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ENGLISH COMMUNICATION NEEDS OF PROFESSIONAL ENGINEERS AND THE RELEVANCE OF ENGLISH LANGUAGE TRAINING IN HIGHER EDUCATION

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ABSTRACT

Understanding the use of English in the workplace is essential for developing effective English language education programs in Higher Education Institutions (HEIs). However, workplace language needs are still understudied, particularly in Vietnam. Therefore, this paper reports on part of a task-based needs analysis research project carried out by a Vietnamese university to improve its institutional English language education programs to effectively prepare students for employment. In particular, it investigates the tasks undertaken in English by professional engineers in the workplace and the relevance of English language education at HEIs for addressing those communicative needs. The data were collected using two parallel versions of a needs analysis questionnaire delivered to 291 professional engineers and 40 employers and backed up by interviews with 39 of the engineers. Results identify 30 workplace tasks that professional engineers frequently dealt with in English, indicating a discrepancy between those identified workplace requirements and the English language training at HEIs, and providing practical suggestions to improve engineering students' readiness for employment. This paper provides useful information for researchers and practitioners interested in improving the effectiveness of English language education for professional purposes at HEIs in Vietnam and possibly across the Asia-Pacific region.

Key Words: English for Engineering, workplace, task-based needs analysis

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INTRODUCTION

Globalization and the resulting rise of multinational corporations have expanded the use of English in more disciplines, in more places, and by more people, becoming the world's first global language (Northrup, 2013). As the lingua franca of business, science, and technology, English is pervasively used in diverse workplaces not only by native English speakers but also by those who speak English as a second or additional language (Hee & Zainal, 2018; Mauranen, 2018; Panero, 2017; Seidlhofer, 2005). As a result, developing students' English language competence to meet workplace requirements has become one of the main objectives of Higher Education Institutions (HEIs) in non-native English-speaking countries (Chan, 2021; Muhammad, Kamil & Druckman, 2021), including Vietnam (Vietnamese Government, 2008, 2017). In order to realize the objective of developing graduates' English competence for workplace communication, it is necessary to investigate the use of English in diverse workplaces to inform the design and development of English language courses and curricula, especially English for Specific Purposes (ESP) courses at HEIs. However, similar to the situations reported in several research studies (Nezakatgoo & Alibakhshi, 2014; Yatroon, 2020), in Vietnam, the design of ESP courses and programs is based largely on English teachers' intuition and experience in developing teaching materials or on selecting or adapting commercial textbooks to define the teaching content and methods (Lam, 2011; Tran et al., 2019). Limited research has been conducted to investigate the need for English language in the workplace in Vietnam. Thus, this paper reports on part of a task-based English language needs analysis project conducted by a Vietnamese university to improve the alignment between university English language education and workplace requirements. In particular, it investigates the workplace tasks that professional engineers in five professional areas - Mechanics, Automobiles, Information Technology, Electrics, and Electronics - often deal with in English. It also explores the engineers' opinions on the relevance of the English language education provisions at Vietnamese HEIs to their workplace needs and their suggestions for improving such provisions to better

prepare undergraduate students for employment.

LITERATURE REVIEW

English for Specific Purposes and Task-based Needs Analysis

English for Specific Purposes (ESP) is a language teaching approach that aims to meet the specified needs of particular groups of learners (Dudley-Evans, 1998; Hutchinson & Waters, 1987). Different from English for general purposes, which is language-centred and deals with the development of general English language capacity, ESP is learner-centred and relates to specific disciplines or professions. Given the aim to develop the English competence of a particular group of learners who need to use English in specific academic and workplace settings, assessing learner needs is "the cornerstone" (Alibakhshi et al., 2022, p.59) and a "prominent distinguishing feature" (Belcher, 2006, p.135) of ESP. In addition to information about the background and characteristics of learners, collecting information about what learners have to be able to do in English in the target contexts where they study or work - learner target needs analysis - is a crucial step in effective ESP course design and development (Lambert, 2010).

Task-based needs analysis (TBNA) is an approach to learner target needs analysis that identifies communicative needs in terms of the tasks learners need to be able to do to function effectively in the target contexts (Dousti & Alibakhshi, 2019; Long, 2005). The employment of tasks as a unit of analysis is considered to be valid both conceptually and pedagogically in ESP course design (Lambert, 2010). In regard to concept, it is easier for professionals and specialists in the field to understand and describe their use of English in terms of the tasks they undertake rather than the linguistic knowledge or skills they use at work. In regard to pedagogy, organizing learning in terms of tasks could unify other possible units of analysis, such as vocabulary, structure, function, etc. since those aspects are included in the assessment criteria of successful task performance. In addition, information on the activities and tasks the learners are likely to undertake in English in the target contexts can also provide input for

designing classroom activities that mirror those of the target situations and help learners understand and relate their classroom learning experiences to their real-life, future use of English (Benavent & Sánchez-Reyes, 2015; Lambert, 2010; Long, 2005). In recognition of its benefits for ESP course design and development, TBNA has been employed in various needs analysis research studies (Alibakhshi et al., 2022; Çal et al., 2022; Dousti & Alibakhshi, 2019; Hayes, 2022; Lambert, 2010; Trager, 2022). TBNA is, therefore, adopted in this study to explore the English communication needs of professional engineers in workplaces and the relevance of English language education at HEIs to those target needs of engineering students.

English Language Uses in Engineering Workplaces

Several studies have investigated English language use in engineering workplaces in different countries. In Taiwan, Spence and Liu (2013) identified various tasks that process integration engineers frequently undertook in English, among which were reading and writing emails, reports, and meeting minutes as well as listening and speaking for teleconferences, telephones, face-to-face customer meetings and presentations. They also found that all four language macro-skills were needed, although reading and writing were used more frequently than speaking and listening. In Malaysia, Kassim and Ali (2010) revealed a variety of both spoken and written communicative tasks that engineers often use English to engage in, including participating in work-related discussions and daily conversations, teleconferencing, presentations, telephoning, writing reports, proposals, minutes of meetings, memos, and formal letters. The study also indicated that English language education programs should place more emphasis on oral rather than written communication skills. In Thailand, Kaewpet (2009) examined the communication needs of engineers and identified four communicative tasks to incorporate into teaching materials: talking about everyday tasks and duties, reading manuals, writing reports, and reading textbooks. Meanwhile, Changpueng and Pattanapichet (2015) investigated engineers' written communications and found that requests, inquiries, and reports were the tasks they most frequently

dealt with. In Turkey, Çal et al., (2022) found that receptive English language skills, especially reading, were the most important and speaking was the least important, and the most frequently undertaken tasks include reading manuals and instructions, reading reports, listening to presentations and in meetings, writing presentation slides, emails, and reports and speaking in teleconferences and video conferences.

It has also been found that engineers' communicative needs and their complexity depend largely on the working and social contexts they are in (Alhilali & McKinley, 2021; Çal et al., 2022). In Vietnam, except for the small-scale study by Vo, Wyatt & McCullargh (2016), which investigated the characteristics of workplace communication in English by information technology staff, we have been unable to locate any studies conducted to identify English language communicative tasks undertaken by engineers in their workplaces. We, therefore, made this a key focus of the study reported here.

In addition, there has recently been a growing concern that HEI graduates are not adequately prepared for their employment in terms of English language (Do & Cheng, 2021; Hellekjær & Fairway, 2015; Vo, Wyatt & McCullargh, 2016). However, to our knowledge, no studies have been conducted to examine engineers' views on the relevance of English language training at HEIs for their workplace language needs. Therefore, this study was designed to take one step in that direction. The study aims to answer the following research questions:

1. What workplace tasks do engineers often carry out in English in Vietnam?
2. What are engineers' perspectives on the English language education provisions at HEIs in terms of preparing them for such workplace needs?

METHODOLOGY

The study employed a mixed-method research design using self-developed questionnaires and semi-structured interviews. Participants were working engineers and employers, either company leaders or

human resource managers, engaged in five professional areas: Mechanics, Automobiles, Information Technology, Electrics, and Electronics. The purposive sampling criteria required participants to work in one of these five professional areas and to use English at least some of the time in their work.

The questionnaires were sent to the potential respondents via two strategies made available by a metropolitan university in Vietnam: ex-students, approached by their teachers, and companies partnering with the university's Center for Enterprise Partnership. A total of 291 engineers and 40 employers working in 174 companies across Vietnam responded. Each questionnaire consisted of three sections. The first sought information about respondents' professional areas, their workplace (type and size of the company), and the amount of time using English at work. The second section sought opinions on the importance of individual English language macro skills and the frequency with which engineers engaged in various communication tasks in English. The communication tasks were developed from the list compiled by West & Tompos (1990) of written and spoken text types or genres employed by all professional areas. Questionnaire items were coded according to the four macro skills (L1-L6 for listening, S1-S14 for speaking, R1- R20 for reading, and W1-W23 for writing). There were open questions at the end of each task list, allowing respondents to add more tasks if possible. The frequency was estimated on a four-point Likert scale ranging from 0 to 3, respectively indicating *never, rarely, sometimes,* and *frequently*. The working engineers (hereafter simply engineers) were asked to rate frequency according to their workplace experience, while the employers were asked to rate according to their understanding and expectations of their employees' work. The third questionnaire section asked the engineer respondents to evaluate the appropriateness of their university English language training as preparation for meeting workplace requirements and to provide suggestions for improvement. The Cronbach's alpha score for the items in each macro skill ranged from .907 to .973, indicating that the questionnaire survey had good reliability and there was high consistency among the items.

To obtain more details on the use of English in the workplace and graduate engineers' views on English language education at HEIs, the

questionnaire concluded with an invitation to participate in a subsequent semi-structured interview. Thirty-nine engineers volunteered: five worked in Information Technology, four in Mechanics and Automobiles, and the remainder in Electrics and Electronics. The interviews were conducted in Vietnamese via Zoom, lasting from 15 to 30 minutes, and focused on participants' purposes, channels, frequency, and difficulties in using English in the workplace and their suggestions for improving university English language programs.

Data collected from the questionnaires and interviews were analyzed separately. Data from the questionnaire were coded in Excel and then transferred to SPSS 25. Frequency statistics, descriptive statistics, independent sample T-tests, and the one-way analysis of variance (ANOVA) were utilized to identify the most frequent tasks and to compare the average ratings of different respondent groups. Data from the interviews were transcribed and coded into three main categories: the engineers' use of English at work, their difficulties when using English and their suggestions for improving English language programs at universities. The results were then thematically synthesized to answer the research questions.

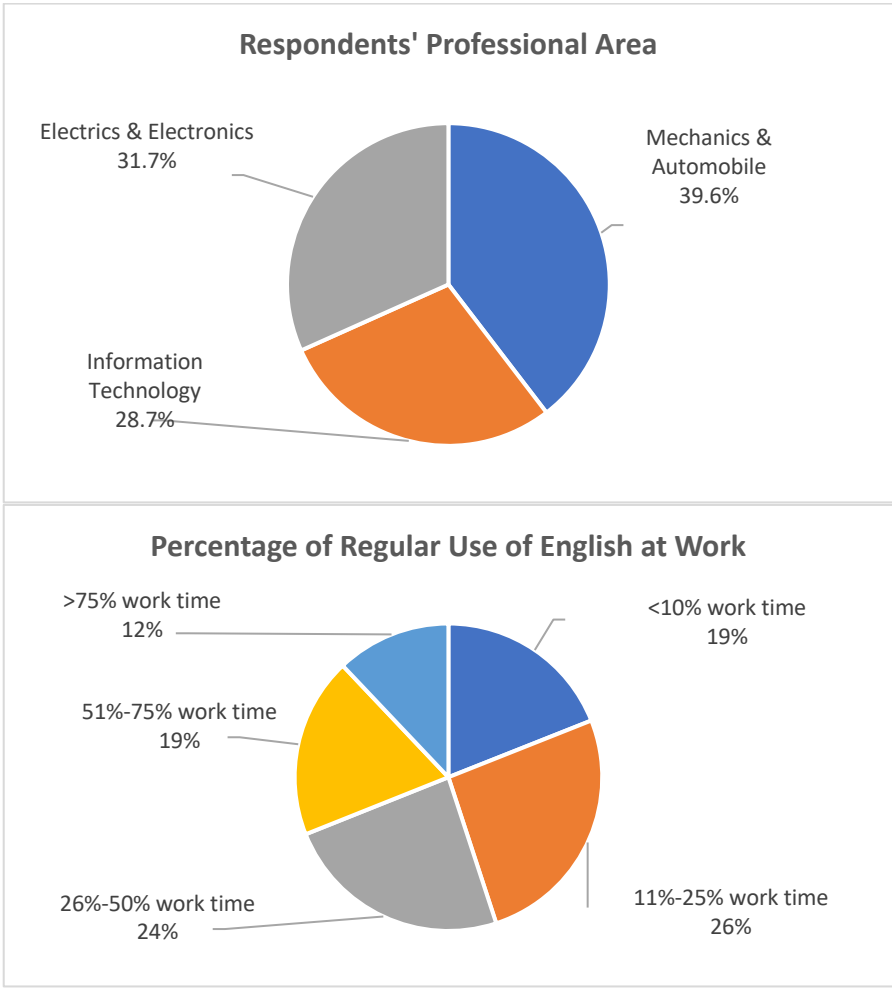
RESULTS

Respondents' Profiles

As demonstrated in Figure 1, about one-third of the respondents worked in Electrics and Electronics, more than one-third of them worked in Mechanics and Automobiles, and the rest (28.7%) worked in Information Technology. Over half of the respondents used English for over a quarter of their work time.

Figure 1

Respondents' Professional Areas and Use of English



The engineers' estimated high frequency of English use might be explained by the fact that more than half of the respondents worked for multinational corporations, as shown in Table 1. More than two-thirds of the respondents in Electrics and Electronics worked for large multinational corporations; more than two-thirds of respondents in Mechanics and Automobiles worked for medium or large

multinational corporations, while about two-thirds of respondents in Information Technology worked for large private companies.

Table 1

Respondents' Workplaces

Company Type and Size		Total Respondents (N=331)	Mechanics & Automobiles (N= 131)	Information Technology (N=95)	Electrics & Electronics (N=105)
Company Type	State-owned	6%	4%	17%	0%
	Multinational	57%	69%	19%	76%
	Private	33%	18%	62%	24%
	Joint venture	4%	8%	2%	0%
Company Size	Micro (<10 employees)	3%	2%	1%	6%
	Small (10 <200 employees)	18%	25%	8%	17%
	Medium (200 - 300 employees)	15%	25%	12%	6%
	Large (>300 employees)	64%	48%	79%	71%

Tasks Professional Engineers Regularly Dealt with in English

Reading Tasks

As shown in Table 2, the respondents generated a mean rating above 2.0 (out of 4) for 13 out of 20 reading tasks, indicating that the engineers regularly carried out those workplace tasks. They particularly underlined the high frequency of dealing with six genres, namely R1-Read operating manuals, instructions, safety instructions, warning labels, etc., R4-Read descriptions/specifications of products, R7-Read professional e-mails, R15-Read professional/ technical materials, R6-Read professional letters, and R11-Read professional/technical reports. Other frequently carried out reading tasks (mean score above 2.0) included R18-Read reference materials such as dictionaries, directories, Yellow Pages, etc.; R5-Read price lists and catalogues; R2-Read professional notices and internal

messages; R17-Read professional books and articles; R20-Read programs, itineraries, agendas, etc.; R16-Read reviews of products on forums and R10-Read minutes of meetings.

Statistical analyses of the mean rating values revealed significant differences in the perspectives of the respondents with different working roles, professional areas, and company types. First, the employers placed higher ratings than the engineers on 12 out of 20 reading tasks, with the average rating differences ranging from 0.34 to 0.52 (on a 4-point scale). They particularly emphasized the need to read technical reports, professional/technical materials, professional letters, and emails with an average rating of 2.6 or above. In terms of professional areas, respondents working in Electrics and Electronics rated ten reading tasks with higher frequency than those working in Information Technology (mean differences from 0.31 to 0.54) and seven reading tasks higher than those working in Mechanics and Automobiles (mean differences from 0.23 to 0.46). In particular, Electrics and Electronics engineers read professional reports, emails, letters, internal messages, and meeting minutes in English more often than their colleagues in the other three professional areas. With regard to company type, significant differences were found in the reading requirements between the international and private sectors. In particular, the engineers working for multinational corporations dealt with 9 out of 20 reading tasks more often than their colleagues in private companies. Among the nine tasks were meeting minutes, reports, agendas, internal messages, emails, and descriptions/specifications of products/services, etc.

Table 2

Respondents' Perspectives on Reading Needs (N=331)

Reading tasks	Mean	SD
R1. Read operating manuals, instructions, safety instructions, warning labels, etc.	2.42	0.77
R4. Read descriptions/specifications of products, etc.	2.36	0.81
R7. Read professional e-mails	2.29	0.91
R15. Read professional/technical materials	2.29	0.90
R6. Read professional letters	2.27	0.92
R11. Read professional/technical reports	2.27	0.94
R18. Read reference materials (dictionaries, directories, Yellow Pages, etc.)	2.14	0.89
R5. Read price lists and catalogs	2.10	0.97
R2. Read professional notices, internal messages	2.09	0.93
R17. Read professional books, articles	2.06	0.94
R20. Read programs, itineraries, agendas, etc.	2.05	0.93
R16. Read reviews of products on forums	2.01	0.96
R10. Read minutes of meetings	2.01	1.02
R13. Read job descriptions, profiles	2.00	0.96
R9. Read proposals, recommendations	1.89	0.97
R14. Read job applications with curriculum vitae/resumes	1.89	1.00
R8. Read bids and tenders	1.87	1.10
R12. Read contracts and legal documents, etc.	1.87	1.02
R3. Read advertisements (e.g. job/product advertisements)	1.84	0.94
R19. Read posters (at exhibitions/ conferences)	1.77	0.93

Listening Tasks

As presented in Table 3, the respondents rated five out of six listening tasks at a high-frequency level (mean score above 2.0), among which the tasks they encountered most frequently included L1-Listen to descriptions and explanations of equipment, processes, etc., L5-Listen and follow hand-outs, demonstrations on PowerPoint slides at conferences, meetings, etc. and L2-Listen to instructions and warnings, e.g. safety procedures, operating instructions. Two other

highly-rated tasks were L6-Listen and taking notes while discussing with customers and L4-Listen to professional talks, presentations, etc.

Table 3

Respondents' Perspectives on Listening Needs (N=331)

Listening tasks	Mean	SD
L1. Listen to descriptions and explanations of equipment, processes, etc.	2.35	0.88
L5. Listen and follow hand-outs and demonstrations on PowerPoint slides at conferences, meetings, etc.	2.29	0.85
L2. Listen to instructions and warnings, e.g. safety procedures, operating instructions	2.24	0.85
L6. Listen and take notes while discussing with customers	2.15	0.91
L4. Listen to professional talks, presentations, etc.	2.11	0.93
L3. Listen to telephone conversations	1.94	0.92

Analyses of the rating values show significant differences in the perspectives of respondent groups. Specifically, the employers rated a higher level of frequency than the engineers on two tasks. These were L1-Listen to descriptions and explanations of equipment, processes, etc. (t (59.938)=2.145, p=0.036, d=0.255) and L2-Listen to instructions and warnings, e.g. safety procedures, operating instructions (t (329)=2.050, p=0.041, d=0.294). In terms of professional areas, the Information Technology engineers listened to descriptions and explanations of equipment and processes (L1) less often than their colleagues in Electrics and Electronics (p=0.005, 95% C.I=[-0.65, -0.9]) and in Mechanics and Automobiles (p=0.001, 95% C.I=[-0.74, -0.15]). Regarding the company type, engineers working in multinational corporations dealt with almost all of the listening tasks more often than those working in the private sector (average rating differences from 0.28 to 0.46) except for tasks/genre entitled L2-Listen to instructions and warnings where no statistical differences were found in average ratings of the two groups (p=0.07).

Speaking Tasks

As demonstrated in Table 4, the respondents rated ten out of 14 speaking tasks at a high-frequency level (mean score above 2.0).

Among those ten tasks, the ones most frequently carried out were S3-Give descriptions and explanations of equipment, processes, etc., to foreign visitors, S6-Take part in professional interviews, e.g. job interviews, media interviews, etc., S7-Take part in professional consultations and discussions and S4-Give instructions and warnings, e.g. operating instructions, safety procedures and S11-Deal with customers' complaints, inquiries and requests. Other frequently carried out speaking tasks (means score above 2.0) included S14-Take part in day-to-day conversations in English, S9-Discuss with customers, S12-Take part in face-to-face professional meetings, S8-Negotiate business contracts: prices, production norms, the progress of delivery, etc., and S2-Give introductions to foreign visitors about one's own job, responsibilities, working conditions, etc.

Table 4

Respondents' Perspectives on Speaking Needs (N=331)

Speaking tasks	Mean	SD
S3. Give descriptions and explanations of equipment, processes, machines, etc. to foreign visitors	2.18	0.94
S6. Take part in professional interviews (job interviews, media interviews, etc.)	2.14	0.99
S7. Take part in professional consultations and discussions	2.12	0.91
S4. Give instructions and warnings, e.g. operating instructions, safety procedures	2.12	0.92
S11. Deal with customers' complaints, inquiries, and requests	2.12	0.94
S14. Take part in day-to-day conversations in English.	2.09	0.95
S9. Discuss with customers	2.08	0.97
S12. Take part in face-to-face professional meetings	2.07	0.96
S8. Negotiate business contracts (prices, production norms, delivery progress, etc.)	2.05	0.98
S2. Give introductions to foreign visitors about one's own job, responsibilities, working conditions, etc.	2.02	0.93
S10. Give professional talks/presentations with hand-outs, PowerPoint, etc.	2.00	0.99
S5. Take part in professional telephone conversations	1.99	0.96
S13. Take part in online business/professional meetings	1.97	1.01
S1. Give introductions/tours of their workplace to foreign visitors)	1.85	1.01

Analyses of the rating values show significant differences in the perspectives of the respondent groups. In particular, the employers rated a higher level of frequency than the engineers on two tasks, namely S3-Give descriptions and explanations of equipment, processes, machines, etc. to foreign visitors ($t(60.395)=3.531$, $p=0.001$, $d=0.444$) and S9- Discuss with customers ($t(54.711)=2.475$, $p=0.016$, $d=0.359$). In terms of professional areas, the Information Technology engineers carried out such tasks as giving introductions of their workplace (S1), their jobs and responsibilities, working conditions, etc. (S2) and giving introductions and warnings (S4) less often than their colleagues in Mechanics and Automobiles. They also entered fewer negotiation meetings (S8) and tackled fewer cases of customers' complaints, requests, or inquiries (S11) than their colleagues in Electrics and Electronics. Regarding the company type, engineers working in multinational corporations were found to perform most of the speaking tasks more often than those working in private companies (mean differences from 0.31 to 0.50 on a 4-point scale), except for two tasks entitled S1-Give introductions/tours of their workplace to foreign visitors and S2- Give introductions to foreign visitors about one's own job, responsibilities, working conditions, etc. The biggest differences were noted in the tasks coded S4, S12, and S8, indicating that engineers working in multinational corporations gave instructions more frequently, attended more meetings, and were involved in more negotiations with customers in English than their colleagues in private companies.

Writing Tasks

As can be seen in Table 5, the respondents rated high-frequency levels (mean value above 2.0) for two out of 23 writing tasks: W7-Write professional emails and W13-Write professional/technical reports. Although the average frequency rating scores were smaller than 2.0 for most of the other writing tasks and genres, the standard deviations were larger than 1.0, indicating that some engineers might deal with those writing tasks much more often than others.

Table 5

Respondents' Perspectives on Writing Needs (N=331)

Writing tasks	Mean	SD
W7. Write professional e-mails	2.15	0.97
W13. Write professional/technical reports	2.08	0.96
W1. Write instructions (e.g. manuals, safety instructions, warning labels, etc.)	1.99	0.96
W6. Write professional letters	1.99	0.98
W4. Write descriptions/specifications of products/services, etc.	1.96	1.01
W8. Complete forms	1.95	0.95
W17. Write professional/technical articles	1.93	1.05
W23. Write programmes, itineraries, agendas, etc.	1.927	1.01
W16. Write job applications with their own curriculum vitae/resume	1.91	0.97
W9. Design forms	1.90	0.97
W12. Write minutes of meetings	1.88	1.04
W22. Write hand-outs/Powerpoints (for presentations, meetings, etc.)	1.873	1.02
W15. Write job descriptions, profiles	1.80	1.02
W2. Write institutional/professional/company notices, internal messages	1.78	1.00
W5. Write price lists and catalogues	1.73	1.09
W11. Write proposals and recommendations	1.71	1.01
W14. Write contracts and legal documents, etc.	1.61	1.11
W18. Write reviews of academic/professional books	1.58	1.09
W10. Write bids and tenders	1.56	1.07
W3. Write advertisements	1.53	1.02
W20. Write reference materials (dictionaries, directories, Yellow Pages, Wikipedia, etc.)	1.52	1.05
W19. Write professional/technical books	1.43	1.12
W21. Produce posters (at exhibitions/conferences)	1.35	1.03

Statistical analyses of the rating values also revealed significant differences in the ratings of different respondent groups. Once again, the employers placed much higher frequency ratings on writing tasks than the engineers, with rating differences ranging from 0.33 to 0.62 on a 4-point scale. In particular, the employers underlined the

engineers' need to deal with such tasks as writing emails and reports, designing and completing forms, and writing programs, agendas, instructions, handouts, and presentation slides. In terms of professional areas, as expressed by the average rating scores, the Information Technology engineers seemed to deal with writing tasks less often than their colleagues in other professional areas, while Electrics and Electronics engineers wrote emails and completed and designed forms in English more often than engineers in other areas. Mechanics and Automobile engineers wrote reports, meeting minutes, and internal messages in English more often than their Information Technology colleagues. Regarding the company sector, analyses show that engineers in multinational corporations carried out 11 of 23 writing tasks in English more often than their colleagues in the private sector. Examples of such tasks include writing meeting minutes, programs and agendas, and internal messages.

Role of English in Professional Engineering

Looking at the frequency ratings presented in the previous section, it is noticeable that there are variations across company types and professional areas and between employers and employees. Differences in frequency indicated by the respondents of different company types clearly reflect the higher demands of English language use in multinational corporations than in other workplaces. Differences across professional areas might be attributed to the fact that the majority of the respondents in Electrics and Electronics and Mechanics and Automobile worked for multinational corporations, whereas the majority of the respondents in Information Technology worked for private companies. Finally, the employers' high-frequency ratings may indicate their vision of how the workplace should be rather than how it actually was at the time for these participants. Thus, the information can be said to reflect company expectations and perhaps to predict actual future employment situations.

The questionnaire respondents were also specifically asked about the importance of English and the four macro skills in the workplace, using a 4-point Likert scale, in which 0=unimportant, 1=not very important, 2=important, and 3=essential. In that context, the large

majority of respondents (86%) considered English to be either crucial or important for their work. These responses are consistent with their high ratings on the percentage of work time using English (see Figure 1).

In responding to the questions on the importance of individual English macro skills, participants rated all four macro skills as important or essential, with the highest mean rating on Reading and the lowest mean rating on Writing. As expressed in the reported mean values in Table 6, Reading and Listening are considered the most important skills for engineers, followed by Speaking and Writing. These responses align with the findings on engineers' frequency of engaging in different tasks in English (section 4.1.2).

Table 6

Respondents' Perspectives on the Relative Importance of the Macro-Skills

	Total respondents' ratings *(N=331)*		**Employers' ratings** *(N=40)*		**Engineers' ratings** *(N=291)*	
Macro-skills	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Reading	2.47	0.68	2.63	0.54	2.45	0.69
Listening	2.36	0.79	2.63	0.63	2.33	0.81
Speaking	2.27	0.83	2.50	0.64	2.24	0.85
Writing	2.04	0.81	2.45	0.60	1.98	0.82

It is noticeable that the employers placed higher importance on each of the macro skills than the engineers, and their ratings were statistically higher than the engineers' on Writing ($t(239) = 3.512$, $p=0.001$, $d=0.47$), Listening ($t(58.442)=2.713$, $p=0.009$, $d=0.03$), and Speaking ($t(59.731)=2.268$, $p=0.027$, $d=0.26$). As mentioned previously, this might reflect employers' expectations of their employees' use of English in the workplace, rather than the actuality.

The interview data in this study provide more illustrative information about the engineers' use of English in the workplace, demonstrating consistent use of English to read professional materials, write reports and communicate with their customers and their bosses and colleagues who cannot speak Vietnamese. Communication

channels included face-to-face/online meetings, emails and social media such as Zalo, Messenger, and Kakao. The following are some examples of the engineers' input:

> I use English to read materials such as user manuals and software development guidelines (SRS, SDS, STS, etc.) and write emails and work reports on a daily basis. I also meet and discuss with customers, but not very often…about once a week. (IT engineer N#3)

> English is important for my work since I translate technical materials and user guidance/manuals of technical devices imported from overseas. We also use English to discuss with our foreign counterparts work-related issues such as technical drawings, Memorandums of Understanding, contracts, etc., in meetings, emails, or via Zalo, Kakao, Messenger…(Electronics engineer, N#19)

> I [use English to] write and report the work progress to my boss every day, attend seminars and internal quality meetings, deal with problems and discuss with foreign partners …I generally use English for about 80 per cent of my work time. (Senior Automation engineer, N#22)

During the interviews, some of the engineers also shared screens to show examples of their reading materials, emails, and messages in English. Most of the reading materials shown were instruction manuals, and most of the emails and messages were short, straightforward, and intertextual (that is, they were in response to previous emails or messages, and/or implicitly drawn on in other texts). It can be seen that the interview data are quite consonant with the questionnaire results on the importance of English in the engineers' employment and the tasks the engineers often engaged with in English in their workplaces.

Perspectives on Undergraduate English Language Education Provisions at HEIs

In the questionnaires, the engineer respondents were asked whether, in their experience, the English language courses they took at university could be considered appropriate for preparing them for their English language needs in the workplace. As can be seen in Table 7, over 60 percent thought the English language courses at universities were either inappropriate or very inappropriate for meeting their English language needs at work.

Table 7

The Engineers' Perspectives on the Suitability of Undergraduate English Language Education (N=291)

	Very Inappropriate	Inappropriate	Appropriate	Very Appropriate
Number	63	113	105	10
Percentage	22%	39%	36%	3%

This generally negative evaluation of the relevance of university English language education programs can be directly linked to the difficulties the engineers reported encountering when using English at work. Apart from one senior automation engineer who indicated having no difficulties at all (N#22), all the other engineers reported specific challenges. Most of these referred to oral communication problems, e.g., the engineers found it difficult to understand foreign counterparts or to explain complicated technical issues in English.

> It is difficult to understand foreign counterparts, especially those who come from Bhutan and West Asian countries (software development engineer, N#5)

> Sometimes I cannot comprehend what customers want to convey. Their accents and pronunciations are very different [from ours] (electronics engineer, N#6)

> It is rather difficult [for me] to explain a technical solution or a technical problem that occurs (senior AI engineer, N#1)

> My [English] speaking skills and pronunciation are not good. Sometimes, customers could not understand me. I cannot respond quickly, either, so I find it challenging to discuss with customers (information technology engineer, N#34)

The engineers also referred to written communication difficulties such as in *writing specifications of information systems or reports of complicated problems* (QA software engineer, N#2) or in reading professional materials (Mechanics engineers, N#36). However, the main reasons for their difficulties reportedly lay in their *limited [professional] vocabulary, [incorrect] pronunciation, poor listening skills, and lack of experience in using English for communication purposes*.

Some interviewees attributed their difficulties to the mismatch between the English courses they had taken at HEIs and the language requirements at workplaces:

> At university, we learned such vocabulary as hammer, wrench, spanner, and valve…but we hardly use those words. Instead, we use such words as spectrum, primary circuit, piecewise linear, district switching centre, biased…(electronics engineer, N#38)

> In the ESP courses at the university, we mainly practised reading and translating technical texts, but in the workplace, we have to do lots of reports, especially work progress reports. (mechanics engineer, N#35)

Such comments, along with the difficulties reported by interviewees and the questionnaire responses regarding the frequency of tasks required in the workplace (section 4.2), indicate a gap between the English language training at HEIs and what is needed to use English successfully in the engineering workplace.

When asked for suggestions to improve the effectiveness of English language education programs at universities, the engineers' responses were quite convergent with the difficulties they identified.

They made such recommendations as developing students' ability to communicate in English, giving priority to [teaching] speaking and listening, increasing students' discipline/profession-specific vocabulary, practising writing professional emails, and revising teaching and learning programs based on actual English needs in workplaces, making it closer to life.

These recommendations align closely with the responses to the last item in the questionnaire – see Table 8 – which also asked for suggestions to improve the English language education programs for engineers at HEIs. One hundred and sixty engineers (55%) responded to that open question, some with several suggestions. The comments were thematically categorized into five groups, as shown in Table 8, which indicates the number and the percentage of engineers who gave comments in each group. As can be seen, the two most common suggestions by the engineers were helping undergraduates develop the ability to communicate in English, especially by speaking and listening (89%), and revising the English language curriculum to meet the real-life language needs of specific professions and disciplines, including such tasks as writing emails, writing internal messages, talking on the phone (43%).

Table 8

Engineers' Suggestions to Improve the English Curriculum for Undergraduate Engineers (N=160)

Suggestion categories	Number (percentage)
Focusing more on developing students' ability to communicate in English, especially speaking and	142 (89%)
Revising the English language courses/curriculum to be professional/discipline-oriented, addressing workplace needs such as writing emails, writing	68 (43%)
Improving teaching practices (e.g. using authentic materials for learning, facilitating discussions…)	42 (26%)
Developing all of the four macro-skills	20 (13%)
Others (developing English-medium instruction programs, raising students' awareness of the importance of the English language, creating an English-speaking environment…)	18 (11%)

The engineers' low ratings on the relevance of the English language education programs at HEIs for their workplace needs and their suggestions for improving the programs indicate a clear direction for addressing the mismatch identified across this study between English language training at HEIs and workplace requirements.

DISCUSSION

English Language Needs of Professional Engineers in the Workplace

The research results presented and analyzed above reveal important insights into the English language needs of professional engineers in Vietnam. First, English plays a significant role in engineering employment. Participating engineers generally need to

use all of the four macro language skills for professional communication, although receptive skills (reading and listening) were used more frequently than productive skills (speaking and writing).

Second, the engineers' English language needs varied according to the workplace context. In this study, the engineers working in multinational corporations were found to carry out more tasks in English with a higher frequency than those working in private companies. Due to the distribution of participants, information related to other company types (state-owned, joint ventures) and sizes is not adequate to draw any further conclusion, but it is predicted that those contextual factors might also influence engineers' language needs.

Third, despite the influence of workplace context, there were some English language tasks that all professional engineers often needed to cope with in the workplace. Examples include reading technical materials and instructional manuals; reading and writing emails, reports, and internal messages; reading and listening to product specifications and operating instructions; discussing with foreign customers; and explaining issues to supervisors and colleagues who are not Vietnamese. Based on the questionnaire results, Table 9 demonstrates the list of 30 tasks that were rated at high levels of frequency by both the engineers and employers (mean scores above 2.0).

Table 9

Engineers' Thirty Most-Frequent Tasks in English

No	Tasks
1	Read operating manuals, instructions, safety instructions, warning labels, etc.
2	Read descriptions/specifications of products/services, etc.
3	Listen to descriptions and explanations of equipment, processes, etc.
4	Read professional/academic e-mails
5	Listen and follow hand-outs and demonstrations on PowerPoint slides at conferences, meetings, etc.
6	Read professional/technical materials
7	Read professional letters
8	Read professional/technical reports
9	Listen to instructions and warnings, e.g. safety procedures, operating instructions
10	Give descriptions and explanations of equipment, processes, machines, etc. to foreign visitors
11	Write professional/formal e-mails
12	Listen and take notes while discussing with customers
13	Take part in professional/academic interviews, e.g. job interviews, scholarship interviews, media interviews, etc.
14	Read reference materials (dictionaries, directories, Yellow Pages, etc.)
15	Participate in professional consultations and discussions (with doctors, lawyers, bank managers, engineers, etc.)
16	Give instructions and warnings, e.g. operating instructions, safety procedures
17	Deal with customers' complaints, inquiries and requests
18	Listen to professional talks, presentations, etc.
19	Read price lists and catalogs

No	Tasks
20	Read professional notices, internal messages
21	Take part in day-to-day conversations in English
22	Discuss with customers
23	Write professional/technical reports
24	Take part in face-to-face business/professional meetings
25	Read professional/scientific books, articles
26	Negotiate business contracts: prices, production norms, the progress of delivery, etc.
27	Read programs, itineraries, agendas, etc.
28	Give introductions to foreign visitors about their own job, responsibilities, working conditions, etc.
29	Read reviews of products on forums
30	Read minutes of meetings

Given the alignment of the results from the questionnaire and interviews and given that the respondents were working in companies of different types and sizes, it is believed that the listed tasks are the key English language needs for engineers working in Vietnam. Furthermore, because the employers consistently demonstrated an expectation of a higher level of English language use for professional purposes than the engineers currently performed, it is predicted that the language requirements for engineers might increase significantly in the near future. This would require recurrent re-analysis of the identified workplace needs to inform English language education in HEIs.

The results of this study on engineers' English language needs have certain similarities with previous research findings. In particular, this study supports Kassim and Ali (2010) and Spence and Liu (2013) in highlighting engineers' needs to use English to instruct, explain and demonstrate, and to discuss work-related matters, converse informally and socially, network, give and listen to oral presentations, and to read and write reports and meeting minutes. The results are also in

agreement with those of Changpueng and Pattanapichet (2015) and Al Hilali and McKinley (2021) in emphasizing engineers' need to read and write emails and reports in English and noting that their writings are mostly interactive and intertextual as they involve communicating with various people and referring to other documents as input sources. In addition, this study is directly in line with those of Çal et al., (2022) in highlighting the importance of English reading and listening skills and underlining engineers' needs to use English to read manuals, instructions, and reports, listen to presentations, and engage in meetings.

Besides those similar findings, this study has specified other workplace tasks that engineers often engage with in English. These include reading instructional manuals, product specifications, price lists, catalogs, product reviews, programs, itineraries, and agendas, listening to instructions and warnings, safety procedures, dealing with customers' requests, inquiries, and complaints, and negotiating business contracts. While these tasks were not referred to in previous studies, which might be due to differences in research objectives and or research contexts, their identification could provide important reference information for developing HEI English training programs that aim to improve undergraduate engineers' readiness for employment.

There are some noticeable differences between the results of this study and those of previous ones involving engineers. For example, this study does not support the finding of Çal et al. (2022) that speaking is the least important English skill or that writing slides is the most frequently undertaken writing task for engineers. The engineers' workplace tasks in English identified in this study also differ considerably from the list reported by Alibakhshi, et al. (2022) who found that marine engineers often needed to use English to carry out such tasks as asking for and giving personal information, directions, and instructions on board, describing parts of vessels and weather conditions, etc. Such divergences in research results could reasonably be attributed to differences in research context and professional area. The study by Çal et al. (2022) was conducted in a European country that has various cultural and sociopolitical characteristics different from Vietnam's, while the professional area

of focus in the study by Alibakhshi, et al. (2022) was Marine Engineering which was not included in the five professional areas targeted in the current study. Such divergent results justify careful and ongoing needs analyses to reflect the particular needs of different professions in particular workplace contexts.

Professional Engineers' Perspectives on the English Language Education Provisions at HEIs

This study has explored professional engineers' perspectives on English language education provisions at HEIs from two perspectives: relevance to workplace needs, and areas for improvement. In terms of relevance, the research results show that many of the participating engineers were not satisfied with the English courses in HEIs in terms of preparing them for their workplace language requirements. In fact, more than 60 per cent of the survey respondents thought the university English courses were not relevant to their workplace needs. Backing this up, almost all of the interviewed engineers reported having various difficulties when communicating in English at work. These results support the findings of previous studies that university undergraduates were not adequately prepared for the English requirements of the workplaces (Talif & Noor, 2009) and that there seems to be a mismatch or a gap between language training and workplace needs (Clement & Murugavel, 2015; Do & Cheng, 2021; Hayati, 2008; Hellekjær & Fairway, 2015; Nezakatgoo & Alibakhshi, 2014; Vo, Wyatt & McCullargh, 2016).

As in studies elsewhere, the Vietnamese engineers in this study gave a clear direction for universities to redesign the English language courses at HEIs specifically to mirror the target tasks (Benavent & Sánchez-Reyes, 2015) and to be tailored to workplace-specific requirements (Do & Cheng, 2021; Talif & Noor, 2009; Vo, Wyatt & McCullargh, 2016).

Although the participants were not experts in language teaching pedagogy, their suggestions (section 4.4) generally align with the principles of communicative language teaching and task-based instruction (Brandl, 2008). Given such alignment and the engineers' learning and working experience, it is highly recommended that their

suggestions be taken into careful consideration in the design and delivery of English language courses at HEIs.

CONCLUSION

The broad conclusion that can be drawn from this study is that the workplace communication needs of engineers are not only complex but also heavily dependent on both the professional area and the working context. Furthermore, based on the data and discussion presented in the foregoing, the following additional conclusions can be made. First, there is a need to improve English language education programs at HEIs in Vietnam to adequately prepare undergraduate engineers for the English language requirements in the workplace. Second, the English courses/curriculum for undergraduate engineers should directly reflect the key tasks identified in this study as frequently dealt with by engineers in the workplace and that such courses reflect the relative importance assigned to the macro-skills for English in the workplace, namely Reading, Listening, Speaking and Writing, and also consider the engineers' suggestions for improving teaching practices. Third, it is essential to conduct need analyses, especially task-based analyses of undergraduates' target needs, and to ensure the contribution of workplace stakeholders to inform the design and development of tertiary English education, especially ESP programs. Since undergraduate students need to learn English not only for their employment after graduation but also for their tertiary study, a future needs analysis could also investigate the English needs for successful undergraduate study so that both could be addressed in a timely way across semesters.

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