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STEM lecturers' English language communication practices, ability beliefs, and needs: the case of Saudi universities

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For internationalization purposes, many higher education institutions in non-English-speaking countries are adopting English as a medium of instruction (EMI) policies. A key challenge is ensuring that subject matter or content teachers possess the required language proficiency levels, as their linguistic readiness is essential for the long-term success and sustainability of Englishization policies, i.e., using English as the language of instruction. This study explored the communication practices, self-perceived language abilities, and needs of 191 STEM lecturers at Saudi universities (n = 61, 58, and 72 lecturers of computer and information technology, engineering, and science majors, respectively). Data were collected through a four-part questionnaire designed to capture insights into the lecturers' EMI-related experiences and professional development requirements. The one-way ANOVA analyses showed significant differences among the STEM lecturers in their language communication practices, self-perceived language abilities, and needs. The lecturers' communication practices were closely aligned with their beliefs about their language competence, indicating the link between the perceived English ability and actual language practices in EMI contexts. The science lecturers reported lower confidence in their English abilities and greater communication needs than their peers in the engineering, computer, and information technology majors. These findings underscore the importance of language support. The article concludes by highlighting practical implications for meeting the specific English communication needs of STEM faculty members at Saudi universities.

KEYWORDS

STEM teacher language needs, English medium instruction, teacher education, EMI, self-ability beliefs

1 Introduction

The internationalization of higher education has become a growing phenomenon worldwide. Many non-anglophone countries have been increasingly implementing higher education internationalization polices for many purposes, such as attracting overseas and talented students, promoting university reputation, and meeting labor market requirements (Abdel Latif, 2024; Abdel Latif and Alhamad, 2023; Galloway, 2020; Macaro et al., 2018). With the notable increase of science, technology, engineering and math (STEM) higher education programs drawing on English as a medium of instruction (EMI) worldwide, it is important to maintain their sustainability requirements (Ismailov et al., 2021). A main relevant dimension pertains to the instruction and communication language in STEM classes, and helping students and teachers interact effectively using English.

Since internationalization generally implies the Englishization of higher education programs or using EMI in them, STEM content teachers represent the agents who are potentially most influenced in this educational scenario, particularly when they may be linguistically unprepared (Wang et al., 2025). In her typology, Bradford (2016) viewed that the implementation of EMI in higher education is encountered by linguistic, cultural, administrative, managerial, and institutional challenges. It is viewed that the planning process of EMI teacher professional development in STEM settings should promote their growth in the linguistic, pedagogical, and psychological domains (Huang et al., 2024; Wang et al., 2025). Of all these professional growth domains, the most complex area relates perhaps to identifying EMI content teachers' linguistic needs (Orduna-Nocito and Sánchez-García, 2022; Wang et al., 2025). With the noted variation in EMI practices across university contexts and classroom environments (Sahan et al., 2021), some researchers have provided conceptualizations of EMI pedagogy and related issues. For example, Richards and Pun (2023) published a typology comprising 51 features across 10 curriculum categories of EMI forms. In their typology, Richards and Pun included categories of different purposes of EMI, forms of its assessment, curriculum models (e.g., single medium, dual medium, interdisciplinary, and sheltered), and types of EMI content teachers (e.g., monolingual, bilingual native, English proficient, English restricted, English certified, English trained, and EMI experienced).

Content teachers' language competence is viewed as a decisive factor in successful EMI implementation for its conditionality to delivering course content effectively (Ismailov et al., 2025; Malmström et al., 2023; Ulfah and Basthomi, 2024; Wang et al., 2025). Rose et al. (2023), for instance, pointed out that EMI content teachers' low language proficiency negatively influences their pedagogical performance as it could reduce classroom interactions and water-down content presentation. These pedagogical weaknesses are likely to be associated with teachers' low language ability, confidence beliefs, and anxiety (Dewaele and Leung, 2022; Dong and Han, 2024). Accordingly, language preparation is an important dimension to be considered in STEM content teacher professional development.

Though EMI teachers' sustainable professional development should empower them to have a sense of ownership of English and develop effective classroom language (Yuan, 2020), previous research attempts have provided us with an unclear picture about the specific linguistic skills or dimensions STEM university lecturers are to be trained in. Overall, there has not been much research on content teachers' English proficiency perceptions in both STEM and non-STEM fields. Identifying STEM teachers' specific language needs remains a complex issue, requiring in-depth research to effectively support their roles in EMI environments.

STEM teachers' linguistic needs seem to be context-specific, and they likely vary from one international STEM setting to another. As Hamid et al. (2013) stated, EMI "cannot be decontextualized from its social, geographical and historical context" (p. 3). Given the context-specific nature of EMI practices, this study addressed Saudi university STEM lecturers' English communication practices and self-perceived language abilities. Examining this rarely explored issue in Saudi Arabia, the findings could be valuable insights for enhancing professional development and language training programs tailored to the needs of STEM faculty members at its universities.

2 Previous studies

Previous research has explored EMI teachers' linguistic needs in both STEM and non-STEM contexts using various approaches. Some studies focused solely on language needs, while others examined broader professional development requirements. However, a few studies have specifically involved STEM lecturers, who face unique language challenges. In the following paragraphs, the research findings of both types of studies are highlighted.

Some studies have adopted a cross-European approach to investigating EMI content teachers' needs. In their comparative study, Dearden and Macaro (2016) interviewed 25 content lecturers from Austrian, Italian, and Polish universities about their EMI experiences and the English proficiency levels needed for effective classroom delivery. Most interviewed teachers reported they were not ready for EMI due to their limited experience and insufficient support from their universities. Orduna-Nocito and Sánchez-García (2022) also identified the internationalization policy orientations at 10 European higher education institutions through analyzing 70 reflections written by 28 EMI lecturers to understand the matches between EMI policy outlines and lecturers' teaching perspectives and experiences. The study found a misalignment between lecturers' classroom experiences and perspectives and the top-down policy requirements for English proficiency in EMI teaching, thus indicating a gap between practical teaching realities and official standards for certifying linguistic and pedagogical competences in EMI settings.

Several studies have examined EMI content teachers' needs in Spain. In a mixed-method study of 41 engineering faculty members, Aguilar (2017) found that most lecturers preferred EMI over content and language integrated learning (CLIL) as a result of language barriers preventing them from adopting more integrated language-teaching approaches. Banks (2018) mix-method study also revealed that Spanish university EMI lecturers prioritized receiving linguistic training for developing oral-aural skills over pedagogical training, and were specifically concerned about making language and pronunciation errors. In another mixed-method study, Macaro et al. (2019) found that the Spanish university EMI teachers who have gone through professional accreditation reported that their training programs excessively emphasized linguistic skills. The training needs the lecturers reported include fostering supra-segmental language skills, stylistics, academic register, enhancing student interaction, and overcoming communication breakdown problems. On the other hand, Cañado (2020) drew on data triangulation to identify content lecturers' training needs in Spain and found that they had a number of challenges in language areas such as written and oral expressions, and specific academic and communicative vocabulary.

Research has also examined pertinent issues with content teachers in other European EMI settings. In the Danish context, Jensen and Thøgersen (2011) surveyed 1,131 university lecturers' attitudes toward EMI. Their participant lecturers' perceived English proficiency levels were found to be associated with their attitudes and practices; younger generations of lecturers had more favorable EMI attitudes and felt more comfortable using English than older generations. Drawing on questionnaire and interview data, Guarda and Helm (2017) explored the EMI experiences and needs of lecturers teaching various majors at an Italian university. While this study revealed the lecturers' divergent EMI experiences, the majority of them had concerns about using English as a language of instruction because of their low English ability confidence,

particularly fluency, pronunciation, grammar and vocabulary, and students' different English levels. In Sweden, Malmström et al. (2023) examined 130 content lecturers' receptive and productive knowledge of general and academic English vocabulary. They found significant proficiency variation in the lecturers' vocabulary knowledge levels, which indicates their diverse abilities to communicate in English in their classes.

Some other research has been concerned with EMI content teachers' needs in Asian contexts. In Japan, Uehara and Kojima (2021) investigated faculty members' professional development needs and priorities. Their questionnaire and interview data revealed that speaking skills and communication skills are among the areas the faculty development programs should prioritize, and that their professional training should be developed based on the content lecturers' English language needs. In Malaysia, Lo and Othman (2023) explored 277 university lecturers' readiness for EMI and the factors associated with it. Their survey data indicated that the lecturers' EMI knowledge and understanding related significantly to their academic qualifications and the EMI training received, but not to their EMI teaching experiences. In China, Curdt-Christiansen et al. (2023) collected questionnaire data from 158 lecturers and interviewed nine of them to identify what content teachers need to successfully implement EMI. Their results indicate that the lecturers' needs relate to a range of areas, including institutional support, professional, linguistic, and pedagogical training. In the Indonesian context, Ulfah and Basthomi (2024) surveyed 67 faculty members' perspectives on EMI. Most of their participant faculty members had positive attitudes toward EMI, but the language and communication use aspect was their most needed training dimension for EMI. Drawing upon interviews, Manan and Hajar (2024) looked at 58 STEM content lecturers' EMI perspectives and experiences in Kazakhstan. They found that the lecturers were not prepared to perform their EMI roles due to linguistic challenges.

Research on EMI content teachers' linguistic needs at Arab universities is limited. Among the few relevant attempts made is the study reported by Alhassan (2021), who studied 12 lecturers at an Omani university. His participant lecturers were found to encounter linguistic and pedagogical challenges in their EMI implementation. They emphasized a greater need for language training to effectively deliver subject content and enhance student understanding. In the Saudi higher education context, relevant empirical research remains scarce. In his survey study, Alhamami (2015) found that the majority of the science faculty members at a Saudi university preferred to use Arabic in their instruction. For these science lecturers, there were some academic challenges in teaching university science courses in English. In a later study at a Saudi university, Alhamami (2021) found that engineering lecturers had a more positive attitude toward using EMI, but their students preferred Arabic over English. On the other hand, Quotah (2023) employed semi-structured interviews in a case study with five STEM lecturers at a Saudi university to explore their EMI implementation and experiences. The study found considerable variation in EMI practices, with Arabic-native lecturers frequently switching to their mother tongue during classes as a result of their limited EMI experience, institutional acceptance of Arabic use, and students' low English proficiency. These findings underscore the complex challenges the lecturers encountered in effectively delivering content through EMI and highlight the need for enhanced support and training.

The other studies involving using EMI at Saudi universities have been concerned with issues beyond the scope of the present study, such as content lecturers' views on students' language difficulties or language-related assessment perspectives (Abdel Latif and Ali El Deen, 2024; Alrashed and Abdel Latif, 2024, for a review see Alqarni et al., 2024). Therefore, there is a need to explore EMI teachers' language needs at Saudi universities. Apart from this contextual gap, a few of the above-reviewed studies have dealt with the language needs or language perspectives of STEM teachers (e.g., Aguilar, 2017; Alhamami, 2015, 2021; Manan and Hajar, 2024; Quotah, 2023). Given the context-specific nature of STEM teachers' language-related instructional practices and linguistic needs, it is essential to examine how content lecturers in various STEM disciplines and international settings are linguistically prepared to implement EMI. This study, therefore, explored the English language communication practices, self-perceived language abilities, and needs of STEM lecturers teaching computer and information technology, engineering, and science majors at Saudi universities. The aim was to better understand their readiness for EMI and to provide implications for supporting their professional and linguistic development.

3 The present study

In light of the above, the present study is guided by the following three research questions:

- To what extent do Saudi university STEM lecturers of computer and information technology, engineering, and science majors use English in their instruction and course-related practices?
- What are these STEM lecturers' perceived English communication self-ability beliefs and needs?
- To what extent do these STEM lecturers' English communication practices, beliefs and needs vary depending on the university major?

To address these issues, we used a questionnaire to reach a broad sample of content lecturers and gather a larger data set. By focusing on the English language practices and needs of STEM lecturers, the study offers valuable insights that may help meet their linguistic demands, enhance the effectiveness of content delivery, and the long-term success of EMI in Saudi universities. The study could also foster the link between research and instructional practices in higher education STEM programs (Abdel Latif, 2025) and contribute to sustaining the quality and international relevance of STEM programs in this educational context.

3.1 Participants

In this study, we used the stratified random sampling approach because we aimed at collecting data from different subgroups to compare their perspectives, and also obtaining responses from a representative sample for generalization purposes. The participants in this study were 191 faculty members teaching STEM majors at eight Saudi universities (n = 61, 58, and 72 in computer and information technology, engineering, and science majors, respectively). The 61 computer and information technology faculty members were majored in computer science, information management, information systems, and information technology (n = 13, 7, 19, and 22, respectively); the 58 engineering faculty members were working in chemical, electrical, civil, industrial, and mechanical engineering departments (n = 12, 10, 17, 8, and 11, respectively); and the 72 faculty members doing sciences

were teaching biology, chemistry, mathematics, and physics (n = 5, 19, 27, and 21, respectively). Of the 191 participants, 127 were male, whereas 64 were female. All the participants were PhD holders with varied ages and teaching experience. Notably, 51 participant faculty members completed their PhD degrees in English-speaking countries, while 140 faculty members obtained their PhD degrees in non-English-speaking ones. The participants were all native speakers of Arabic, and they were of Algerian, Egyptian, Jordanian, Saudi, Sudanese, Tunisian, and Yemeni nationalities. All the participant faculty members took part in the study voluntarily and based on informed consent.

3.2 The questionnaire

We used a 4-part questionnaire to collect the data about the issues addressed in the study. The items of the questionnaire were developed in light of the research purpose and questions. Through online discussions, we developed our conceptualization of the questionnaire format and sections, and what each section should assess. In light of this conceptualization, the first author wrote an initial questionnaire draft whose items were checked and discussed for face validity through our online discussion. Some editing changes were made in the initial questionnaire draft guided by the comments given by the second author. Meanwhile, an expert applied linguist also read our agreed-upon questionnaire draft for face validity purposes and provided some comments, which helped us to edit six items in it. The questionnaire was written in Arabic to avoid the respondents any potential difficulties in understanding its items. In its final draft, the questionnaire consists of 21 statements that are given in four parts. It starts with the demographic section, which was used to collect data about the respondent faculty members' STEM majors, universities, colleges, gender, nationalities, ages, teaching experiences, and the countries (an English-speaking country versus a non-English-speaking one) in which they completed their PhD degrees. The first questionnaire part includes nine statements that concern the teachers' use of English in different instruction and course-related activities. Parts 2 and 3 on the questionnaire were used to assess the lecturers' perceived English language proficiency and communication self-ability beliefs. Part 2 has one item tapping the lecturers' rating of their English language proficiency according to five levels (excellent, very good, good, satisfactory, and poor). The third questionnaire part includes six items assessing the respondents' self-ability beliefs about performing particular communicative, instructional, and course-related tasks in English. The last part of the questionnaire has five items related to the lecturers' perceptions of their English language needs. A 5-Likert scale (strongly agree, agree, uncertain, disagree, and strongly disagree) is used in the first, third, and fourth questionnaire parts. The 21 Likert-scale items used in the questionnaire parts had an average Cronbach's alpha reliability coefficient of 0.76.

3.3 Data collection and analysis

Data were collected using an online questionnaire created through Google Forms. Before distribution, institutional ethical approval was obtained. Faculty members from computer and information technology, engineering, and science colleges at various Saudi universities were invited to complete the questionnaire. To avoid bias in sample selection, we invited groups of faculty members working at universities belonging to different geographical regions in Saudi Arabia. In doing this, we aimed to maximize participation and ensure broad representation across different STEM disciplines and institutions within the Saudi higher education context. The data collection process was completed over a period of 10 weeks. Following the data collection process, we started sorting out the data and preparing it for the statistical analysis. We used the one-way ANOVA in analyzing the data and comparing the responses of the three faculty member groups to the questionnaire items. The one-way ANOVA was particularly preferred over non-parametric tests due to the large sample size in the present study. The random sampling of the participants and the normal distribution of the data, as indicated by Kolmogorov–Smirnov and Shapiro–Wilk tests, also supported our decision to use the one-way ANOVA. The data analysis outcome was organized in tables summarizing the results of the one-way ANOVA for all the items, and the *post hoc* multiple comparisons of the lecturers' responses to the statements with significant differences.

4 Results

The results of the study are organized into the following subsections, with each section addressing one of the research questions. This structure allows for a clear and focused presentation of the results, ensuring that each research question is thoroughly answered. By dividing the results of the data analysis in this way, we aimed to provide a detailed description of the English language practices, self-perceived abilities, and communication needs of STEM lecturers in the Saudi higher education context.

4.1 The lecturers' use of English in different instruction and course-related activities

Table 1 shows the results of the one-way ANOVA of the teachers' reported uses of English in instruction and course-related tasks. As the table shows, there are no significant differences between the responses of the computer and information technology, engineering, and sciences groups to statements 1–6 which tap their use of English in explaining the whole lecture content (M = 3.92, 4.17, and 3.96, respectively), explaining a part of the lecture content (M = 4.07, 4.14, and 4.14, respectively), communicating technical terms (M = 4.52, 4.72, and 4.64, respectively), asking students questions (M = 3.61, 3.76, and 3.82, respectively), giving classroom instructions (M = 3.71, 3.33, and 3.60, respectively), and providing students with feedback (M = 2.82, 2.95, and 2.92, respectively). This means that lecturers' translanguaging varies depending on the instructional context. English is used most frequently for communicating technical terms and explaining lecture content (average means of 4.62 and 4.11, respectively). It is less often used for asking questions and giving instructions (means of 3.73 and 3.54), and least for providing feedback to students (mean of 2.89). Meanwhile, there are significant differences among the faculty member groups in the responses to statements 7–9.

Table 2 gives the LSD *post hoc* multiple comparisons of the lecturers' responses to statements 7–9. In their responses to statements 7–9, the sciences lecturers reported lower frequencies than those teaching computer and information technology and engineering students using English for communicating with students in office

TABLE 1 Results of the one-way ANOVA of the lecturers' reported uses of English in instruction and course-related tasks.

Item	Differences	Sum of squares	df	Mean square	*F*	Sig.
Item 1	Between groups	2.238	2	1.119	1.197	0.304
	Within groups	175.741	188	0.935		
	Total	177.979	190			
Item 2	Between groups	0.221	2	0.110	0.135	0.874
	Within groups	153.245	188	0.815		
	Total	153.466	190			
Item 3	Between groups	1.197	2	0.598	1.832	0.163
	Within groups	61.410	188	0.327		
	Total	62.607	190			
Item 4	Between groups	1.551	2	0.776	0.924	0.399
	Within groups	157.831	188	0.840		
	Total	159.382	190			
Item 5	Between groups	4.592	2	2.296	2.362	0.097
	Within groups	182.779	188	0.972		
	Total	187.372	190			
Item 6	Between groups	0.545	2	0.272	0.204	0.816
	Within groups	251.361	188	1.337		
	Total	251.906	190			
Item 7	Between groups	24.964	2	12.482	9.216	0.000
	Within groups	254.617	188	1.354		
	Total	279.581	190			
Item 8	Between groups	17.920	2	8.960	12.997	0.000
	Within groups	129.609	188	0.689		
	Total	147.529	190			
Item 9	Between groups	6.090	2	3.045	8.003	0.000
	Within groups	71.533	188	0.380		
	Total	77.623	190			

hours (M = 4.07, 3.90, 3.25; SD = 1.30, 1.11, 1.21, respectively), in writing emails to students about course-related issues (M = 4.79, 4.60, 4.08; SD = 0.55, 0.70, 1.08, respectively), and in writing course tests and assignment requirements (M = 4.98, 4.86; 4.57; SD = 0.13, 0.51, 0.89, respectively). As noted, there are differences between the sciences lecturers' mean responses to the three statements and those of the computer and information technology and engineering lecturers. This suggests that the science lecturers use more Arabic in non-instructional course-related activities than the faculty members in the computer and information technology and engineering colleges. In addition, no significant differences are found between the responses of the computer and information technology lecturers and the engineering lecturers to the three statements.

4.2 The lecturers' English language proficiency and communication self-ability beliefs

Parts 2 and 3 of the questionnaire were designed to evaluate the lecturers' English language proficiency and their self-perceived communication abilities. The two self-assessment parts provided insights into how confident the lecturers felt about their language ability and skills, thus forming a basis for understanding their readiness to teach using EMI and any potential gaps in their linguistic competences, which in turn may influence their classroom performance.

Part 2 has a single item, which asks the participants to rate their overall English proficiency. The results of the one-way ANOVA, shown in Table 3, reveal significant differences in the lecturers' ratings of their English proficiency levels. The LSD *post hoc* multiple comparisons given in Table 4 show that both the computer and information technology lecturers have significantly higher English proficiency self-ability ratings than the science lecturers (M = 4.44, 4.28, 3.78; SD = 0.45, 0.44, 0.31, respectively). This denotes that science lecturers have lower English language proficiency perceptions than their computer and information technology and engineering peers. Meanwhile, no significant differences have been detected between the responses of the computer and information technology and engineering lecturers to item 10.

The responses to the six statements in Part 3 of the questionnaire (items 11–16) provided deeper insights into the lecturers' perceived

TABLE 2 *Post hoc* multiple comparisons of the lecturers' reported uses of English in some course-related tasks.

Statement	(I) Colleges	(J) Colleges	Mean difference (I-J)	Std. error	Sig.	95% CI	
						Lower bound	Upper bound
I communicate with students in English while meeting them in office hours. (item 7)	Comp. & Inf. Tec.	Engineering	0.16902	0.21343	0.429	−0.2520	0.5901
		Sciences	0.81557*	0.20252	0.000	0.4161	1.2151
	Engineering	Comp. & Inf. Tec.	−0.16902	0.21343	0.429	−0.5901	0.2520
		Sciences	0.64655*	0.20533	0.002	0.2415	1.0516
	Sciences	Comp. & Inf. Tec.	−0.81557*	0.20252	0.000	−1.2151	−0.4161
		Engineering	−0.64655*	0.20533	0.002	−1.0516	−0.2415
I use English in writing emails to students about course-related issues. (item 8)	Comp. & Inf. Tec.	Engineering	0.18344	0.15228	0.230	−0.1170	0.4838
		Sciences	0.70355*	0.14449	0.000	0.4185	0.9886
	Engineering	Comp. & Inf. Tec.	−0.18344	0.15228	0.230	−0.4838	0.1170
		Sciences	0.52011*	0.14650	0.000	0.2311	0.8091
	Sciences	Comp. & Inf. Tec.	−0.70355*	0.14449	0.000	−0.9886	−0.4185
		Engineering	−0.52011*	0.14650	0.000	−0.8091	−0.2311
I use English in writing course tests and assignment requirements. (item 9)	Comp. & Inf. Tec.	Engineering	0.12154	0.11313	0.284	−0.1016	0.3447
		Sciences	0.41416*	0.10734	0.000	0.2024	0.6259
	Engineering	Comp. & Inf. Tec.	−0.12154	0.11313	0.284	−0.3447	0.1016
		Sciences	0.29262*	0.10883	0.008	0.0779	0.5073
	Sciences	Comp. & Inf. Tec.	−0.41416*	0.10734	0.000	−0.6259	−0.2024
		Engineering	−0.29262*	0.10883	0.008	−0.5073	−0.0779

*The mean difference is significant at the 0.05 level.

TABLE 3 Results of the one-way ANOVA of the lecturers' ratings of their English levels.

Item	Differences	Sum of squares	df	Mean square	*F*	Sig.
Item 10	Between groups	16.103	2	8.052	16.620	0.000
	Within groups	91.080	188	0.484		
	Total	107.183	190			

Comp. & Inf. Tec., Computer & Information Technology.

abilities to perform specific instructional and course-related communication tasks in English, such as explaining concepts, asking and answering questions, and giving feedback. The responses helped me gain a clearer understanding of the lecturers' communicative strengths and challenges within EMI settings. The average means of the lecturer groups' responses indicate that the six instructional and course-related tasks given in this part can arranged from the least to the most challenging for them to perform in good English as follows: communicating technical terms, explaining a part of the lecture content, pronouncing words and sentences, writing course handouts and assessments, explaining the whole lecture content, and fluently communicating course-related issues to students (average means = 4.62, 4.60, 4.52, 4.50, 4.41, and 4.27, respectively). Therefore, the lecturers find fluent English communication and whole lecture content explanation in English to be their most challenging tasks.

Table 5 provides the results of the one-way ANOVA of their responses to the six statements. As noted, there are no significant between-group differences in the lecturers' responses to item 15 tapping their perceived ability to communicate technical terms correctly in English (M = 4.57, 4.71, 4.60; SD = 0.74, 0.59, 0.66 for computer and information technology, engineering, and science lecturers, respectively). The noted high means in the three lecturer groups' responses to item 15 are similar to their responses to item 3 in the first questionnaire part (the above subsection), which concerns their use of English for communicating technical terms. This similarity means that it is a very common tradition for the lecturers in the three college types to communicate technical terms in English rather than in Arabic; therefore, they have no linguistic difficulty or confusion in this instructional dimension. Apart from item 15, there are significant differences in the lecturers' responses to the other five statements in the same questionnaire part (i.e., items 11, 12, 13, 14, and 16).

Table 6 gives the LSD *post hoc* multiple comparisons of the lecturers' responses to the five statements with the significant differences in the third questionnaire part. Various significant difference patterns can be noted in the table. In their responses to statements 11 and 12 concerned with explaining the lecture content partially or completely in good English (respectively), computer and information technology lecturers reported significantly higher self-ability beliefs than the science lecturers but not the engineering lecturers (M = 4.79, 4.59, 4.44; SD = 0.41, 0.75, 0.65, respectively for

TABLE 4 *Post hoc* multiple comparisons of the lecturers' ratings of their English proficiency levels.

Statement	(I) Colleges	(J) Colleges	Mean difference (I-J)	SE	Sig.	95% CI	
						Lower bound	Upper bound
How do you rate your English language level? (item 10)	Comp. & Inf. Tec.	Engineering	0.16676	0.12765	0.193	−0.0851	0.4186
		Sciences	0.66485*	0.12112	0.000	0.4259	0.9038
	Engineering	Comp. & Inf. Tec.	−0.16676	0.12765	0.193	−0.4186	0.0851
		Sciences	0.49808*	0.12281	0.000	0.2558	0.7403
	Sciences	Comp. & Inf. Tec.	−0.66485*	0.12112	0.000	−0.9038	−0.4259
		Engineering	−0.49808*	0.12281	0.000	−0.7403	−0.2558

*The mean difference is significant at the 0.05 level.

TABLE 5 Results of the one-way ANOVA of the lecturers' self-ability beliefs about performing particular instructional and course-related tasks in English.

Item	Differences	Sum of squares	df	Mean square	*F*	Sig.
Item 11	Between groups	3.882	2	1.941	5.063	0.007
	Within groups	72.076	188	0.383		
	Total	75.958	190			
Item 12	Between groups	4.978	2	2.489	4.807	0.009
	Within groups	97.347	188	0.518		
	Total	102.325	190			
Item 13	Between groups	6.715	2	3.357	6.778	0.001
	Within groups	93.128	188	0.495		
	Total	99.843	190			
Item 14	Between groups	4.141	2	2.070	4.443	0.013
	Within groups	87.598	188	0.466		
	Total	91.738	190			
Item 15	Between groups	0.604	2	0.302	0.674	0.511
	Within groups	84.255	188	0.448		
	Total	84.859	190			
Item 16	Between groups	3.023	2	1.511	3.527	0.031
	Within groups	80.569	188	0.429		
	Total	83.592	190			

statement 11; $M = 4.61, 4.45, 4.22$; SD = 0.49, 0.84, 0.77, respectively for statement 12), In contrast, the engineering lecturers outscored their science peers but not the computer and information technology ones in their responses to statement 16 tapping self-ability beliefs about correctly pronouncing English ($M = 4.57, 4.67, 4.38$; SD = 0.69, 0.47, 0.74, respectively).

The science lecturers have also lower scores than the computer and information technology and engineering lecturers in the responses to statement 13 assessing the perceived ability to use fluent oral English in communicating course-related issues to students ($M = 4.34, 4.48, 4.04$; SD = 0.60, 0.60, 0.85, respectively). An odd difference pattern is noted in the responses to statement 14, where computer and information technology lecturers outscored the engineering and science lecturers in their reported self-ability belief about writing course handouts and assessments in good English ($M = 4.72, 4.43, 4.39$; SD = 0.45, 0.82, 0.72, respectively). The responses to this part add further evidence of the lower English language communicative self-ability that the science lecturers have compared to their colleagues in the other two college types; they have significantly lower means in their responses to all items.

4.3 The lecturers' perceived needs for improving their English language skills

The last questionnaire part is related to the faculty members' perceived English language needs. The average means of the three lecturer groups' responses to the five items in this part show that their lowest English improvement need is writing course handouts and assessments, while their highest one is communicating with students in non-lecture situations (average means = 2.55 and 2.76, respectively). Regarding the other three improvement areas (explaining lecture content, and using good vocabulary and grammar), they have similar average means (2.66, 2.67, and 2.68,

TABLE 6 *Post hoc* multiple comparisons of the lecturers' self-ability beliefs about performing particular instructional and course-related tasks in English.

I think I am able to:	(I) Colleges	(J) Colleges	Mean difference (I-J)	Std. error	Sig.	95% CI	
						Lower bound	Upper bound
Explain a part of the lecture content in good English. (item 11)	Comp. & Inf. Tec.	Engineering	0.20068	0.11356	0.079	−0.0233	0.4247
		Sciences	0.34244*	0.10775	0.002	0.1299	0.5550
	Engineering	Comp. & Inf. Tec.	−0.20068	0.11356	0.079	−0.4247	0.0233
		Sciences	0.14176	0.10925	0.196	−0.0737	0.3573
	Sciences	Comp. & Inf. Tec.	−0.34244*	0.10775	0.002	−0.5550	−0.1299
		Engineering	−0.14176	0.10925	0.196	−0.3573	0.0737
Explain the whole lecture content in good English. (item 12)	Comp. & Inf. Tec.	Engineering	0.15828	0.13197	0.232	−0.1021	0.4186
		Sciences	0.38434*	0.12522	0.002	0.1373	0.6314
	Engineering	Comp. & Inf. Tec.	−0.15828	0.13197	0.232	−0.4186	0.1021
		Sciences	0.22605	0.12696	0.077	−0.0244	0.4765
	Sciences	Comp. & Inf. Tec.	−0.38434*	0.12522	0.002	−0.6314	−0.1373
		Engineering	−0.22605	0.12696	0.077	−0.4765	0.0244
Use fluent oral English to communicate course-related issues to students. (item 13)	Comp. & Inf. Tec.	Engineering	−0.13850	0.12908	0.285	−0.3931	0.1161
		Sciences	0.30260*	0.12248	0.014	0.0610	0.5442
	Engineering	Comp. & Inf. Tec.	0.13850	0.12908	0.285	−0.1161	0.3931
		Sciences	0.44109*	0.12418	0.000	0.1961	0.6861
	Sciences	Comp. & Inf. Tec.	−0.30260*	0.12248	0.014	−0.5442	−0.0610
		Engineering	−0.44109*	0.12418	0.000	−0.6861	−0.1961
Write course handouts and assessments in good English. (item 14)	Comp. & Inf. Tec.	Engineering	0.29028*	0.12519	0.021	0.0433	0.5372
		Sciences	0.33242*	0.11879	0.006	0.0981	0.5667
	Engineering	Comp. & Inf. Tec.	−0.29028*	0.12519	0.021	−0.5372	−0.0433
		Sciences	0.04215	0.12044	0.727	−0.1954	0.2797
	Sciences	Comp. & Inf. Tec.	−0.33242*	0.11879	0.006	−0.5667	−0.0981
		Engineering	−0.04215	0.12044	0.727	−0.2797	0.1954
Correctly pronounce English. (item 16)	Comp. & Inf. Tec.	Engineering	−0.09864	0.12006	0.412	−0.3355	0.1382
		Sciences	0.19877	0.11392	0.083	−0.0260	0.4235
	Engineering	Comp. & Inf. Tec.	0.09864	0.12006	0.412	−0.1382	0.3355
		Sciences	0.29741*	0.11550	0.011	0.0696	0.5253
	Sciences	Comp. & Inf. Tec.	−0.19877	0.11392	0.083	−0.4235	0.0260
		Engineering	−0.29741*	0.11550	0.011	−0.5253	−0.0696

*The mean difference is significant at the 0.05 level.

respectively). These results further emphasize the lecturers' need for enhancing their oral English fluency and overall communicative competence. As noted in Table 7, the one-way ANOVA shows significant differences in the lecturer groups' responses to all five statements in the last questionnaire part. The differences suggest variation in their self-perceived communication abilities, and they underscore the importance of designing appropriate support initiatives for addressing the lecturers' specific language needs across the different STEM disciplines.

Table 8 gives the *post hoc* multiple comparisons of the lecturers' reported English language needs. Compared to their computer and information technology and science lecturers, the engineering lecturers reported a significantly lower need for improving their ability to explain lecture content in fluent oral English (item 17). In addition, the computer and information technology lecturers have a significantly lower need to improve the same skills as the science lecturers (M = 2.64, 2.16, 3.26; SD = 1.47, 1.17, 1.26, respectively).

The lecturers' responses to the other four statements in this questionnaire part (items 18–21) have the same pattern as the above. As noted, the science lecturers reported a higher improvement need in the four language skills than the computer and information technology and engineering peers, and no significant differences are found between the last two groups (M = 2.31, 2.26, 3.08; SD = 1.48, 1.24, 1.30 for item 18; M = 2.64, 2.28, 3.35; SD = 1.34, 1.20, 1.16, for item 19; M = 2.43, 2.45, 3.15; SD = 1.44, 1.23, 1.29, for item 20; M = 2.57, 2.34, 3.14; and SD = 1.44, 1.29, 1.17 for item 21, respectively

TABLE 7 Results of the one-way ANOVA of the lecturers' reported English language needs.

Item	Difference	Sum of squares	df	Mean square	*F*	Sig.
Item 17	Between groups	40.188	2	20.094	11.459	0.000
	Within groups	329.655	188	1.753		
	Total	369.843	190			
Item 18	Between groups	38.143	2	19.071	11.207	0.000
	Within groups	319.930	188	1.702		
	Total	358.073	190			
Item 19	Between groups	28.622	2	14.311	7.967	0.000
	Within groups	337.703	188	1.796		
	Total	366.325	190			
Item 20	Between groups	39.065	2	19.533	12.841	0.000
	Within groups	285.971	188	1.521		
	Total	325.037	190			
Item 21	Between groups	22.999	2	11.499	6.579	0.002
	Within groups	328.582	188	1.748		
	Total	351.581	190			

in all items). Overall, these results mean the science lecturers have more English language needs than the computer and information technology and engineering lecturers. While the means of the science lecturers' responses (ranging from 3.08–3.35) indicate they have high language needs, the mean responses of the computer and information technology and engineering faculty members (ranging from 2.16–2.64) show they have moderate language needs.

5 Discussion

The present study uncovered key insights into STEM lecturers' EMI practices at Saudi universities. Regardless of their teaching majors or English proficiency levels, many lecturers reported switching to Arabic in instructional tasks such as asking questions, giving instructions, and providing feedback, while English was often used for communicating technical terms and explaining a part of the content. In non-instructional tasks such as office-hour meetings and email communication, Arabic was also preferred. Notably, the science lecturers reported a significantly higher use of Arabic than those teaching engineering and computer and information technology; this goes in line with the research findings reported by Alhamami (2015, 2021).

While some researchers (e.g., Zhou et al., 2021) view that translanguaging fosters sustainable EMI classroom environments, it seems that two problematic issues have caused the lecturers in the present study to switch to Arabic. The first issue concerns the lecturers' consideration of their students' low English proficiency levels; this coping instructional strategy has been revealed by some previous studies (Abdel Latif and Ali El Deen, 2024; Abdel Latif and Alrashed, 2025; Quotah, 2023). The second one relates to the lecturers' self-perceived language abilities. This is clear, for instance, in the lecturers' lower mean responses on item 12, tapping their perceived ability to explain the whole content in good English, compared to their higher mean score on item 11 assessing their ability to use good English in explaining a part of the lecture content. Overall, the lecturers' responses to the second and third questionnaire parts suggest that their English language proficiency and ability to perform some instructional tasks in English have yet to be improved. The case is more problematic for the science lecturers, who reported lower language ability self-ratings than those in the other two college types. One main factor accounting for the science lecturers' higher use of Arabic and their lower language ability self-ratings is the low language-related admission requirements in their colleges where they have graduated and work now (see Abdel Latif and Alrashed, 2025; Alhamami, 2015). In fact, this is a well-known tradition at public Saudi universities and at Arab ones as well. With these low language-related admission requirements, students' low English levels lead their lecturers to depend normally on translanguaging in their instruction practices (Abdel Latif and Alrashed, 2025), and thus they may find no pressing need for using English as the instruction language or even paying attention to improving the English performance quality in their classes. In other words, such accumulated educational experiences and interactive effects on their students' learning seem to have shaped the science lecturers' higher use of Arabic and lower English language ability self-ratings. This interpretation concurs with the EMI perspectives of science lecturers versus the engineering lecturers in Alhamami (2015, 2021) two studies.

The indicators noted in the first three parts of the questionnaire are further supported by the responses to the final part assessing the lecturers' perceived needs for English language improvement. Across all three groups, the lecturers' responses indicate language challenges, particularly in communicating effectively with students in non-lecture situations and using accurate English vocabulary and grammar. Thus, despite their current EMI practices, the lecturers still have clear linguistic gaps. In their responses to the last questionnaire part, the science lecturers reported significantly greater language improvement needs than the computer and information technology and engineering lecturers; therefore, the science lecturers particularly need language support tailored to their specific disciplinary and communication contexts within EMI environments.

TABLE 8 The *post hoc* multiple comparisons of the lecturers' reported English language needs.

I think I need to improve my ability to:	(I) Colleges	(J) Colleges	Mean difference (I-J)	Std. error	Sig.	95% CI	
						Lower bound	Upper bound
Explain lecture content in good oral English. (item 17)	Comp. & Inf. Tec.	Engineering	0.48417*	0.24285	0.048	0.0051	0.9632
		Sciences	−0.62454*	0.23043	0.007	−1.0791	−0.1700
	Engineering	Comp. & Inf. Tec.	−0.48417*	0.24285	0.048	−0.9632	−0.0051
		Sciences	−1.10872*	0.23364	0.000	−1.5696	−0.6478
	Sciences	Comp. & Inf. Tec.	0.62454*	0.23043	0.007	0.1700	1.0791
		Engineering	1.10872*	0.23364	0.000	0.6478	1.5696
Write course handouts and assessments in good English. (item 18)	Comp. & Inf. Tec.	Engineering	0.05285	0.24580	0.830	−0.4320	0.5377
		Sciences	−0.77186*	0.23323	0.001	−1.2319	−0.3118
	Engineering	Comp. & Inf. Tec.	−0.05285	0.24580	0.830	−0.5377	0.4320
		Sciences	−0.82471*	0.23647	0.001	−1.2912	−0.3582
	Sciences	Comp. & Inf. Tec.	0.77186*	0.23323	0.001	0.3118	1.2319
		Engineering	0.82471*	0.23647	0.001	0.3582	1.2912
Communicate with students in good English in non-lecture situations. (item 19)	Comp. & Inf. Tec.	Engineering	0.36348	0.22619	0.110	−0.0827	0.8097
		Science	−0.70788*	0.21462	0.001	−1.1313	−0.2845
	Engineering	Comp. & Inf. Tec.	−0.36348	0.22619	0.110	−0.8097	0.0827
		Sciences	−1.07136*	0.21761	0.000	−1.5006	−0.6421
	Sciences	Comp. & Inf. Tec.	0.70788*	0.21462	0.001	0.2845	1.1313
		Engineering	1.07136*	0.21761	0.000	0.6421	1.5006
Use good English vocabulary. (item 20)	Comp. & Inf. Tec.	Engineering	−0.02205	0.24246	0.928	−0.5003	0.4562
		Sciences	−0.72655*	0.23006	0.002	−1.1804	−0.2727
	Engineering	Comp. & Inf. Tec.	0.02205	0.24246	0.928	−0.4562	0.5003
		Sciences	−0.70450*	0.23326	0.003	−1.1646	−0.2444
	Sciences	Comp. & Inf. Tec.	0.72655*	0.23006	0.002	0.2727	1.1804
		Engineering	0.70450*	0.23326	0.003	0.2444	1.1646
Use good English grammar. (item 21)	Comp. & Inf. Tec.	Engineering	0.22894	0.23801	0.337	−0.2406	0.6985
		Sciences	−0.56512*	0.22584	0.013	−1.0106	−0.1196
	Engineering	Comp. & Inf. Tec.	−0.22894	0.23801	0.337	−0.6985	0.2406
		Sciences	−0.79406*	0.22898	0.001	−1.2458	−0.3424
	Sciences	Comp. & Inf. Tec.	0.56512*	0.22584	0.013	0.1196	1.0106
		Engineering	0.79406*	0.22898	0.001	0.3424	1.2458

*The mean difference is significant at the 0.05 level.

In their EMI practices and the deficiencies they experience, the lecturers who took part in the present study resemble content lecturers in STEM and non-STEM university settings in other countries, such as China (Curdt-Christiansen et al., 2023), Denmark (Jensen and Thøgersen, 2011), Italy (Guarda and Helm, 2017), Kazakhstan (Manan and Hajar, 2024), Spain (Dearden and Macaro, 2016), and Sweden (Malmström et al., 2023). Like the previous studies about these contexts, the present one indicates a misalignment between EMI policies at Saudi universities and STEM content lecturers' practices. Additionally, the present results are congruent with those of previous research, indicating that in some higher education settings, content teachers have diverse English proficiency levels and inconsistent implementation of EMI (e.g., Guarda and Helm, 2017; Malmström et al., 2023; Quotah, 2023). In line with some previous studies (e.g., Alhassan, 2021; Lo and Othman, 2023; Ulfah and Basthomi, 2024), training is essential to helping STEM lecturers meet their communication needs in instructional and non-instructional situations at Saudi universities.

6 Conclusion

The results of the present study have important implications for the sustainability of instructional practices in STEM programs in Saudi Arabia. The study indicates a misalignment between STEM education policies mandating the use of EMI and the content lecturers' instructional practices at Saudi universities. Many lecturers encounter linguistic challenges impeding their ability to effectively communicate

subject matter in English, with the science faculty members experiencing greater difficulties than those in the computer and information technology and engineering fields. This variation in English proficiency has resulted, in turn, in the inconsistent use of English both within and between colleges, affecting instructional and non-instructional interactions. Overcoming such inconsistencies is essential for the sustainability and long-term reform of EMI practices, aligning teaching practices with policy goals, and ensuring the quality of STEM programs in the Saudi higher education system.

Ensuring sustainable instructional and communication practices in STEM programs at Saudi universities requires reforms in both content teacher education and recruitment processes. It is crucial to provide target linguistic training for current in-service lecturers, particularly for those teaching science majors, as they have more language needs compared to those teaching in the engineering, computer, and information technology colleges. The training provided could particularly focus on enabling lecturers to develop their communicative ability in instructional and non-instructional situations, and on dimensions such as subject content presentation, classroom oral interactions, oral communication situations outside the classroom, and handout, assessment and email writing. Additionally, to ensure their preparedness, linguistic certification or specific language ability criteria could be conditional in recruiting STEM faculty members in the future. Parallel reforms should also address student admission standards and offer them in-sessional language support. When students are ready enough to study their STEM majors in English, their lecturers will be more motivated to use English in instructional and non-instructional situations. All these desired and interconnected reforms will promote greater consistency in using the English language in all situations, both within and across STEM disciplines. Ultimately, they will contribute to improving the overall quality of STEM teaching and learning processes and maintaining the sustainability and international competitiveness of STEM programs in Saudi higher education institutions.

This study is not without limitations. Given the context of the study, the present findings are not generalizable beyond Saudi universities or the STEM majors covered in the study. The study is also limited in its use of self-report quantitative data only, and by the lack of data triangulation. Furthermore, gender-related differences are also beyond the scope of the present study; therefore, future research may explore how STEM female and male lecturers differ in their EMI practices and language needs. Investigating gender-based variations might reveal unique challenges and support requirements, contributing to more inclusive and effective professional development programs. Several other important issues warrant further research efforts. There remains a significant gap in understanding the EMI practices of STEM lecturers across various Arab higher education contexts beyond Saudi Arabia. Countries such as Egypt, Iraq, Jordan, Lebanon, Morocco, Syria, Tunisia, and Yemen lack sufficient empirical data regarding how STEM programs implement EMI and how lecturers navigate language challenges within these settings. Methodologically, future relevant studies could draw upon other data sources, such as classroom observation and interviews, and could offer richer and more nuanced insights into translanguaging and linguistic interactions in STEM classes. In addition, future relevant studies may also make use of mixed-method and longitudinal research designs. It is also important to explore the role of some factors potentially influencing STEM lecturers' EMI perspectives, such as the EMI training received and students' English proficiency. Addressing these research gaps could enhance our understanding of EMI implementation across diverse Arab contexts and yield important implications for promoting the sustainability and quality of STEM education in the region.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Deanship of Scientific Research at Imam Mohammad Ibn Saud Islamic University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MMMA: Writing – review & editing, Conceptualization, Methodology, Writing – original draft. MA: Writing – original draft, Formal analysis, Data curation, Writing – review & editing, Validation, Investigation, Funding acquisition.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The authors declare that no Gen AI was used in the creation of this manuscript.

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