EXPLORING ENGLISH NEEDS OF ENGINEERING STUDENTS IN A VOCATIONAL HIGHER EDUCATION INSTITUTION: A NEED ANALYSIS

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Abstract: Need analysis is an initial step in designing a course. At this stage, what students really need to learn is investigated and analyzed so that the course can be well-designed and planned. This study aimed to investigate (1) what language skills, (2) what vocabulary topics, (3) what structures, and (4) what method of learning were needed in the English course in the coal mining engineering department. A triangulation method is used to obtain a comprehensive description of what mining engineering students' English needs are. The current students, content lecturers, and professionals are the participants of this research. The instruments are a questionnaire (for students), a focus group discussion (for lecturers), and an interview (for professionals). This quantitative-qualitative study uses a descriptive approach in presenting its findings. Based on findings, four English skills should be integrated; the implementation of the four skills and glossary in context should be in line with its area of expertise, the structure of English should be given at the basic level, and L1 should be involved as the medium of instruction.

Keywords: English for specific purposes, mining engineering, needs analysis

INTRODUCTION

Vocational higher education aims to prepare graduates with both hard and soft skills. Not only to master hard skills in their field, vocational students are also required to sharpen their communication skills using the international language, English, to have greater employment

opportunities and higher long-term income (Barrera-Osorio et al., 2020).

English learning in vocational institutions should be more practical and designed based on what students need, rather than emphasizing mostly grammatical rules. English for vocational communication is usually taught very specifically through an English for Specific Purposes course. ESP was born naturally after World War II. Many fields, such as science, engineering, economics, medicine, and business, grew massively, which then triggered the existence or need of a specific English learning design for those different majors (Hijuelos-Cruz et al., 2020; Hutchinson & Waters, 1987). This course should be designed by customizing it with learners' orientation, more realistic communicative drill, and specific contents such as vocabulary, reading, and listening related to the field (Fitria, 2020; Phillips & Shettlesworth, 1978; Richards, 2001). It is, therefore, very reasonable to state that designing an ESP course must be initiated with conducting a needs analysis to identify what ESP learners need from learning English in their ESP class (Brown, 2016; Richards, 2001; Widodo, 2017).

Need analysis (NA) has been a cornerstone in English curriculum and material development for years, particularly within the field of ESP (Dick et al., 2004; Widodo, 2017). Accordingly, ESP practitioners must undertake a sequence of activities before teaching, which include conducting learners' NA, designing a course syllabus, developing authentic teaching materials, delivering the instructions, and conducting assessment (Baştürkmen &

Bocanegra-Valle, 2019). In a broader process of curriculum design, needs analysis constitutes the initial stage, which plays a very critical role in developing a well-designed ESP course (Alsamadani, 2017). It facilitates the alignment of learners' needs with the syllabus design, material selection, and pedagogical strategies. Nevertheless, this stage must be well-planned and systematic to provide valid and reliable information (Brown, 2016).

The current English curriculum in the Coal Mining Engineering Study Program of Politeknik Akamigas Palembang was not developed through a sequence of instructional design process. Considering the fact, this study was conducted as an initial stage of developing a new curriculum of ESP. In addition, this study became the basis for developing an English textbook for coal mining engineering students.

English for Specific Purposes (ESP) refers to an approach in ELT that is designed to meet the needs of learners for real communication that will support their future career (Anthony, 2018; Brown, 2016; Woodrow, 2018). Post World War II was the beginning era of ESP due to the massive advancement of technology, economy, social, medical, and energy sectors, and it is closely related to vocational education, which is affected by the dynamic circumstances of ELT pedagogical strategies (Hutchinson & Waters, 1987; Kirkgöz & Dikilitaş, 2018).

Anthony (2018) proposes three principles of ESP: it is learner-centered, covers multidisciplinary, and combines theories and practical

implementation. In the sense of course content, ESP has a smaller scope than general English and is a more work-or-study-related course (Basturkmen, 2010). In vocational higher education institutions (HEIs), the English course or subject is on the track of ESP rather than GE (general English).

In instructional design theory, NA is the starting point (Dick et. al., 2004). This is reasonable, as to design effective instructions or materials for teaching, the teacher must first know what students really need. Primarily, an ESP course should be designed based on learners' needs, rather than language analysis, to have a lasting impact (Hutchinson & Waters, 1987; Richards, 2001). NA in ESP is a structured process of identifying learners' language demands, viewed through democratic, discrepancy, analytic, and diagnostic perspectives (Songhori, 2008; Brown, 2016; Anthony, 2018). In analyzing students' needs, NA questions serve as the references which then undergo eleven analyses, which are target-situation use analysis, target-situation linguistic analysis, target-situation learning analysis, present situation analysis, gap analysis, individual-differences analysis, rights analysis, classroom-learning analysis, classroom-teaching analysis, means analysis, and language audits (Brown, 2016). Stakeholders in need analysis can refer to students, teachers/lecturers, administrators, future employers, parents, policy makers, content specialists, government, and many more (Richards, 2001; Brown, 2016; Anthony, 2018).

NA research trends have switched focus to technology-enhanced learning, varied material, and holistic stakeholder involvement through a triangulation approach, important gaps remain in terms of professional involvement and teaching resources (Musrina et.al, 2024). Fatmawati (2017) highlighted the mismatch between students' awareness of the importance of English communication and the lack of engaging, discipline-specific materials in vocational high schools. Alsamadani (2017) investigated English needs in engineering programs but limited the analysis to prioritizing language skills without offering a comprehensive account of students' specific needs, materials, and preferred learning approaches. Similarly, Nasmah (2018) found that ESP materials only partially addressed students' disciplinary requirements, yet the study did not consider methodological preferences or classroom practices. Collectively, these studies emphasize the necessity of tailoring ESP to learners' contexts but leave unanswered questions about the integration of language skills, grammar, vocabulary, and pedagogical strategies in vocational higher education. NA studies on ESP at the engineering department, especially in Indonesia, mostly involve undergraduate students, paying less attention to mining engineering in a vocational education setting (Musrina et. al., 2024), particularly on coal mining engineering which has no record in it. Furthermore, for the sake of effectiveness and industry-demand orientation, institutions are urged to collaborate with industry in

developing ESP courses (Changpueng & Pattanapichet, 2023). Addressing this gap, the present study explored the English needs of coal mining engineering students in a vocational higher education institution, aiming to provide a more holistic basis for curriculum and material development through investigating what language skills, grammatical aspects, vocabulary, and teaching methods that the coal mining engineering students need in their ESP class.

METHODOLOGY

This study was a mixed-methods research conducted at Politeknik Akamigas Palembang, specifically in the Coal Mining Engineering study program. This study analysed coal mining engineering students' needs for English skills, grammatical aspects, and vocabulary topics. To obtain a detailed and comprehensive explanation of the research, a triangulation method was employed in this study. This section includes research design, data collection instruments, participants/sample, procedure of data collection, and data analysis. The participants of this research were from three different groups, namely Coal Mining Engineering students, Coal Mining Engineering lecturers at Akamigas Polytechnic of Palembang, and some professionals from coal mining industries, including some alumna of the study programs.

Three different kinds of instruments were utilized in this research, namely focus group discussion for content lecturers, a questionnaire for students and an interview for the professional group.

A questionnaire for students was taken from a ready-made needs analysis questionnaire by Aliki et al. (2021). The questionnaire was tried out first before it was used with the participants. The questionnaire was tried out with 32 participants from the same college, but with different majors. The validity of the questionnaire was analyzed using Pearson Correlation. All try-out data were analyzed using SPSS.

Table 1
Questionnaire Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of items
.796	.768	41

Based on the analysis results, the Cronbach's Alpha value was 0.796. According to Cohen et al. (2007, p. 506), the instrument is reliable if the value of alpha is between 0.7 and 0.79. Thus, it indicated that the questionnaire was reliable.

The validity of the questionnaire was also analyzed to ensure that the questionnaire was valid for the participants. There were forty-one items in the questionnaire asking the students about learning style, learning strategy, and aptitude. Background information item, however, was not included as the items whose validity was tested. Out of 41 items of the questionnaire proposed, 21 were not valid as the significance value was > 0.05. Therefore, those items were removed from the questionnaire.

In conclusion, the questionnaire obtained a Cronbach's Alpha value of 0.796 in the reliability analysis. Based on the Pearson Correlation analysis, the critical value for degrees of freedom of 30 (N-32) with the significance level 0.05 was 0.349. Therefore, the items whose values

were higher than 0.349 were considered valid. Thus, according to the data analysis results of validity and reliability, the questionnaire was categorized as valid and reliable.

The data were obtained from the focus group discussion, questionnaire, and interview. The method of data analysis referred to thematic analysis by referring to Clarke and Braun (2013) which undergo (1) data classification (familiarization with data), (2) categorizing dataset (generating initial codes), (3) classifying the language skills and aspects (searching for themes), (4) studying the skill and aspects of English (reviewing themes), (5) identifying and labelling the skills and aspects (defining and naming themes), and (6) interpreting the findings and drawing conclusions (writing the report). The questionnaire will have open-ended questions, and the answers to the questions will be analyzed to draw a comprehensive conclusion. An interview was conducted with some professionals from several coal mining companies via Zoom Apps, and the meeting was recorded and it was transcribed. The data analysis was described in the findings of the study.

Quantitative data from the student questionnaires were analyzed using descriptive statistics to identify the most frequently needed language skills, vocabulary items, grammatical aspects, and preferred classroom activities. These statistical results provided an overview of general trends among coal mining engineering students.

Based on these results, semi-structured interviews with selected

professionals from mining were conducted and analyzed thematically to gain insights into the relevance of English for workplace communication and to validate or challenge the student-reported needs. The datasets were then integrated by comparing convergent findings (e.g., both sources confirmed the importance of technical vocabulary), divergent findings (e.g., differences between students', lecturers', and professionals' views on the priority of language skills), and expanded findings.

Through this process, the quantitative data offered breadth across the student cohort, while the qualitative data provided depth and contextual explanation, resulting in a more comprehensive understanding of the English needs of coal mining engineering students.

RESULTS AND DISCUSSION

A total of 49 students across different semesters completed the questionnaire via Google Form. Many respondents were second-semester students (69.4%), followed by those in the sixth semester (24.5%) and fourth semester (6.1%).

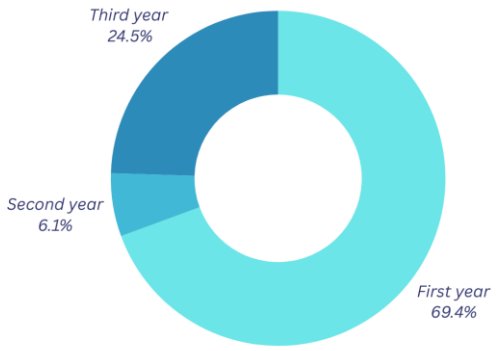

Chart 1. Participants' Groups

The questionnaire comprised five sections: background information (Items 1–4), motivation (Items 5–6), learning style (Item 7), learning strategy (Item 8), and aptitude (Items 9–26). Reliability testing produced a Cronbach's Alpha value of 0.772, indicating acceptable internal consistency. Approximately one third

(30.6%) had taken English courses outside the campus, whereas most had not. Nonetheless, almost all participants (93.9%) had prior experience taking an English test.

Table 2
English Learning and Test Experience

Questionnaire	Response	
	Yes	No
Do you study English outside of campus?	30.6% (15)	69.4% (34)
Have you taken an English test before?	93.9% (46)	6.1% (3)

Learners' Perception

Motivation is one of the key issues in learning as it can affect learners' performance and achievement in learning (Redondo & Martin, 2015; Vero & Puka, 2017). As shown in Table X, most students reported instrumental motivation, with nearly half (49%) learning English for better job opportunities and 46.9% recognizing its status as an international language. Fewer students mentioned integrative or personal reasons, such as understanding movies, songs, or stories in English or travelling.

Table 3
Learner's Motivation

	Responses
a. Better job opportunities	49%
b. English as an international language	46.9%
c. Understanding songs/ movies/articles	16.3%
d. Others	12.2%

Speaking of the topic of coal mining preferred by the participants, the topic of mining technology was the most preferred one, with 49% of the participants. Up next were work health and safety (42.9%), heavy equipment (24.5%), environment (20.4%), mining method (18.4%), human resources (14.3%), and geology (6.1%).

Table 4
Favorite Topics

Choose your favorite topics	Response
Mining Technology	49% (24)
K3 (Occupational health and safety)	42.9% (21)
Human Resources	14.3% (7)
Environment	20.4% (10)
Mining Equipment (Heavy Equipment)	24.5% (12)
Geology	6.1% (3)
Mining Method	18.4% (9)
Total respondents	49 students

As shown in Table 5, many of the learners preferred bilingual learning (96%) rather than L1 (2%) or L2 only (2%).

Table 5
Style and Strategies Statistics

Style	Frequency	Percent
Full English	1	2.0
Indonesian and English	47	96.0
Indonesian	1	2.0
Strategies		
Individual	8	16.3
Pair	10	20.4
Group	24	49.0
Whole class	7	14.3
Total	49	100.0

Nearly half of the participants chose working in a group (49%), followed by pair work (20.4%), individual work (16.3%), and whole class (14.3%).

Next, the participants were asked about their aptitude in listening, speaking, reading, writing, grammar, and vocabulary. The results can be seen in Table 6.

Table 6
Aptitude Statistics

	Mean
Listening	3.5510
Speaking	3.4082
Writing	3.2449
Grammar	3.3061
Spelling	3.4082
Vocabulary	3.1633

As shown in Table 8, being asked how often they found difficulties in writing, speaking, spelling, vocabulary, grammar, and listening, most of the participants agreed to be in the 'sometimes' position. It indicated that most of the students have difficulties in all areas mentioned above. Then, in reading main ideas in a text, the participants agreed that they sometimes read the text quickly to get the main idea or general overview of a text. This activity is called skimming. However, when it comes to comprehending detailed information in a text, students usually tend to read slowly.

This might be because students need to generate the information by translating it into their first language.

Table 7
Reading Statistics

		Main Idea	Detail Idea
N	Valid	49	49
	Missing	0	0
Mean		3.0408	3.7347
Median		3.0000	4.0000
Std. Deviation		.93450	.93040
Variance		.873	.866

The next part of the questionnaire is about how the participants used English in the class. This part of the questionnaire asked about how English was used in the class, speaking anxiety, and difficulties. Here are the results.

Table 8
Language and Speaking Statistics

		English usage	Speaking Anxiety	Speaking Difficulties
N	Valid	49	49	49
	Missing	0	0	0
Mean		2.7551	3.3673	3.5306
Median		3.0000	4.0000	4.0000
Std. Dev.		.75085	1.26974	.95964
Variance		.564	1.612	.921

The results indicated that the students were not accustomed to using English in their daily classes, as they sometimes used English in class. It was found that they were reluctant to speak English in class due to difficulties in speaking English.

Talking about students' vocabulary and pronunciation, the results were similar. Learners agreed that they sometimes had difficulties with vocabulary and pronunciation.

Table 9
Vocabulary and Pronunciation Statistics

		Pronunciation	Vocabulary
N	Valid	49	49
	Missing	0	0
Mean		3.2245	3.2653
Median		3.0000	3.0000
Std. Deviation		1.02602	.99531
Variance		1.053	.991

Lecturers' perception

A focus group discussion with the content lecturers was conducted to discuss what lecturers wanted their students to learn from their English classes. Simply, the lecturers gave their opinion about what English materials students should learn to

support their academic success. Five out of eight content lecturers attended the FGD. They taught main content courses in the study program, such as geology, introduction to mining, engineering drawing, and many more.

The lecturers shared the same opinion in terms of what vocabulary set the learners should learn, mining-related lexical. Even one lecturer mentioned a very specific vocabulary set.

Q: What vocabulary should be taught to mining engineering students, especially coal mining engineering?
L4: Mining terms; overburden, interburden, cross fall, side cast, slope stability, bench, double bench, crest, toe, low wall, high wall, sub crop, side wall, mine out, test pit,

The lecturers also agreed that students should learn grammar, which includes common tenses that support learners in discussion and presentation. Talking about listening and speaking skills, learners were also expected to be able to communicate confidently in a simple or daily conversation, such as a presentation, discussion, etc.

As for reading, learners are expected to read beyond common or general texts. Most lecturers agreed that students should also be able to read scientific articles related to mining from research journals. Finally, students are also expected to be able to write a report, at least a simple one, and a simple business letter.

When discussing the mining of authentic resources, not all participants explicitly mentioned the titles of the books. They just mention general topics of resources such as coal handling, coal combustion, stockpile management, and mining dictionaries.

To sum up, the FGD of content lecturers agrees on some points.

Students should master simple grammatical structures used in daily communication and specific vocabulary related to coal mining. Next, the scientific article reading text should be familiarized with the students, even though it is presented in a brief and straightforward form. In writing, students should be able to write simple business letters or emails and reports. All lecturers agree that materials should be sourced from authentic resources, such as mining books, articles, journals, magazines, and dictionaries.

Professional Perception

Among several alumnae who were asked to participate in an interview, only one alumna was willing to do so. The participant was an alumnus of the study program who works in a state-owned company as a surveyor. Several questions related to the needs of English in the workplace. The interview was scripted

Q: Please order the English skills based on their importance in your job sector.
A: In my opinion, under my circumstances, I think the most important skill is writing because reporting uses English. Then reading, speaking, and listening. I think speaking and listening are not prioritized, as here (in the mine site), workers are mostly locals. But in the marketing division, speaking and listening are good to develop, as most of our buyers are from abroad and use English.

From the interview, it is known that the importance of skills such as listening, speaking, reading, and writing is different according to the position in the company. In my site of national or local companies, writing was essential as workers usually write their reports in English. Listening and speaking were less practiced as most workers are locals. On the other hand, people in other divisions, such as marketing and managerial, seem to need to speak more often while they

meet buyers and have meetings with the board of directors.

Another question asks about what kinds of vocabulary topics should be taught. Here is the result:

Q: What kind of topic in mining must students master?
A: A good topic to learn is the application of new technology in mining because some of the technology that we use here is already applied abroad, and the manuals are in English. Safety signs are also important, but they can be easily understood by looking at pictures without understanding the writing on them. Words such as fatigue and microsleep are also important. Other typical words such as undercut, overcut, cut and filling, bench, slope, and gradient or grade, and slippery
.

According to the interviewee, vocabulary related to the latest equipment used on the mine site is important as the manuals are written in English. This might be related to heavy equipment manuals such as bucket wheel excavators, high dump trucks, electronic distance measurement (EDM) instruments, total stations, global positioning system (GPS) devices, automatic levels, etc. Surprisingly, the topic of safety signs seems very important, but it was not necessarily as the pictures in the signs help people understand the meaning.

The interview concluded that all skills should be learned in the same proportion, but the materials should be adjusted according to how they are typically used in the workplace. Then the vocabulary topics should include more recent terms in technology and mining.

This needs an analysis study to generate some findings based on the triangulation of participants. Many students agree that their English learning motivations are to have better career opportunities in their future and to communicate with global citizens using the most-

recognized international language. This aligns with findings from a study by Nguyen (2019) that recognition and employability are the main motivations of vocational graduates. Students are also aware that English proficiency can open a broader professional network and increase their professional job opportunities on a global scale (Klimova, 2011). To be a professional, an engineer should be able to communicate effectively in English with clients from different countries and fields and academic backgrounds due to the demand of globalization (Badawy & El Banna, 2023; Shrestha et al., 2015).

Secondly, when it comes to vocabulary, discipline-related lexical knowledge, especially the latest technology, occupational health and safety, and others relevant to engineering, are, of course, preferred by the engineering students. Other topics such as human resources, geology, environment, and mining equipment are also important. Furthermore, students should also be familiar with mining terms such as overburden, interburden, crossfall, sidecast, slope stability, bench, double bench, crest, toe, low wall, high wall, subcrop, side wall, mine out, and test pit. Topics in the learning sources should include the newest fields in engineering so students' knowledge corresponds to the advancement in their respective field (Badawy & El Banna, 2023).

All language skills are important to learn in the English subject in an engineering department. Speaking and listening are seen as the most important skills to support daily communication in the workplace. Writing is also an essential skill, as

students and workers in the engineering field often need to prepare reports. Additionally, students are expected to comprehend discipline-related texts, such as manuals, reports, and other documents written in the English language.

While often perceived as a barrier, grammar was still recognized as essential, particularly for written communication (Afrin, 2016; Van & Habok, 2023). Most writing mistakes that students often make are spelling, tenses, subject-verb agreement, punctuation, numbers, pronouns, articles, capitalization, etc. It is, therefore, for non-English major students, basic grammatical remains very reasonable to study. This is to equip them to communicate in English effectively, especially in writing (Shen, 2012). Due to students' problems in grammar, teaching grammar should be more engaging, and activities in learning grammar should be varied and fun to maintain students' attention and enthusiasm. Students still need to interact through various engaging activities, such as collaborative tasks and game-based exercises, during a grammar learning session.

Lastly, many students agree that the language of instruction in their English class should not only use English. The use of English only in the class can stress students, especially those with low proficiency in English. From the findings, the students prefer to have their L1, Indonesian, and English used together in their English classes. This confirms other research findings that students and teachers have a strong preference for having English and L1 as the

medium of instruction, which means that the combination of English as the target language and Indonesian as the students' L1 is assumed to be the best option to be implemented in the ELT classroom (Effendy & Fahri, 2019; Lestari, 2023). The use of L1 in giving instruction, concept checking, and explaining patterns helps students to understand what teachers deliver. Effendy and Fahri (2019) further stated that the use of L1 benefited the learning objectives in that it aids the students' comprehension of the materials, the learning becomes more effective, especially in explaining difficult concepts and complex grammar points, and it helps students feel more comfortable during the learning activities. Liando et al. (2023) strengthened the view that using the mother tongue in the classroom contributes to understanding complex grammar rules, lengthy instructions, and vague vocabulary or phrases, thereby ensuring students' comprehension and providing more opportunities for students to express their ideas.

Furthermore, since the students and the teacher share the same L1, the usage of L1 in the EFL classroom creates an easy atmosphere for students and teachers to communicate and to acquire a better connection between the teacher and the students (Anindya et al., 2022)

CONCLUSION

This study identified the needs of English learners from coal mining engineering programs in a vocational higher education institution. This triangulation study revealed some findings. First of all, learners are motivated to learn English for better

career opportunities and global communication. All four language skills are essential. Speaking and listening were prioritized for workplace interaction, while writing and reading were necessary for reporting and interpreting technical materials. Vocabulary topics should be related to disciplinary context, such as modern mining technology, occupational health, and safety. Grammar remained a challenge yet was acknowledged as crucial, particularly in writing, and students strongly preferred bilingual instruction to support comprehension and reduce anxiety.

This study might represent the English needs of mining engineering students in the level of vocational college, but not mining engineering students in general or higher level of study. Also, the involvement of industry professionals was not optimal. Thus, future studies are expected to have broader participant engagement, especially from the industry and government officials.

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