Development of a New 'Engineering English for Intercultural Communication' Online Course to Prepare New Engineers for Working in Intercultural Workplace Settings

Chalida Janenoppakarn[a], Krich Rajprasit[b,*]

[a] chalida@g.swu.ac.th, International College for Sustainability Studies, Srinakharinwirot University, Thailand
[b] krich@g.swu.ac.th, International College for Sustainability Studies, Srinakharinwirot University, Thailand
[*] Corresponding author, krich@g.swu.ac.th

ABSTRACT

This study aimed to develop a tailor-made online course called "Engineering English for Intercultural Communication (EEIC)" for undergraduate engineering students based on the self-report on English language proficiency, intercultural communication competence (ICC) as well as needs of a diverse set of stakeholders in the engineering professions and education. It comprises two phases: (1) analyzing the data from the stakeholders, and (2) designing and developing a course. In the first phase, a mixed-methods approach was adopted. A questionnaire was employed for a self-report on English language proficiency and problems in language use, as well as the ICC of 108 Thai engineering students at an autonomous university in Thailand and 22 Thai engineering professionals working in international companies. Then, semi-structured interviews on the necessity of engineering English and ICC for

novice engineers were conducted with 16 engineering course lecturers. The second phase involves the design and development of the EEIC course. The ADDIE model was adopted and the findings from the analysis of the data collected in the first phase were used to guide the design and develop such a course with four units, each with a different focus, specifically. This study contributes to the ELT field by showcasing a course design process to meet the needs of a set of diverse stakeholders. Specifically, the course was developed based on real-life information obtained from both educational and professional contexts analyzed to provide guidance for the course design and development.

Keywords: Engineering English, intercultural communication competence, engineering workplace communication, online course development, English for Specific Purposes (ESP)

Introduction

In the complex intercultural global contexts of today, English communication skills, apart from professional expertise, are critical for successful international business or company operations. In such settings, employees may also have to engage in unfamiliar cultural and linguistic practices in their workplace, such as when dealing with solving problems, selling products, negotiating prices, or simply getting their job done, as well as communicating with various stakeholders from diverse cultures. Thus, many multinational companies require their employees to be equipped with not only professional expertise, but also English communication skills and intercultural communication competence (ICC). This is true for most professions today, including engineering (de Souza Almeida, 2019; Shrestha et al., 2020; Vani et al., 2022). Indeed, English communication skills and ICC are regarded as key components for engineering professionals to achieve job advancement, as such skills and competence help those professionals be able to do their job effectively in international settings. At the same time, such professionals are better able to successfully communicate with colleagues, clients, and other stakeholders hailing from diverse cultural backgrounds (Ford et al., 2021).

In the modern era, the professional community has become more globalized and more intercultural interactions occur nowadays within and between organizations. Thus, higher education institutes and programs, including engineering programs, are encouraged to reconsider their current programs and courses to open them up to including more courses/units, not

just temporary activities, aimed at developing English communication skills and ICC. The significant process of educating and training engineering professionals in terms of building up their professional expertise while also developing English communication skills and ICC should occur when they enter higher education (Deardorff, 2006). However, recent research has suggested there is a gap between the English communication skills learned in engineering programs today and those required in the workplace (Çal et al., 2023; Ford et al., 2021; Rajprasit & Hemchua, 2015; Shrestha et al., 2020; Vani et al., 2022) and even ignorance about the importance of increasing the awareness of intercultural issues in workplace communication in many programs (Candel-Mora, 2015; Yu, 2012). Such a gap seems problematic as it is often debated whether such issues should be covered in such programs, which typically have a heavy focus on technical-expertise development. Even though attempts have been made in various higher education contexts using e-learning courses to develop ICC (e.g., Shih, 2017 in Taiwan; Di Sarno-García, 2023 in Spain), and both English communication skills and ICC (e.g., Jiang & Hou, 2022 in China), the number of such courses is rather small, and it seems that such courses have rarely developed for Thai undergraduate engineering students.

Based on recent research and identifying problems and gaps, our study aimed to develop a tailor-made online course called "Engineering English for Intercultural Communication (EEIC)" for undergraduate engineering students based on the collected data from the self-reports of engineering students, professionals, and lecturers. Thus, we posed the following research questions to guide our study:

1. What are the components of an "Engineering English for Intercultural Communication (EEIC)" online course for undergraduate engineering students based on stakeholders' perceptions and needs?
2. What are the design and development of an EEIC online course based on the components?

Literature Review

The following text discusses the key aspects and literature relating to this study.

English Communication in the Engineering Workplace

Irrespective of working in English-speaking countries or non-English-speaking countries, these skills can help such professionals do their

jobs, and provide them with more opportunities to attain job advancement. Typically, English is the only or at least one of the main corporate languages of most multinational companies, and most engineers may use it in their working day when communicating with others in an international or multicultural setting (Ford et al., 2021). English communication skills may even be as essential as or even more important than technical competencies in employability for an engineer in such settings (Çal et al., 2022). In other words, achieving success in the engineering profession often relies on a good command of English, not just technical expertise (Vani et al., 2022). Such a fact has put pressure on higher education institutions as there seems to be a gap between English communication instruction in most engineering programs and the expectations from workplaces and employers. Unarguably, engineering programs' main focus is on building up their students' technical expertise (de Souza Almeida, 2019), but even so, soft skills or non-technical skills, such as "team, communication, ethical reasoning, and societal and global contextual analysis" cannot be ignored (Wisniewski, 2017, p. 9). Apart from technical excellence, engineering graduates or novice engineers with effective communication skills are essential in engineering companies and professional organizations that need to collaborate with a diversity of people in a globalized professional environment, as is increasingly the case today (Handford et al., 2019).

Studies on engineering students and professionals in terms of English workplace communication in engineering have highlighted the challenges facing them and the mismatch between the English communication skills learned in many engineering programs and those required in the workplace. For instance, in the professional context, one study done with computer engineers in Thailand explored the role of the English language in international workplace communication. The engineering participants in the study confirmed that effective English communication skills are undeniably necessary for organizational and professional success and that technical knowledge alone is insufficient for today's engineering profession (Rajprasit & Hemchua, 2015). Another study in Nepal examined how English communication skills play a role in the engineering workplace and discovered that such skills are key for the successful execution of engineering jobs, and again found that technical excellence alone was insufficient in the engineering profession today (Shrestha et al., 2020). Yet another study was conducted in the U.S. to explore whether there was a gap in communication skills among novice engineers when participating in workplace communication activities and found there was a huge gap between the communication skills those engineers practiced at their institution and the skills they needed in the workplace. The study also revealed that engineering workplace communication is complex and heavily dependent upon context, and good

language skills are critical (Ford et al., 2021). Another study in Turkey reported that the use of English is an important part of professional life, especially employment and career advancement. Of the four language skills, reading was considered the most significant, whereas speaking was considered less important, while the purposes of using English varied much, depending on the communication contexts and types of companies (Çal et al., 2022). In terms of educational contexts, another study in Turkey investigated Turkish engineering students' perceptions of the status and the importance of English in the workplace from their experiences of working as interns in engineering companies. The students pointed out there was a clear gap between their experiences in higher education and industry settings when it came to emphasizing the value of English communication skills for engineers. That is, they felt their institutions needed to improve their programs to respond to the workplace reality and demands for English communication skills (Çal et al., 2023).

Intercultural Communication Competence in the Engineering Profession

Apart from mastering English workplace communication skills, today's businesses require engineering professionals to be equipped with intercultural communication competence (ICC). Such competence can help engineering professionals communicate effectively and properly in intercultural communicative situations that require cross-cultural knowledge, skills, and attitudes (Deardorff, 2006). Chen and Starosta (1996) explain that ICC comprises three main dimensions: intercultural awareness (e.g., knowing and understanding cultural characteristics and traditions impacting individual behaviors and perceptions), intercultural sensitivity (e.g., being able to develop a positive attitude toward cultural differences), and intercultural effectiveness (e.g., being able to act effectively and attain a communication goal in intercultural communicative situations). In this regard, ICC is important for current and future engineering professionals in complex intercultural global contexts, as more business interactions take place among professionals from diverse cultural backgrounds (e.g., diverse ways of life, customs, traditions, and habits) (Bharadwaj, 2023; Handford et al., 2019; Rico-García & Burns, 2020).

In this context, engineering professionals should pay more attention to ICC as a key element of professional success. For instance, when communicating with other people, they should be aware that different styles of language should be used, depending on certain situations. The term "style" here refers to a range of varieties of a single genre or register that may differ in the degree of formality (Trudgill, 1992). Second, they should avoid

stereotypes, which refers to making judgments based on any group membership (Jandt, 2007) or their perceived membership of one or more social groups, and about the members of such groups as a whole (Taylor, 2013). While stereotypes may be positive or negative, and can help people generally make sense of the world by categorizing and classifying the people and situations they encounter (Barna, 1997), if people only use the concept of stereotypes without having cultural awareness and understanding intercultural communication in the real world, it can cause problems and failures in communication. Third, they should not have prejudice, which normally refers to having biased or unfair opinions or attitudes toward any other people or groups due to differences in race, nationality, religion, culture, gender, or other aspects (Samovar & Porter, 1991). Further, prejudice relates to having preconceptions of individuals or groups based on unfounded attitudes, opinions, or beliefs. The negative effects of prejudice include viewing persons within a group not in terms of their individual merit but rather by the superficial characteristics that make them part of that group. Prejudice can arise in many forms, ranging from those that are impossible to detect (unintentional) to those that are clearly intentional. A particularly serious intentional form of prejudice is discrimination, which can cause lots of problems in intercultural communication because it involves the unfavorable treatment of individuals or groups due to their e.g., gender, religion, race, or disability (Brislin, 1985).

Some studies have been conducted to investigate engineering students' attitudes toward intercultural communication, as present-day engineering companies increasingly require staff with intercultural communication competence. For example, a survey study was done in a Spanish university based on an intercultural communication competence assessment framework among industrial engineering students. It found that many students already had some awareness of common cultural differences and stereotyping, and agreed that not only English communication skills, but also intercultural communication skills are factors for successful intercultural communication (Candel-Mora, 2015). Conversely, a study at a US university examined engineering students' intercultural communication skills using surveys, textual analysis, and interviews. The study found that the students did not show a high level of awareness of such skills, meaning that the engineering program in that university did not emphasize the development of those skills, though these skills would be beneficial for students' future careers (Yu, 2012).

E-learning

To enhance learning performance, and autonomous learning in the 21st century, electronic learning, or e-learning, is receiving increasing attention. E-learning is an integration of technology and education and has been increasingly adopted worldwide in many educational contexts, particularly higher education (Cidral et al., 2018). Unlike traditional face-to-face learning, it is another way of study that also brings great benefits for learners. Even though various definitions of e-learning have been given by various scholars, the original meanings are not much different (Lee et al., 2011; Mayer, 2017; Pham et al., 2019). Generally, e-learning refers to the integration of technology to promote teaching and learning, whereby such learning relies on either internet-based learning or computer-based learning as a powerful medium for learning. Learners can gain learning experience by accessing various resources in different formats (e.g., text, images, audio, videos) from a range of devices, including laptops, computers, smartphones, and/or tablets (Al-Fraihat et al., 2020). E-learning platforms can take various forms, such as Moodle (Modular Object-Oriented Dynamic Learning Environment), MOOCs (Massive Open Online Courses), or even social media (e.g., Facebook, YouTube, and X, formerly known as Twitter). Each platform has unique characteristics and functionality. Therefore, it is up to the teacher to select the platform that is most appropriate to their classroom context and learner readiness for and familiarity with the use of each platform. E-learning offers great opportunities for learners. First, it solves the potential problems of time and location, whereby learners can access online lessons nearly anytime and anywhere when they are ready and eager to learn (Mayer, 2017). Second, it allows learners to learn on demand and reduces the cost of learning (Cidral et al., 2018). Third, learners tend to enjoy the freedom this learning offers for controlling the pace and rhythm of their studies as they are not required to stay in the classroom (Pham et al., 2019).

Because of such benefits of e-learning, researchers have attempted to improve teaching practices by incorporating e-learning, including for developing English communication skills and ICC for engineering programs. One such effort is the development of online courses or technology-assisted learning activities to develop the skills of engineering students. In Taiwan, a tailor-made course entitled "Cross-Cultural Communication" was developed and enabled students to have discussions about cultural topics with other students from partner universities in the U.S., Mexico, Peru, Switzerland, Russia, and Japan via the use of information and communication technology (ICT). This attempt was successful in enhancing both the English communication skills and ICC of the students (Shih, 2017). Another study in China designed and developed a massive open online course (MOOC) on "English cross-cultural communication" with the overall aim to develop such skills. The MOOC was able to improve students' ICC as well as their English

language abilities (Jiang & Hou, 2022). Another attempt was made to develop aerospace engineering students' intercultural skills in a Spanish university and an English university through telecollaboration. Both groups participated in asynchronous discussions focusing on two cultural topics in small groups and via synchronous Zoom sessions in pairs. These innovative learning activities were successfully implemented and yielded benefits for both groups of students in terms of developing their intercultural communication and English communication skills (Di Sarno-García, 2023). Still, such online courses are not widely available in recent literature, especially in the Thai HE context when it comes to promoting both English communication skills and ICC of undergraduate engineering students.

The ADDIE Model for Course Design and Development

The ADDIE model, introduced by Rosset (1987), offers an effective instructional design process with five essential phases: analysis, design, development, implementation, and evaluation (see Figure 1). This model provides valuable support to teachers as course designers and developers, enabling them to thoughtfully plan instruction, implement the curriculum effectively, and skillfully incorporate technology, pedagogical knowledge, and classroom environment (Baldwin & Ching, 2019).

Figure 1

ADDIE Model (Rosset, 1987)
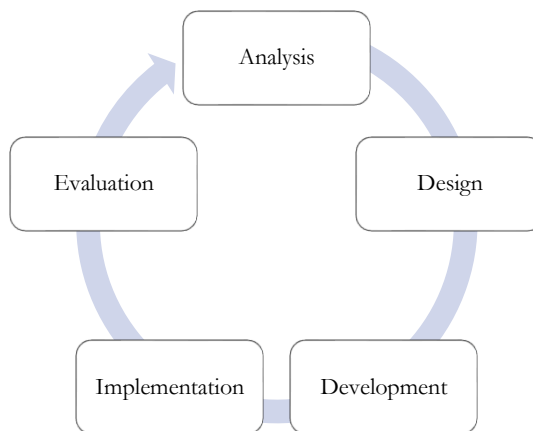
Specifically, the model can be followed step-by-step. The first phase involves the analysis of students' needs, such as more information about the knowledge, skills, or attitudes the students need to attain and what needs to

be taught to accomplish their educational goals. In our study, we analyzed not only students, but also professionals and lecturers to explore different perspectives in the engineering field, connecting the professional and educational settings. In the design phase, teachers create a blueprint that describes how to deliver the instruction to meet the objectives identified in the first phase. It is a selection of an instructional method that is helpful for students and helps them achieve learning objectives. The third phase deals with developing all the instruction components and actual learning materials that meet the blueprint created during the design phase. Next is the implementation phase. The instruction must be implemented in an actual classroom with student involvement and effective classroom management. The final phase evaluates whether instruction achieves its intended goal(s) and whether it needs any improvement. Collecting formative and summative feedback from students is undeniably crucial in this phase. Therefore, this study adopts the ADDIE model to develop a tailor-made course. We have observed that the model offers a systematic design process that can effectively assist us in achieving our research aims. However, we focused on the initial three phases (i.e., analysis, design and development) as this study is intended to present the findings of an initial phase in our research project.

Methodology

Research Design and Setting

Herein, a mixed-methods approach was employed to gather both quantitative and qualitative data in the first phase (Creswell & Plano Clark, 2018). The key findings were then used to guide the design and development of an online course for engineering undergraduate students based on the ADDIE model in the second phase.

The study was done at an autonomous university situated in the Bangkok metropolitan area, Thailand. The Faculty of Engineering at that university was purposively chosen as the research site, which comprised seven departments, namely Chemical Engineering, Computer Engineering, Civil Engineering, Mechanical Engineering, Electrical Engineering, Environmental Engineering, and Biomedical Engineering. This faculty offers nine bachelor's programs taught in Thai and three bachelor's programs taught in English, catering to both local and international students. The faculty is well-equipped with modern laboratories, research facilities, and industry connections, supporting a robust educational environment.

Participants

The participants of this study comprised three groups: engineering students, lecturers from the Faculty of Engineering, and engineering professionals.

The first group consisted of students from the seven departments mentioned above. They were purposively selected based on their active enrollment in undergraduate engineering programs, with a focus on third-year students. These participants were chosen from those who were willing to engage in the study.

With the assistance of the Vice Dean of Academic Affairs, 108 engineering students and 16 engineering lecturers were identified and enrolled in this study. Among the 108 students, 53 were male (49.07%) and 55 were female (50.93%). All participants were third-year students majoring in chemical engineering, computer engineering, civil engineering, mechanical engineering, electrical engineering, environmental engineering, and biomedical engineering. Chemical engineering accounted for the largest proportion of students (29.63%), followed by computer engineering (21.30%) and civil engineering (19.44%), respectively.

The 16 lecturers all hold doctoral degrees and have at least 5 years of teaching experience at the university. Male lecturers (10, 62%) outnumbered female lecturers (6, 38%).

Additionally, 22 engineers from local and international companies in Thailand participated in the study. The snowball sampling technique was used to recruit these participants, allowing access to a specialized group of engineers through existing professional networks. This resulted in a sample of 14 male engineers (63.64%) and 8 female engineers (36.36%). The engineers' highest level of education ranged from bachelor's to doctoral degrees, with civil engineering, electrical engineering, and computer engineering accounting for 77.27% of the participants. Their professional work experience ranged from less than 1 year to more than 30 years, with 68.18% having 1–15 years of experience.

Research Instruments

A questionnaire and semi-structured interviews were employed as the key research instruments.

Questionnaire

We developed the questionnaire for participants to self-report their abilities and needs (i.e., engineering students and professionals), based on

similar processes applied in previous studies (e.g., Alaka, 2020; Rajprasit & Hemchua, 2015). It aims to assess the current skill levels and identify specific areas where development is needed. The questionnaire was developed in Thai and was divided into five parts.

- **Part I** covered the participants' demographics, including gender, educational background, and work experience (for the participants who were engineering professionals). This section contained three items.
- **Part II** was designed for the participants to self-report their English language proficiency, including listening, speaking, reading, and writing skills. This section contained 15 items. Below are sample statements or questions from this section:
  1. Listening skill: understanding words and basic familiar expressions; understanding key points in clear and standard English.
  2. Speaking skill: using basic expressions and phrases and asking simple questions; responding to familiar topics such as describing jobs in simple terms.
  3. Reading skill: reading simple words and phrases used in everyday life; reading short simple texts to get the gist or specific information.
  4. Writing skill: writing coherent texts or notes on familiar subjects; writing clear and detailed texts, reports, and essays.
- **Part III** was designed for the participants to self-report any problems they encountered with the general English language in the four language skills. This section contained a total of 17 items. Below are sample statements or questions from Part III.
  1. Listening skill: inability to understand English presentations; inability to understand long conversations.
  2. Speaking skill: inability to make oral presentations; inability to pronounce English clearly and correctly.
  3. Reading skill: inability to find the main idea(s); inability to guess meaning from the context.
  4. Writing skill: inability to write more complicated structures; inability to express opinions effectively in writing.
- **Part IV** covered participants' perceptions of the language skills needed to perform English-related tasks in the engineering workplace. This section contained 20 items. The following are the sample statements or questions from Part IV.
  1. Listening tasks: understanding the core content when attending international conferences; understanding instructions and recommendations.

2. Speaking tasks: delivering oral presentations; handling telephone conversations; engaging in informal and social conversations.
3. Reading tasks: interpreting instructions and recommendations; reading project reports and engineering-related articles.
4. Writing tasks: composing business e-mails; writing business letters; drafting reports; preparing project proposals.

- **Part V** covered participants' knowledge about intercultural communication competence in the workplace. This section contained 12 items. The following are sample statements or questions from Part V.
    1. Multiculturalism: A multinational company has employees from various nationalities.
    2. Interpersonal Communication: Employees have to cope with other nationalities with different cultural statuses, affecting interpersonal communication.
    3. Low versus high context communication: The level of understanding of instructions and orders may vary among employees from different nationalities.
    4. Individualism versus communitarianism: Some employees may prefer to handle tasks individually, while others may prefer working in groups.
    5. Specific versus diffuse cultures: Some employees may continue to interact with colleagues from other countries after work.

All questions in the questionnaire were close-ended. A five-point Likert scale was used in Parts II-IV. For participants' English proficiency in Part II, the scale ranged from 1 (very poor) to 5 (excellent). For participants' problems in Part III, the scale ranged from 1 (never) to 5 (always). For participants' needs to perform English-related tasks in Part IV, the scale ranged from 1 (very low) to 5 (very high). However, in Part V, which addressed participants' knowledge of intercultural communication competence (ICC) in the workplace, we used a different scale: "1" if they are unaware of ICC, "2" if they are unsure, and "3" if they are aware of it.

Regarding the reliability of the questionnaire, Cronbach's Alpha Coefficient was 0.95, indicating high reliability.

Semi-Structured Interviews

The semi-structured interviews aim to explore engineering lecturers' perspectives on the role of English language skills and intercultural communication in the field of engineering. The questions for the engineering lecturers were developed, based on previous studies. In total, 17 questions were developed, covering the themes of English use in engineering classes and intercultural workplaces, as well as soft skills (i.e., separate from the disciplinary knowledge) needed for future workplaces. Some sample questions are as follows:

1. How important do you think English language skills are for an engineering career?

2. While teaching, have you integrated your work experiences to highlight the importance of English language skills? If so, how?

3. While teaching, have you integrated your work experiences to highlight the importance of intercultural communication skills? If so, how?

4. What issues would you like to suggest to instructors of English courses for engineering students to improve content and learning activities to better prepare future engineering graduates?

During the interviews, all the questions were posed in Thai to avoid misunderstanding and misinterpretation.

Data Collection Procedures

After receiving approval for the study from the institutional review board, we first contacted the heads of the seven departments for permission to perform the data collection as well as to explain the purposes of the data collection and the procedures we would follow. As mentioned earlier in the section on participants, this study included three groups: engineering students, lecturers, and engineering professionals. We used purposive sampling to select engineering students and lecturers from the Faculty of Engineering. In addition, we contacted engineering professionals using our connections to identify possible participants through snowball sampling techniques. Such techniques assisted us to further connect with professionals working for domestic and international companies that require their employees to have both English communication skills and intercultural communication competence.

The specific data-collection process involved three stages. First, the online questionnaire was distributed to the engineering students with the assistance of their lecturers. It took one week to complete this stage. Second, another online questionnaire was distributed to the identified engineering professionals via email and a mobile messenger application. This process was

also completed within a week. Finally, we conducted semi-structured interviews in Thai with the lecturers of the seven departments via the Zoom conferencing app. Each interview lasted about 60 minutes and it took about three weeks to complete this stage.

Data Analysis

There were two sets of the collected data: quantitative and qualitative data. The quantitative data (i.e., the engineering students' and professionals' self-report on their abilities and needs) were first analyzed using descriptive statistics, including the mean, standard deviation, frequency, and percentage. Then, the qualitative data (i.e., the engineering lecturers' responses to the semi-structured interviews) were analyzed by means of qualitative content analysis. That is, we transcribed and translated the voice recordings from Thai to English, and then manually coded the data using coding developed from previous studies. Key themes were elucidated based on the main results. After the data analysis, all the results were carefully considered and used to aid the design and development of an online course on engineering English for intercultural communication, which we hoped would meet their needs and fill the gaps in current engineering programs to develop engineers able to effectively perform English-related tasks in intercultural engineering workplaces.

Research Results

This section deals with the results from the two phases of the study: analyzing the data from the stakeholders, and designing and developing a course. First, it reports the results of Stakeholders' perceptions and needs of English communication skills and ICC. Such results are critical for designing and developing an EEIC online course as they reveal the English language proficiency, awareness of intercultural workplace communication, and needs of engineering students, professionals, and lecturers. Second, an EEIC online course and its components are presented.

Stakeholders' Perceptions and Needs of English Communication Skills and ICC

Quantitative data

In this section, the engineering students' and professionals' perceptions of their English language proficiency and intercultural

communication competence as well as their needs are reported and then compared.

      1. Perceived English Language Proficiency of the Engineering
         Students And Professionals

      As illustrated in Table 1, the perceptions of the English language proficiency of the engineering students and professionals were compared, covering their listening, speaking, reading, and writing skills. First, the overall mean score for the **listening abilities** of the students was 2.49 (fair level), whereas that of the engineers was 2.82 (good level), meaning that their perceived listening abilities were quite different. However, the students reported that they could do the following listening tasks effectively: understanding expressions and common vocabulary (mean = 2.57), understanding key points in clear and standard English (mean = 2.68), and understanding extended speech, even when it is not clearly structured (mean = 2.53). Conversely, the professionals were more confident about their listening abilities in terms of understanding words and basic familiar expressions (mean = 2.95), and understanding any kind of spoken language (mean = 2.68). Second, the students' perceived level of **speaking abilities** (mean = 2.44) was lower than that of the professionals (mean = 2.61). Nevertheless, the students perceived that they were only good at using basic expressions and phrases, and asking simple questions (mean = 2.55), whereas the professionals stated they were able to respond to familiar topics, such as describing my job in simple terms (mean = 2.64) and explaining their opinions or projects, and spontaneously participating in conversations (mean = 2.55). Third, both the students and professionals had high confidence about their **reading abilities** (mean = 2.82, and 2.96, respectively). Here, both groups believed they could read effectively, including reading simple words and phrases that are used in everyday life, reading short simple texts to get the gist or specific information, reading texts written in everyday language, and reading articles or reports with a particular point of view. Finally, the students' perceived level of **writing abilities** (mean = 2.24) was lower than that of the professionals (mean = 2.73). The professionals believed that they could do better than the students when it comes to writing coherent texts or notes on familiar subjects (mean = 2.95), writing clear and detailed texts, reports, and essays (mean = 2.68), and writing clear, well-structured texts, and developing their own point of view on complex subjects (mean = 2.55).

      To conclude, professionals generally possess stronger language skills, particularly in listening, speaking and writing, compared to students. While the students felt they could excel in specific listening tasks, the professionals exhibited overall higher confidence in their language abilities. Both groups

rated their reading skills as high, but professionals felt more competent in wrting detailed and coherent texts. The overall results emphasize the importance of addressing specific language skills in English language programs for engineering students to bridge the gap needed for them to become effective professionals and enhance their communication abilities in real-world scenarios.

Table 1

Perceived English Language Proficiency of Engineering Students and Professionals

Abilities	Engineering Students			Engineering Professionals		
	Mean ($\overline{X}$)	SD	Interpretation (Level of Ability)	Mean ($\overline{X}$)	SD	Interpretation (Level of Ability)
Listening Abilities	**2.49**	**0.819**	**Fair**	**2.82**	**0.930**	**Good**
1.1 Understanding expressions and common vocabulary	2.57	0.776	Good	2.91	0.868	Good
1.2 Understanding key points in clear and standard English	2.68	0.807	Good	2.77	0.973	Good
1.3 Understanding extended speech, even when it is not clearly structured	2.53	0.891	Good	2.82	0.958	Good
1.4 Understanding words and basic familiar expressions	2.49	0.815	Fair	2.95	0.899	Good
1.5 Understanding any kind of spoken language	2.35	0.812	Fair	2.68	0.839	Good
Speaking Abilities	**2.44**	**0.803**	**Fair**	**2.61**	**1.020**	**Good**
1.6 Using basic expressions and phrases, and asking simple questions	2.55	0.802	Good	2.64	1.002	Good
1.7 Responding to familiar topics, such as describing jobs in simple terms	2.44	0.800	Fair	2.64	1.049	Good
1.8 Explaining their opinions or projects, and spontaneously participating in conversations	2.33	0.809	Fair	2.55	1.011	Good
Reading Abilities	**2.82**	**0.761**	**Good**	**2.96**	**0.895**	**Good**
1.9 Reading simple words and phrases that are used in everyday life	3.03	0.755	Good	3.18	0.795	Good
1.10 Reading short simple texts to get the gist or specific information	2.92	0.763	Good	3.14	0.834	Good

1.11 Reading texts written in everyday language	2.68	0.795	Good	2.59	1.008	Good
1.12 Reading articles or reports with a particular point of view	2.64	0.729	Good	2.95	0.844	Good
Writing Abilities	**2.24**	**0.845**	**Fair**	**2.73**	**0.846**	**Good**
1.13 Writing coherent texts or notes on familiar subjects	2.44	0.846	Fair	2.95	0.844	Good
1.14 Writing clear and detailed texts, reports, and essays	2.16	0.799	Fair	2.68	0.894	Good
1.15 Writing clear, well-structured texts, and developing their own point of view on complex subjects	2.12	0.782	Fair	2.55	0.858	Good
Total	**2.49**	**0.807**	**Fair**	**2.78**	**0.895**	**Good**

2. Perceived Problems in English Language Proficiency

Table 2 shows the problems that engineering students and professionals have faced in achieving English language proficiency. First, both groups did not seem to have serious problems with their **listening abilities**, such as an inability to understand English presentations, English discussions, long conversations, or information delivered by speakers. However, the students reported that they sometimes had listening problems (mean = 2.73), as did the professionals, but to a lesser extent (mean = 2.38). Second, both groups did not report any major issues in **speaking English**, though the students tended to have a few more problems in certain areas (mean = 2.84) (e.g., inability to make oral presentations, construct oral sentences in a limited time, communicate properly, or pronounce English clearly and correctly) than the professionals (mean = 2.30). Third, when comparing their **reading abilities**, both the students and professionals seldom had reading problems (mean = 2.53, and 1.91 respectively), and they reported they usually did not have problems in finding the main idea(s), using skimming and scanning techniques, using detailed reading techniques, and guessing the meaning from the context. Lastly, the students seemed to have a few more **writing problems** (mean = 2.71) than the professionals (mean = 2.25), especially regarding writing more complicated structures, using vocabulary in different contexts, writing a paragraph or more, expressing opinions effectively when writing, and conveying messages to readers.

To summarize, both the engineering students and professionals reported minimal difficulty in listening and speaking English, although the students had occasional issues. Reading abilities were generally strong for both groups, with rare difficulties in various comprehension techniques. Writing seemed to pose slightly more challenges for the students, especially in complex structures and expressing opinions effectively, while the

professionals seemed to encounter fewer problems in this area. The findings indicate a generally positive trend in language proficiency, although targeted interventions in listening, speaking, and writing would potentially enhance students' overall language competence, and align their skills more closely with those of professionals in the engineering field.

Table 2

Perceived Problems in English Language Proficiency of Engineering Students and Professionals

Problems	Engineering Students			Engineering Professionals		
	Mean ($\overline{X}$)	SD	Interpre tation (Level of Frequency)	Mean ($\overline{X}$)	SD	Interpre tation (Level of Frequency)
Listening Skills	**2.73**	**0.857**	**Sometimes**	**2.38**	**1.032**	**Seldom**
2.1 Inability to understand English presentations	2.75	0.833	Sometimes	2.36	1.002	Seldom
2.2 Inability to understand English discussions	2.80	0.840	Sometimes	2.55	1.143	Seldom
2.3 Inability to understand long conversations	2.84	0.856	Sometimes	2.36	1.049	Seldom
2.4 Inability to understand any information from speakers	2.55	0.880	Seldom	2.23	0.973	Seldom
Speaking Skills	**2.84**	**0.941**	**Sometimes**	**2.30**	**1.103**	**Seldom**
2.5 Inability to make oral presentations	2. 81	0.949	Sometimes	2.23	1.193	Seldom
2.6 Inability to construct oral sentences in a limited time	2.93	0.964	Sometimes	2.23	1.110	Seldom
2.7 Inability to communicate properly	2.94	0.920	Sometimes	2.32	1.129	Seldom
2.8 Inability to pronounce English clearly and correctly	2.69	0.934	Sometimes	2.41	0.908	Seldom
Reading Skills	**2.53**	**0.845**	**Seldom**	**1.91**	**0.903**	**Seldom**
2.9 Inability to find the main idea(s)	2.53	0.859	Seldom	1.82	0.733	Seldom
2.10 Inability to use scanning and scanning techniques	2.55	0.836	Seldom	1.91	0.868	Seldom
2.11 Inability to use a detailed reading technique	2.54	0.891	Seldom	1.95	0.899	Seldom

2.12 Inability to guess meaning from the context	2.53	0.837	Seldom	1.95	0.950	Seldom
Writing Skills	**2.71**	**0.903**	**Sometimes**	**2.25**	**1.102**	**Seldom**
2.13 Inability to write more complicated structures	2.89	0.931	Sometimes	2.50	1.058	Seldom
2.14 Inability to use vocabulary in different contexts	2.65	0.857	Sometimes	2.18	0.907	Seldom
2.15 Inability to write a paragraph or more	2.65	0.940	Sometimes	2.14	0.941	Seldom
2.16 Inability to express opinions effectively when writing	2.71	0.876	Sometimes	2.23	1.110	Seldom
2.17 Inability to convey messages to readers	2.68	0.926	Sometimes	2.18	1.106	Seldom
Total	**2.70**	**0.887**	**Sometimes**	**2.21**	**1.035**	**Seldom**

3. Awareness of Intercultural Workplace Communication

Apart from English language proficiency, intercultural communication competence in the engineering profession is also a key aspect for future engineering professionals. Tables 3 and 4 present the participants' awareness of intercultural workplace and communication, comparing the engineering students and professionals. Both engineering students and professionals revealed some minor differences in their perceived awareness of intercultural workplace communication regarding the five issues: multiculturalism, interpersonal communication, low versus high context communication, individualism versus communitarianism, and specific cultures versus diffuse cultures.

First, as seen from Table 3, overall, 54.78% of the engineering students were aware of the above issues, while 45.22% were unaware. Noticeably, the issue that most were aware of was **multiculturalism** (e.g., working as a team with people from different parts of the world), with 66.67% aware of this, and 33.33% unaware. In this group, more than half of the students were aware of the issues of **interpersonal communication** (e.g., coping with other nationalities with a different cultural status in terms of different interpersonal communication styles or expectations of the time to be spent on tasks, and sharing their experiences with other nationalities, most especially for facing challenges), **individualism versus communitarianism** (e.g., understanding personal preferences between handling tasks handled individually and acting in a group), and **specific versus diffuse cultures** (e.g., relating with colleagues mostly from other countries after work). However, less than 50% were aware of the issue of **low versus high context communication**, such as that the level of understanding instructions and

orders may vary among employees with different nationalities, and there may be some differences in the allocation of responsibilities, most especially in terms of the hierarchy within different nationalities in a multinational company.

Second, as presented in Table 4, 71.59% of the professionals were aware of these issues, whereas 28.41% were unaware. Interestingly, the issue that most professionals were aware of was **interpersonal communication**, with 81.82% aware. The issue that the professionals were least aware of was the issue of **specific versus diffuse cultures** (54.55%). Additionally, more than 60% of them were aware of the following issues: **multiculturalism, low versus high context communication, and individualism versus communitarianism**.

In summary, while both groups showed awareness of some of the key issues, such as multiculturalism and interpersonal communication, disparities existed. The students had lower awareness of low versus high context communication, while the professionals were less aware of the issue of specific versus diffuse cultures. These findings highlight a need for increased education on intercultural communication for engineering students, focusing on specific aspects, such as low versus high context communication. The professionals' generally higher awareness of these issues suggests the importance of incorporating these topics into engineering education to better prepare future engineers for working in multicultural workplaces.

Table 3

Engineering Students' Awareness of Intercultural Workplace and Communication

Knowledge	Aware		Unaware		Total	
	N	**%**	**N**	**%**	**N**	**%**
Multiculturalism						
3.1 A multinational company has employees from various nationalities.	71	65.74	37	34.26	108	100.00
3.2 In a multinational company, employees will work as a team with people from different parts of the world.	72	66.67	36	33.33	108	100.00
Interpersonal Communication						
3.3 Employees have to cope with other nationalities with different cultural statuses in terms of interpersonal communication.	64	59.26	44	40.74	108	100.00
3.4 Employees have to cope with other nationalities with different	58	53.70	50	46.30	108	100.00

cultural statuses in terms of time spent on each task.						
3.5 Employees have to cope with other nationalities with different cultural statuses in terms of cultural differences.	65	60.19	43	39.81	108	100.00
3.6 Employees can share their experiences with other nationalities, most especially when facing challenges.	57	52.78	51	47.22	108	100.00
Low versus high context communication						
3.7 A level of understanding of instructions and orders may vary among employees from different nationalities.	42	38.89	66	61.11	108	100.00
3.8 It is possible to have communication misunderstandings in a multinational company.	57	52.78	51	47.22	108	100.00
3.9 There may be some differences in the allocation of responsibilities, most especially in terms of hierarchy within the nationalities in a multinational company.	48	44.44	60	55.56	108	100.00
Individualism versus communitarianism						
3.10 Some employees may prefer tasks handled individually, while others may prefer working in groups.	57	52.78	51	47.22	108	100.00
Specific versus diffuse cultures						
3.11 Some employees still relate with colleagues mostly from other countries after work.	56	51.85	52	48.15	108	100.00
3.12 Working environment should be conducive for all nationalities.	63	58.33	45	41.67	108	100.00
Total		**54.78**		**45.22**		**100.00**

Table 4

Engineering Professionals' Awareness of Intercultural Workplace and Communication

Knowledge	Aware		Unaware		Total	
	N	**%**	**N**	**%**	**N**	**%**
Multiculturalism						

4.1 A multinational company has employees from various nationalities.	17	77.27	5	22.73	22	100.00
4.2 In a multinational company, employees will work as a team with people from different parts of the world.	17	77.27	5	22.73	22	100.00
Interpersonal Communication						
4.3 Employees have to cope with other nationalities with different cultural statuses in terms of interpersonal communication.	18	81.82	4	18.18	22	100.00
4.4 Employees have to cope with other nationalities with different cultural statuses in terms of time spent on each task.	14	63.64	8	36.36	22	100.00
4.5 Employees have to cope with other nationalities with different cultural statuses in terms of cultural differences.	18	81.82	4	18.18	22	100.00
4.6 Employees can share their experiences with other nationalities, most especially when facing challenges.	16	72.73	6	27.27	22	100.00
Low versus high context communication						
4.7 A level of understanding of instructions and orders may vary among employees from different nationalities.	14	63.64	8	36.36	22	100.00
4.8 It is possible to have communication misunderstandings in a multinational company.	15	68.18	7	31.82	22	100.00
4.9 There may be some differences in the allocation of responsibilities, most especially in terms of hierarchy within the nationalities in a multinational company.	15	68.18	7	31.82	22	100.00
Individualism versus communitarianism						
4.10 Some employees may prefer to handle tasks individually, while others may prefer working in groups.	17	77.27	5	22.73	22	100.00
Specific versus diffuse cultures						
4.11 Some employees still relate with colleagues mostly from other countries after work.	12	54.55	10	45.45	22	100.00

4.12 The working environment should be conducive for all nationalities.	16	72.73	6	27.27	22	100.00
Total		**71.59**		**28.41**		**100.00**

4. Needs to be able to Perform English-Related Tasks

After investigating the perceptions of English language proficiency, problems with language skills, and awareness of intercultural workplace and communication, we next turned our attention to determining what the needs and ability gaps were among the engineering students and professionals for performing English-related tasks. Table 5 presents a needs analysis of listening, speaking, reading, and writing skills. First, the engineering professionals' scores suggested they had a greater need for English to effectively perform English-related **listening tasks** than the engineering students did (mean = 3.50 and 3.09, respectively). Specifically, the professionals wished they could have a better ability to understand instructions/recommendations (mean = 3.64) and the core content of meetings they attend (mean = 3.50). Second, the mean scores of these two groups were quite similar regarding the needs for English-related **speaking tasks** (i.e., oral presentation, talking at meetings/seminars, routine work, and telephone, informal, and social conversations). In addition, both groups felt they needed to improve their ability to take part in informal and social conversations. Third, the professionals felt they needed improvements in their English abilities to perform English-related **reading tasks** more than the students did (mean = 3.42, and 3.19, respectively). The ability to read instructions/ recommendations, manuals, and engineering-related articles was clearly an important point among the professionals. Lastly, the two groups' needs for doing English-related **writing tasks** (e.g., writing presentation slides, business emails, project proposals, and project reports) were at the same level, though the overall mean score of the students was slightly lower than that of the professionals (mean = 3.11, and 3.22, respectively). Overall, the professionals' scores suggested they had a higher need for advanced English language abilities to perform English-related tasks compared to the students. While the former are skilled in their engineering fields, they clearly encountered some challenges in English workplace communication. Therefore, their first-hand experiences were useful to consider when designing the course contents and learning activities.

To sum up, the engineering professionals exhibited greater needs for higher English abilities to perform English-related tasks in the workplace, especially listening and reading skills, and understanding instructions and the core content during meetings. Both the professionals and students had similar

needs regarding speaking and writing tasks, with particular needs to improve their English abilities to take part in informal conversations and write various document types. The findings highlight the importance of designing and developing the course content with consideration of the practical experiences of professionals in the field to address the specific challenges faced by professionals in English workplace communication.

Table 5

Needs Analysis in Performing English-Related Tasks

Needs	Engineering Students			Engineering Professionals		
	Mean ($\overline{X}$)	SD	Interpretation (Level of Needs)	Mean ($\overline{X}$)	SD	Interpretation (Level of Needs)
Listening Tasks	**3.09**	**0.920**	**Average**	**3.50**	**1.134**	**High**
5.1 Understanding instructions/ recommendations	3.22	0.801	Average	3.64	0.953	High
5.2 Understanding the core content when attending meetings	3.14	0.859	Average	3.50	1.185	High
5.3 Understanding the core content when attending international conferences	2.93	1.030	Average	3.36	1.217	Average
Speaking Tasks	**3.10**	**0.924**	**Average**	**3.09**	**1.338**	**Average**
5.4 Oral presentation	3.09	0.912	Average	3.14	1.320	Average
5.5 Meeting/ seminar	2.93	0.944	Average	2.91	1.377	Average
5.6 Routine work	3.10	0.917	Average	3.00	1.380	Average
5.7 Telephone	3.15	0.915	Average	3.09	1.342	Average
5.9 Informal and social conversations	3.22	0.921	Average	3.32	1.359	Average
Reading Tasks	**3.19**	**0.914**	**Average**	**3.42**	**1.152**	**High**
5.10 Instructions/ recommendations	3.22	0.890	Average	3.45	1.101	High
5.11 Manuals	3.20	0.915	Average	3.59	1.008	High
5.12 Project reports	3.19	0.888	Average	3.27	1.241	Average
5.13 Inter-office documents	3.08	0.948	Average	3.27	1.386	Average
5.14 Engineering-related articles	3.27	0.933	Average	3.50	1.058	High

Writing Tasks	3.11	0.990	Average	3.22	1.256	Average
5.15 Business e-mails	3.01	0.981	Average	3.27	1.202	Average
5.16 Business reports	3.11	0.970	Average	3.09	1.269	Average
5.17 Project proposals	3.11	0.980	Average	3.14	1.320	Average
5.18 Project reports	3.11	1.053	Average	3.18	1.296	Average
5.19 Business letters	2.98	1.004	Average	3.27	1.279	Average
5.20 Presentation slides	3.36	0.922	Average	3.36	1.293	Average
Total	**3.12**	**0.937**	**Average**	**3.30**	**1.220**	**Average**

Qualitative Data

This section mainly reports the engineering lecturers' perceptions of their students' English language proficiency and their support for increasing students' English communication skills and intercultural communication competence.

1. Students' English Language Proficiency

The engineering lecturers agreed that not all their students had a satisfactory level of English proficiency, mainly because they did not have many opportunities for improving their language proficiency during their study, and especially as their academic work focused primarily on mathematics, not on language proficiency per se. One lecturer asserted that "*Some students have a low level of English proficiency and lack assertiveness in communication in English.*" In addition, many students tended to have problems regarding an insufficient English proficiency level when first introduced to their work.

Many lecturers believed that without a practical level of English proficiency, their students would not be able to survive in their careers or compete with other engineers who are more proficient. One lecturer pointed out that writing emails is one of the most common forms of communication that students have to learn and use when working as professionals and mentioned that "*Many students still suffer from a lack of English email writing and direct communication skills.*" Another lecturer added that "*Most computer engineering students only need to learn more advanced technical terms used in their work contexts in order to successfully succeed with their tasks.*"

However, comparing their current students' language proficiency with the students who had graduated in the past ten years, most lecturers felt that more students today are able to use English more effectively in the

classroom when they are required to read texts and give group presentations in English, with one lecturer stating that "*Students in the present have better English communication skills and more confidence.*"

2. Importance of English Communication in the Engineering Workplace

Even though mastering of the English language may take much longer than learning engineering, most lecturers agreed that undeniably English is a crucial international communicative means or *lingua franca* for engineering professionals. Apart from domain-specific expertise, a competent level of English proficiency can open up students and professionals to better job opportunities. The lecturers added that many graduates today are likely to work in foreign or multinational companies or large and famous companies where English is one of the key requirements. This emphasizes that English is always a key to entering and progressing in the engineering profession, including in Thailand. One lecturer maintained that "*A competent level of English proficiency is the gateway to international or more advanced career opportunities.*" Once students are employed, they will need to have an even higher level of the language proficiency to get their job done and to enjoy career advancement. This was confirmed by some lecturers, with one stating that "*A competent level of English proficiency makes students or employees more professional-looking and sounding.*" That is, such proficiency can assist professionals to access a broader range of knowledge and information, and perform their tasks effectively and confidently, specifically in the international workplace, or even the domestic workplace when English is required for work. One lecturer emphasized, "*The success of English written communication is very important to working in engineering contexts.*"

3. Emphasis on English Communication in Engineering Classrooms

Despite the issues with English skills, English communication is not ignored in engineering classrooms. Most lecturers emphasized and reminded their students about the importance of English as an international *lingua franca*. Some lecturers who used to work for private organizations or state enterprises shared their work experiences in using English in the workplace. One lecturer mentioned, "*I often shared my work experiences with my students to make them aware of the significance of English,*" while another stated, "*I encouraged and shared techniques that help students develop their English language skills such as correct pronunciation, and linked pronunciation.*"

Apart from that, some lecturers had graduates working in large or famous companies to share their professional and language-related work

experiences with the current students to motivate them. In addition, many lecturers used instructional materials in English to get their students familiar with engineering terminology in English. Some had students conduct group presentations in English as shared by one lecturer who stated, "*I assigned students to conduct group presentations in English so that they can know and improve their language skills.*"

4. Emphasis on Intercultural Communication Competence in Engineering Classrooms

Although their engineering classrooms were mostly monolingual and monocultural settings, some lecturers did not ignore the need to raise intercultural communication competence in the workplace.

First, lecturers shared that they sometimes referred to the importance of people's diverse cultures and backgrounds to make their students aware of foreign employees' work habits. One lecturer asserted, "*I often emphasized my students to value work etiquette for my students to be able to sustainably and effectively live or work with people from other cultures.*"

Second, many of them shared with their students ways to cope with foreign employees who had different cultural-hierarchical statuses in terms of interpersonal communication. This was confirmed by one lecturer, who stated, "*I often referred to specific differences in styles of working with Asians and Europeans to make students understand different styles of communication.*" Another lecturer shared that "*I emphasized my students to value appropriate work habits in international working societies, especially politeness.*"

Third, the importance of coping with different perspectives and perceptions of time or punctuality by foreign employees was shared with students. One lecturer said, "*I told my students that, unlike Asian employees, European or Western employees do not work long hours a day because they prioritize the efficiency of work.*" Some lectures shared similar experiences, with one adding "*I always reminded my students that the Thai way of seeing punctuality as not a serious matter is unacceptable in international or professional work contexts.*"

Fourth, many lecturers sometimes shared with their students that employees of different countries or nationalities may have different levels of comprehension regarding advice and orders. One lecturer mentioned "*I referred to the diversity of cultures of people from different countries and different levels of cognition in the language used as a communicative means.*" Another lecturer added that he told his students not to accuse people from certain countries that they have a high or low level of comprehension as it could be construed as the speaker insulting or underestimating them.

Fifth, some lecturers highlighted the possibility of miscommunication issues occurring in multinational companies. One lecturer emphasized "*I*

always encouraged my students to be aware of using English and to consistently improve their English proficiency because miscommunications happen very often due to deficiencies in English speaking and listening proficiency." A key strategy that they introduced to their students to help them avoid miscommunication was to ask questions for clarification, as asserted by one lecturer, saying, *"I suggested my students ask questions when they do not clearly understand or are in doubt as it is the easiest and yet a very effective approach to solving such problems.*" Some lecturers also shared with their students' tips about how to socialize with international colleagues. One lecturer said that "*I often shared my work experiences with students that in some cultures, people feast after work and explained the purposes of such a culture to them.*" Another lecturer pointed out, "*I told my students that different groups of people feast or celebrate at different places depending on the interest of each specific group*".

Overall, most lecturers were quite sure that most of their students would be able to build good relationships with those around them and comfortably adapt to the future work environment. They believed that their students tend to have open minds and would be able to maintain proper etiquette in social and work environments.

5. Necessity of Teaching English Communication Skills

English communication is one of the key skills for undergraduate students today and requires effective teaching and practices in classroom settings for the students to improve their English skills. Most lecturers were not worried about their students' grammatical knowledge, and rather emphasized the focus should be on the communication skills that they will need in real-life workplace situations. One lecturer emphasized, "*The genuine essence or objective of language learning is proficiencies in communication*", while another mentioned, "*Only studying grammar does not effectively motivate students.*" Some lecturers agreed that improving students' communication skills, especially listening and speaking skills, should be prioritized. This is because their students lacked the opportunity to use English in everyday life and did not live in an environment that encouraged the consistent use of the language. One lecturer mentioned that the English courses provided to the students were not sufficient to improve their language alone, asserting that "*The engineering curriculum offers only two general English courses, which is not sufficient for developing students' English language skills.*"

In addition, most lecturers thought English instructors at their university could help by designing practical learning activities that would encourage and provide opportunities for students to express and share ideas in English to develop their English proficiency. Those activities could be designed based on entertainment purposes, because this might better interest and motivate the students in learning English. Apart from that, English

instructors could consider making use of technology to facilitate English language teaching and learning. One lecturer stated, "*I would like for there to be a convenient and efficient application that can perform as a teaching-learning platform.*" Some lecturers pointed out the issue of confidence in that many students were overly afraid of making mistakes when speaking or using the English language. They also lacked communication confidence and were unassertive. Therefore, the use of technology in English classrooms could help students to become more confident in learning English on their own and not to be afraid of losing face when making mistakes.

In summary, the qualitative data from the interviews provided a comprehensive insight into the engineering lecturers' perspectives on their students' English language proficiency and the need for a greater emphasis on English communication and intercultural communication competence in engineering classrooms. They collectively highlight the challenges in English proficiency, the pivotal role of English in engineering careers, their efforts to enhance communication skills in classrooms, and the importance of intercultural communication competence for success in the global engineering landscape. The lecturers expressed a desire to see more practical learning opportunities for the students and the integration of technology in classrooms to promote English language teaching.

An EEIC Online Course and its Components

In the previous phase, we analyzed the engineering students' and professionals' English language proficiency, existing knowledge about ICC, and needs, and analyzed engineering lecturers' perceptions of their students' English language proficiency and their support for increasing their English communication skills and ICC. The key findings were then used to construct the design and structure of an EEIC online course. That is, we carefully considered such findings when choosing the units' topics that combined English communication skills and ICC identified by those participants (see Figure 2).

Figure 2

The Two Phases of Developing the EEIC Online Course
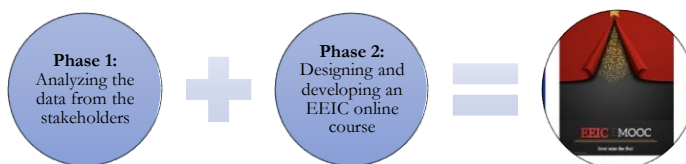
In doing so, we set the learning aims, decided on the content ordering, chose appropriate instructional techniques and instructional media (i.e., texts, graphics, and video clips), and chose the range of exercises (i.e., reading, writing, and discussion tasks). Next, we developed the lesson plans and decided on the best order of activities, and then created exercises to enable evaluating whether the students could demonstrate their learning. Finally, we uploaded all the instructional materials onto the course creation platform, which included the following: course overview, course objectives, expected learning outcomes, and learning activities.

Figure 3

Welcome Page for the Engineering English for Intercultural Communication (EEIC) Online Course

Our tailor-made online course aimed to develop undergraduate students' English communication skills and ICC in the international engineering workplace. Speaking, reading, and writing skills are the primary English language skills covered in this EEIC online course. Units were designed based on the self-reports of the participants and needs analysis of English communication skills and ICC among Thai engineering students and professionals. The findings from the data collection and analysis show that the key needs with regard to the language skills are: speaking skills, including the ability to take part in informal and social conversations, make oral presentations, and participate in telephone conversations; reading skills, including the ability to read manuals, instructions, recommendations, and

engineering-related articles as required for daily work; writing skills, including the ability to write business emails, project proposals, and reports. This course also aimed to enhance students' ICC to work in the international engineering workplace through specific activities and assignments in a separate unit. In this regard, Hofstede's cultural dimensions (i.e., power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity, long-term orientation/short-term orientation, and indulgence) are highlighted throughout the four units of the course, i.e., Multiculturism, Interpersonal communication, Verbal business communication, and Written business communication. Again, the ICC-related content was carefully crafted using the valuable self-reports and needs analysis provided by the participants. As for the EEIC learning objectives, the aim by the end of the course is that students' English communication skills will be improved and will meet the needs required for Thai engineering professionals while also increasing their intercultural awareness and sensitivity to work in international engineering workplaces in Thailand and possibly abroad.

Table 6

Course Outline

| Unit	Learning objective	Language skills	Hofstede's cultural dimension	Resources	Activity and assignment	Time needed to complete
1. Multiculturalism Multinational companies	By the end of this unit, participants will be able to: 1. Make conversations about company and colleagues 2. Explain instructions and recommendations about Engineering-related work 3. Identify challenges in international Engineering workplace	Speaking Reading	Individualism and collectivism Power distance Masculinity	A video clip: *International engineer* An article: *Multiculturalism in workplace* Discussion forum: *Working in a multinational company*	Watch a video clip Read an article and answer questions Discuss a topic in a forum Make a video of yourself: *instructions and recommendations about Engineering-related work*	10 mins 40 mins 30 mins 60 mins
2. Interpersonal communication 2.1 Multicultural team 2.2 International conference	By the end of this unit, participants will be able to: 1. Make small talk with colleagues at a meeting in International workplace 2. Make social conversations with foreign participants at the international conference 3. Discuss effects of cultural diversity on workplace communication	Speaking Reading	Individualism and collectivism Indulgence	A video clip: *Small talk* An article: *Interpersonal communication in international workplace* Discussion forum: *Avoiding communication misunderstanding in multicultural team*	Watch a video clip Read an article and answer questions Discuss a topic in a forum Make a video of yourself: *Small talk*	10 mins 40 mins 30 mins 60 mins
3. Verbal business communication 3.1 Oral presentation 3.2 Telephone conversation	By the end of this unit, participants will be able to: 1. Deliver a project presentation 2. Make telephone conversations with foreign colleagues 3. Discuss difficulties in communicating effectively in international engineering workplace	Speaking Reading	Uncertainty avoidance Indulgence	A video clip: *Technical sales engineer* An article: *Verbal workplace communication* Discussion forum: *Barriers to effective (spoken) business communication*	Watch a video clip Read an article and answer questions Discuss a topic in a forum Make a video of yourself: *Sales pitch*	10 mins 40 mins 30 mins 60 mins
4. Written business communication 4.1 Formal letters and emails 4.2 Project proposal and report	By the end of this unit, participants will be able to: 1. Write formal letters and emails to foreign colleagues and customers 2. Write project proposal and report 3. Identify challenges in technical writing among international engineers	Writing Reading	Uncertainty avoidance Long term orientation	A video clip: *Technical writing* An article: *Long-term orientation that affects international business* Discussion forum: *Challenges in technical writing in international workplace*	Watch a video clip Read an article and answer questions Discuss a topic in a forum Write formal emails Write project proposal	10 mins 40 mins 30 mins 60 mins 60 mins

Figure 4

Four Units of the EEIC Online Course

Regarding the expected learning outcomes, our course aims to highlight and improve the English communication skills required for the Thai engineering profession and raise key issues concerning intercultural awareness and sensitivity for effective engineering workplace communication. In doing so, the course includes various learning activities that address the challenges the students may face in their future careers in the engineering profession, including preparing them for the diverse environment they may find in the workplace, especially if working in an international company and/or in multicultural settings where people can be connected without a border. Students are expected to practice English communication skills and think about the effects of cultural diversity on international workplace communication from their own experiences and viewpoints. Throughout the course, the students will do speaking, reading, and writing activities, and share their ideas online with their classmates in discussion forums. It is expected that the students be respectful and polite to their classmates at all moments. Tentatively, we expect the students to complete the course within four weeks. They will need to spend approximately 3 to 5 hours per week to complete all four units. Many resources, such as video clips, web pages, and recommended reading lists, are

provided in each unit for participants who want to study the topics more deeply. The participants are recommended to use all the materials that are best suited to their needs, interests, and abilities.

Figure 5

Sample Larning Activities
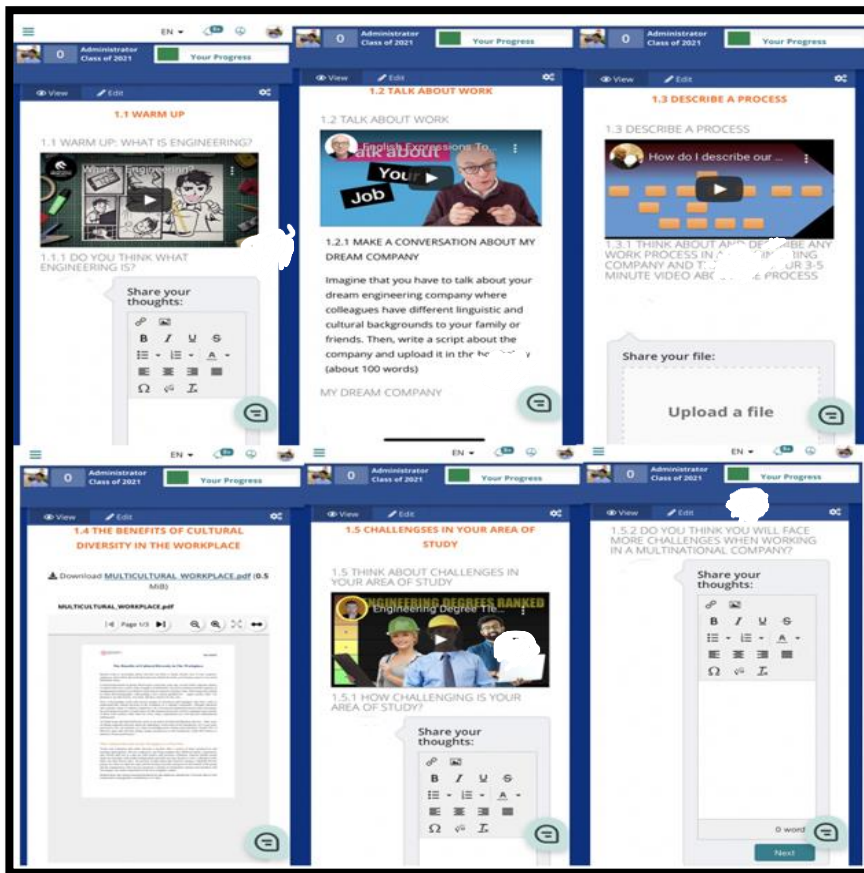
Discussion

New courses should be designed and developed based on the needs of stakeholders in specific and general areas to develop learners' knowledge, skills, and abilities as expected (Baldwin & Ching, 2019; Rossett, 1987). In this regard, we aimed to design and develop the 'Engineering English for Intercultural Communication (EEIC)' online course guided by the

perceptions and experiences of stakeholders, including engineering students, lecturers, and professionals. To attain this goal, the design included two phases: first, surveying the experiences, needs, perceptions, and problems raised by stakeholders, and second, utilizing the findings from analysis of the data collected to aid the course design and development.

First, the findings from those stakeholders revealed their perceived abilities and challenges in using English in educational and professional contexts. Here, we found that even though most of engineering students and professionals did not have serious problems, they did not seem to be competent or confident users of English. In particular, they did not express confidence in their abilities when asked to rate their levels of English language proficiency (i.e., listening, speaking, reading, and writing skills). They mostly believed that their abilities only stretched to doing simple English tasks, such as "understanding words and basic, familiar expressions", "reading simple words and phrases used in everyday life, reading short, simple texts", and "writing coherent texts or notes on familiar subjects". As emphasized by many researchers in studies on engineering education (e.g., Çal et al., 2022; de Souza Almeida, 2019; Ford et al., 2021; Handford et al., 2019; Wisniewski, 2017), apart from technical expertise, English communication skills are one of the key soft skills that engineering professionals need to get their job done and for their career advancement. English communication skills are also required when engineering students are looking for a job and the key extra qualification that many employers seek in their new employees. However, both the students and especially professionals lacked confidence in their communication skills, possibly because they had not been trained well enough in their classrooms. This is also true in other countries, such as Nepal (Shrestha et al., 2020) and Turkey (Çal et al., 2022; Çal et al., 2023), where studies have reported there is a gap between what is learned in educational settings and what is really used and needed in the professional world. This problem does not seem easy to be easy to resolve as engineering workplace communication is complex and context-dependent (Ford et al., 2021). The best solution that researchers and educators can come up with is to rely on stakeholders in the specific area who can share their real experiences of their "needs, lacks, and wants" when working in the profession. Consequently, collaboration between stakeholders, researchers, and educators can be fruitful in terms of improving the learning contents and skills acquired in education to make them more appropriate for the real workplace.

Second, when it comes to workplace intercultural awareness, about half the engineering students and professionals recognized the importance of cultural awareness in workplace communication, such as "coping with other nationalities with different cultural status in terms of interpersonal communication styles", and "cultural preferences in handling tasks

individually or as a group". However, the other half had not realized such issues may exist when working in the international workplace. This is not a surprise as the priority of engineering education is to train students in acquiring the necessary technical skills they will need in the profession. Nevertheless, it was pointed out that intercultural communication skills cannot be ignored in the present engineering profession as more interactions now occur with people, including engineering professionals, from diverse cultural backgrounds in the modern workplace. Therefore, engineering professionals need intercultural communication skills for professional success (Bharadwaj, 2023; Handford et al., 2019; Rico-García & Burns, 2020). In our study, the findings demonstrate that engineering education in a Thai context to date has not paid serious enough attention to developing intercultural communication competence among Thai students, even though many lecturers in our study informed us that they try to share experiences relating to intercultural workplace communication in their classrooms. While it is true that most engineering graduates will work domestically, even if they work in Thailand-based multinational companies and tend to work physically only with their Thai colleagues, intercultural communication competence is still necessary for Thai engineering professionals as there will undoubtedly be instances when they will need to deal with international colleagues and/or clients. In most cases, such communicative activities may be in writing emails, or taking part in group discussions, or conducting negotiations, all of which require not only English communication skills, but also intercultural communication skills. Thus, engineering professionals must be interculturally aware of diverse styles of language (Trudgill, 1992), and take care not to stereotype (Taylor, 2013) or prejudice (Brislin, 1985) others and so on to avoid communication breakdown from miscommunication or misinterpretation.

Third, the main findings from the stakeholder survey provided us with useful information to aid the "EEIC online course" design and development. We decided to design such a course as we believe that our engineering students would enjoy being able to follow the course and learn anytime and anywhere at their own pace (Lee et al , 2011; Mayer, 2017; Pham et al., 2019), and at the same time develop their English communication skills and intercultural communication competence. Because of the limited face-to-face learning hours and the large size of classrooms today, this EEIC online course can supplement in-class teaching and highlight both English communication skills and intercultural communication competence that are relevant to the real engineering workplace communication. Some previous studies (e.g., in Spain, Di Sarno-García, 2023; in China, Jiang & Hou 2022; in Taiwan, Shih, 2017) also developed online courses to increase university students' intercultural communication competence, but what differentiates

our study from their studies is the inclusion of stakeholders' experiences and perceptions in our study in the course design and development. In our online course, the four key English skills are equally in focus (see Table 1). Before students do an activity and complete an assignment in each unit, they will watch a video clip (e.g., international engineers, and small talk) and read a related article(s) (e.g., multiculturalism in workplace, and interpersonal communication in international workplace). They will then practice their listening and reading skills in the initial part of the lesson. Next, the students will be required to write their opinions on various topics (e.g., avoiding communication misunderstanding in multicultural teams, and barriers to effective (spoken) business communication) in a discussion forum and will need to speak about the subject by making a video recording of themselves (e.g., small talk and sales pitch). As described, we specially selected appropriate and relevant content and designed the learning activities and assignments based on the survey findings about their challenges, and needs in English language skills and intercultural communication competence in both educational and professional contexts.

Conclusion

We designed and developed a tailor-made online course called "Engineering English for Intercultural Communication (EEIC)" using the findings from a survey conducted with Thai engineering students, professionals, and lecturers. Even though we achieved the goals of our study, there are some limitations to note. First, the included engineering students and lecturers were selected from the same university. Thus, the findings reported are based on the specific teaching and learning contexts at that university, and so may not be generalizable to other institutes. Second, even though the number of students who responded to the questionnaire was statically sufficient, the number of engineering professionals who participated was quite low. Third, while the EEIC online course was successfully designed and developed as the first part of the research project, it still needs to be implemented in an actual learning environment to evaluate its quality. For further studies, the inclusion of more engineering professionals would provide a wider range of the "needs, lacks, and wants" in the workplace (both domestic and international), and help researchers and educators to rethink and improve their teaching practices and (online) courses. Taken together, this EEIC online course can be a reference for developing courses to meet the needs of engineering stakeholders in today's global workplace, in particular the use of English in intercultural workplace communication.

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About the Authors

Chalida Janenoppakarn: A lecturer at the Department of Language and Intercultural Communication, International College for Sustainability Studies, Srinakharinwirot University. Her research interests include English Language Teaching, English for Specific Purposes, and writing strategies and motivation.

Krich Rajprasit: An Assistant Professor at the Department of Language and Intercultural Communication, International College for Sustainability Studies, Srinakharinwirot University. His research interests include English for Specific Purposes, Global Englishes and English medium education.

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