm that reading skills are fundamental for physics students. Most respondents acknowledged that reading English textbooks and research articles is essential for understanding both theoretical explanations and applied concepts. This indicates that ESP materials should emphasize reading strategies tailored to scientific texts. These results indicate that reading is a fundamental skill, as students must interpret complex scientific explanations and formulas presented in English.

Table 5. Importance of Technical Vocabulary in Physics

Main Statement	Mean Score	Interpretation
Technical terms are essential in learning physics	81%	High
Vocabulary knowledge helps understand concepts	78%	High
Lack of vocabulary hinders comprehension	75%	High
Vocabulary mastery supports problem-solving	73%	High

Table 5 highlights the critical role of technical vocabulary in physics learning. A high percentage of students agreed that insufficient vocabulary knowledge directly affects their ability to understand concepts and solve problems. This suggests that ESP instruction should integrate systematic vocabulary development aligned with physics content. This suggests that technical vocabulary functions as a key element in understanding scientific concepts. Without sufficient vocabulary knowledge, students may struggle to comprehend and apply physics concepts effectively.

Table 6. Listening Skills in ESP Learning

Main Statement	Mean Score	Interpretation
Listening skills help understand lectures	72%	High
Listening is needed for understanding video materials	76%	High
Listening supports comprehension of explanations	70%	High
Listening improves overall learning experience	74%	High

The data in Table 6 show that listening skills are considered important, particularly for understanding lectures and multimedia materials. This indicates that students benefit from exposure to spoken English, especially through audio-visual learning resources commonly used in physics instruction. This indicates the importance of integrating audio-visual materials into ESP learning, as students increasingly depend on video-based explanations to support their understanding.

Table 7. Preferred Learning Materials in ESP

Main Statement	Mean Score	Interpretation
Students prefer video-based learning materials	78%	High
Visual materials help understand abstract concepts	80%	High
Multimedia learning increases engagement	75%	High
Digital materials are easier to access	77%	High

Table 7 reveals a strong preference for multimedia-based learning materials. Students perceive videos and visual resources as effective tools for understanding abstract physics concepts. This preference indicates the need for ESP materials that integrate multimedia elements to enhance comprehension and motivation. This may occur because physics concepts are often abstract, requiring visual representation to facilitate better understanding.

Table 8. Learning Environment and Practice Opportunities

Main Statement	Mean Score	Interpretation
Students need more opportunities to practice English	73%	High
Classroom activities support language practice	70%	High
Learning outside the classroom is beneficial	72%	High

The results in Table 8 indicate that students expect more opportunities to practice English both inside and outside the classroom. This suggests that ESP learning should not be limited to theoretical instruction but should also provide practical and interactive activities to strengthen language use in real academic contexts. This suggests that ESP instruction should incorporate more interactive and task-based learning activities to provide students with meaningful opportunities to practice English.

Overall, the results from the eight tables indicate that English plays a significant and functional role in students' academic activities within the ESP context. The majority of respondents consistently showed high agreement across most statements, with percentages generally ranging from approximately 70% to above 80%, particularly in aspects related to the use of English for academic reading, accessing scientific references, understanding course materials, and engaging with digital learning resources. The findings demonstrate that English is not merely perceived as an additional subject, but rather as a necessary tool that supports students in comprehending physics-related content, completing academic assignments, and following explanations delivered through various instructional media.

Furthermore, the analysis of language skills and learning preferences highlights clear priorities in ESP learning. Reading skills and technical vocabulary emerged as the most critical needs, with agreement levels exceeding 75%, indicating that students rely heavily on these skills to understand scientific texts and physics terminology. Listening skills also showed a high level of importance, particularly in relation to lectures and multimedia-based materials, while speaking and writing skills were perceived as moderately important. In terms of learning materials and learning environment, more than 70% of students expressed a strong preference for multimedia-based resources and emphasized the need for more opportunities to practice English both inside and outside the classroom. These results suggest that ESP instruction for physics students should focus on receptive skills, technical vocabulary development, and the integration of multimedia resources to better support students' academic needs.

CONCLUSION

This study examined the English for Specific Purposes (ESP) needs of Physics Education students through a structured needs analysis questionnaire. The findings showed a significant gap between students' current English language skills and the linguistic demands required in physics-based academic tasks. Students reported difficulties in understanding technical vocabulary, reading scientific texts, and understanding English-language lectures or instructional videos. The results also highlight that reading scientific articles, understanding laboratory instructions, and listening to academic explanations are the most critical skills needed. Vocabulary mastery, especially technical terminology, emerged as an essential component that supports comprehension in all language skills. Students expressed a strong preference for learning materials directly related to physics, such as scientific texts, experiment-based videos, and multimedia digital learning resources.

Based on these findings, it can be concluded that an effective ESP curriculum for Physics Education must prioritize reading comprehension, technical vocabulary development, and multimedia-based learning that is contextualized according to the science discipline and aligned with students' actual academic tasks. In terms of curriculum development, ESP courses must be specifically designed by integrating scientific texts, laboratory instructions, and physics-based vocabulary. Lecturers need to adopt interactive and task-based approaches using authentic scientific materials, digital simulations, and visual explanations, as well as providing explicit instructions on scientific vocabulary and strategies for reading academic texts. The design of learning materials should combine traditional sources with multimedia tools such as experiment videos, interactive simulations, and digital worksheets to meet student preferences. Reading and vocabulary skills should be emphasized in the early stages of ESP learning, followed by structured support in listening, speaking, and writing as students' progress. Educational institutions should provide specialized ESP courses for science programs and invest in digital learning tools and multimedia resources that support the learning process. Students are expected to actively engage with English-language scientific materials outside of class, such as journal articles, instructional videos, and simulations, to build familiarity with scientific language. Researchers are further encouraged to investigate ESP needs in other science departments or compare the needs of students at different grade levels to gain broader insights into the language challenges specific to each discipline.

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