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Exploring teaching engineering in English at a Spanish university: perspectives of students and lecturers on challenges and opportunities

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Abstract

The persistent challenge of English proficiency in Spain, particularly in higher education, has gained critical importance due to global industry demands. Despite over 15 years of English-Medium Instruction (EMI) initiatives under the European Higher Education Area framework, linguistic shortcomings remain prevalent. This study examines the perceptions of engineering students and lecturers at a Spanish public university regarding EMI, focusing on the institution's role in fostering language competencies, influential factors, and areas for improvement. A survey was conducted with 311 of 2,090 students from various engineering degrees and age groups, including those with and without prior EMI experience, as well as 30 of 45 lecturers with diverse professional backgrounds. Data analysis, performed using Python, reveals that students frequently lack sufficient English skills and emphasise the need for stronger institutional support. Lecturers highlight insufficient pedagogical training and the challenges of linguistic heterogeneity among students. Statistical findings underscore the necessity for specialised lecturer training, interdisciplinary collaboration, and a student-centred approach to EMI. The study concludes that Spanish public universities cannot assume incoming students possess adequate language skills. Effective EMI implementation requires addressing lecturers' training needs and providing robust linguistic support for students. These insights contribute to enhancing EMI practices in higher education.

Keywords Higher education, Engineering education, English as medium of instruction (EMI), Teacher's perceptions, Students' perceptions.

1 Introduction and aims of the study

The introduction of content subjects taught in English within higher education may not initially appear to be a particularly novel topic. Indeed, in the case of Spain, the integration of English-Medium Instruction (EMI) has been notably pronounced since the country's universities aligned with the European Higher Education Area (EHEA) in 2007 [1]. Why, then, does it remain relevant to study the impacts of English-taught courses at the university level? Achieving an adequate level of English proficiency across the population continues to be a significant challenge in Spain. According to the National Institute

of Statistics (2021), less than 25% of the population is fluent in English. Furthermore, the EF English Proficiency Index (2024) ranks Spain 26th out of 35 European countries, placing it below the European average.

The globalisation of the economy has heightened the demand for English proficiency, which has become the dominant language in both academic and professional spheres. English's role as a global lingua franca has further accelerated the adoption of EMI. Factors such as increased cross-national mobility, international travel, and the proliferation of online communities have elevated English to this status [2]. Consequently, the number of non-native English speakers now surpasses that of native speakers, underscoring the importance of English in global communication [3, 4]. This trend holds particular relevance for higher education, where internationalisation is pivotal for achieving academic and research excellence. This process fosters the development of English-medium curricula, enabling institutions to remain globally competitive [5]. It is especially pertinent for engineering students, who must stay abreast of technological advancements, engage in global research, and compete for international job opportunities.

Several factors have driven the adoption of EMI in Spanish universities, which likely mirror those influencing educational institutions across Europe and globally. Firstly, internationalisation serves as a key indicator of prestige, enabling institutions to attract international students and faculty and enhance their standings in global education rankings [6, 7]. Secondly, the use of English facilitates student exchanges and labour mobility, allows access to English-language research and teaching materials, and enhances graduates' career prospects. Additionally, EMI programmes address the growing demand for English proficiency in an increasingly globalised job market [8].

In Spain, the adoption of EMI has grown rapidly, though not without challenges. Private universities launched so-called "bilingual" degree programmes as early as 2002, paving the way for similar initiatives at public institutions [9]. By 2018, 415 degree programmes included English-medium tracks, and this figure rose to 995 by 2021 [10, 11], underscoring the rising popularity of EMI. However, the expansion has brought methodological difficulties, with instructors often struggling to adjust their pedagogy to the new linguistic context [12, 13].

The University of Cantabria (UC) provides a compelling case study for examining the impacts of EMI. UC, a Spanish public university located in the monolingual Spanish-speaking region of Cantabria, has approximately 13,000 students and 1,300 lecturers, and offers thirteen different undergraduate engineering degrees. The university mandates that students demonstrate proficiency in a foreign language to obtain a degree. Between 2022 and 2024, these thirteen engineering programmes included twenty-two subjects taught in English. Enrolment in these courses requires a minimum B1 level of English proficiency, yet students often exhibit significant linguistic heterogeneity and face recurring difficulties that impede the attainment of learning objectives, as noted in departmental interviews and discussions with institutional staff.

Over several academic years, lecturers of engineering subjects delivered in English at UC have reported methodological challenges in achieving satisfactory learning outcomes and developing students' foreign-language skills. These challenges—raised in informal discussions, departmental interviews, and end-of-course feedback—highlight the fact that many students do not meet the language proficiency levels expected by the university. The perceptions of both lecturers and students regarding instruction in

a foreign language are influenced by a range of complex and subjective factors. To date, neither our institution nor others known to us have conducted a study that thoroughly examines the difficulties perceived by both groups and the factors shaping these perceptions. Such insights are crucial for enhancing the quality of teaching and learning processes in a foreign language and for proposing solutions at an institutional level. This study aims to investigate the challenges and perceptions of EMI among engineering students and lecturers at UC. Its objective is to contribute to a broader understanding of the effectiveness of EMI and to identify areas for improvement within Spanish higher education institutions, with findings that could also be applicable to other countries experiencing similar challenges.

To explore students' perspectives, we formulated the following research questions (*RQ-S*):

- *RQ-S1*: Do students perceive that the public English education system in Spain adequately meets their linguistic needs, or do they consider it necessary to seek private tutoring in order to achieve the desired proficiency level?
- *RQ-S2*: Which factors (e.g., age, gender, prior experience, satisfaction with previous English instruction, etc.) influence students' self-perception of their language skills, their motivation to improve their English proficiency, and the importance they assign to the language for personal and professional purposes?
- *RQ-S3*: How do students evaluate the introduction of compulsory university instruction delivered in English, and to what extent do they feel prepared to undertake it? Does their self-assessment of linguistic competence affect these perceptions?
- *RQ-S4*: Do students believe that instruction in English impacts the quality or quantity of course content, while simultaneously helping them enhance their language proficiency? In what ways does their self-assessment of linguistic competence shape these views?
- *RQ-S5*: Do students think the university should provide additional activities or resources to support the development of English language skills? To what extent are their opinions influenced by factors such as age and self-assessment of language proficiency?

To explore non-native lecturers' perspectives, we formulated the following research questions (RQ-L):

- *RQ-L1*: To what extent do non-native lecturers feel comfortable teaching courses in English compared to Spanish, and which factors (e.g., teaching experience, self-assessed linguistic competence) influence their level of comfort?
- *RQ-L2*: Do lecturers find that teaching in English requires more time and effort in lesson preparation than teaching in Spanish? What are the main reasons or factors involved (e.g., teaching experience, English proficiency level)?
- *RQ-L3*: How do lecturers evaluate the impact of teaching in English on student learning? In particular, do they deem it necessary to adjust the level of content difficulty, or do they consider EMI beneficial for improving students' English proficiency? Which factors shape these perceptions?
- *RQ-L4*: To what extent do lecturers believe that having support from a philology or linguistics specialist would be helpful when teaching in English? Moreover, do they

think the university should offer more activities—beyond credit-bearing modules—to enhance students' language skills?

- *RQ-L5*: Do lecturers believe that teaching in English should be mandatory or elective within degree programmes? Which factors (e.g., age, self-assessed language proficiency) influence their stance?

Despite the substantial body of research on students' and lecturers' perceptions of EMI programmes in Spain, certain gaps remain unaddressed. While numerous studies have investigated overarching motivations, benefits, and challenges, they frequently focus on only one stakeholder group—or treat students and lecturers separately—without examining the interaction of their experiences within the same institutional context. For instance, both [14, 15] centred on engineering undergraduates and documented significant comprehension difficulties, yet neither study included lecturers' perspectives in the same setting, raising the question of whether the challenges they identified in Korea and Italy likewise surface in Spanish EMI classrooms or reflect context-specific issues. Furthermore, existing works rarely delve into the specific linguistic challenges that engineering students and lecturers face, nor do they systematically examine the practical support mechanisms needed to overcome such difficulties. Equally important, subjective and emotional factors—such as feeling prepared or comfortable when teaching or studying in another language, and having adequate tools or resources to navigate these challenges—are often overlooked, despite their considerable impact on the overall learning and teaching experience.

In response, our study introduces a comprehensive set of research questions for both students and lecturers, explicitly targeting issues of language proficiency, self-assessment, institutional support, and the practical implications of compulsory versus elective EMI. By capturing both perspectives within a single university context, our investigation goes beyond the scope of most prior studies, mapping out how engineering students' and lecturers' experiences intersect, and identifying the distinct challenges and resources needed to enhance teaching and learning processes. Through this dual focus, we aim to contribute an integrative view of EMI in Spain, providing evidence-based recommendations for improving language support and pedagogical strategies in similar higher education contexts.

2 Literature review

2.1 Students' perceptions of EMI programmes

Students enrolled in EMI programmes exhibit a variety of perceptions regarding their educational experience. First of all, motivation for selecting EMI programmes emerges as a significant aspect of students' perception. According to [9], students are often motivated by the prospect of better job opportunities. Additionally, students enrol in EMI programmes to enhance their English-language competence, recognising it as an opportunity for personal and professional development [16]. Furthermore, students perceive EMI as a means to acquire specialised language skills relevant to their field of study, further reinforcing their motivation [17].

Secondly, the findings of diverse studies exhibit notable satisfaction towards EMI programmes. Students often value the improvement in language skills and academic performance attributed to EMI [18]. Studies have shown enhancements in vocabulary, pronunciation, listening comprehension, and overall English proficiency [18, 19].

Moreover, students recognise progress in subject-specific vocabulary acquisition [12], highlighting the value they place on EMI as a conducive environment for English-language learning and vocabulary acquisition [20]. High levels of satisfaction among students regarding lecturers' English competence were noted by [21]. Students' satisfaction, particularly with the collaborative efforts of advisor teachers in EMI programmes was emphasised by [22].

However, alongside the perceived benefits of EMI programmes, students also encounter various challenges that affect their learning experiences. According to [23], some students struggle with grasping certain concepts due to language barriers, even though they perceive an overall improvement in their English proficiency. Supporting this, it was found by [14] that Korean science-and-engineering undergraduates in an EMI physics course earned lower grades and felt less satisfied than peers taking the same course in Korean, largely because comprehension barriers hampered content learning. This sentiment was echoed by [24], who observed that following classes in English often requires more effort, leading to concerns about not fully comprehending course content. Similarly, a survey of EMI undergraduates at the University of Bologna reported that pronunciation-related intelligibility problems frequently impeded comprehension and participation, especially for international students [15]. Additionally, students may resort to their native language or rely on translation when faced with difficulties. Moreover [9], highlighted the challenge faced by students with lower language proficiency levels, especially in the initial stages of EMI programmes, where language barriers may hinder effective communication and understanding during class discussions.

Despite recent scholarly attention to students' perspectives in EMI programmes [25], underscores a crucial gap in research, emphasising the need for further research regarding student viewpoints, often overshadowed by the focus on EMI teachers. Addressing this gap becomes imperative in gaining a comprehensive understanding of the efficacy and impact of EMI programmes in the Spanish context.

2.2 Lecturers' perceptions of EMI programmes

Many Spanish university lecturers are drawn to participating in EMI programmes due to a variety of motivations that span professional, personal, and institutional factors. Many express enthusiasm for the opportunities presented by school internationalisation, the potential to attract new students, and the anticipation of engaging with higher-level future students [26]. This aligns with the broader context of the EHEA initiative, with the goal of fostering collaboration among universities and enhancing mobility for students and faculty. Additionally, many teachers are motivated by the chance to improve students' future employability and educational outcomes [26]. Some lecturers are also driven by the desire to not be left behind in the implementation of EMI programmes, feeling that teaching conditions and student motivation are better within these programmes [27].

However, while positive motivations abound, concerns persist among teaching staff regarding their participation in EMI programmes. Firstly, many of them are reluctant to take part in them due to the increased workload associated with teaching in English [28, 29], which demands additional effort in terms of preparing materials, lesson planning, and assessment creation.

While [26] emphasise that confidence in language skills does not appear to be the primary reason for teachers' reluctance to participate in EMI programmes, other studies, such as [29, 30], suggest that language difficulties do present significant challenges for Spanish lecturers in EMI settings. Lecturers, particularly non-native English speakers, face challenges in maintaining their English proficiency [27], necessitating personal investment and time commitment to keep up-to-date with the language [31]. These challenges include limitations in vocabulary usage, decreased depth in explanations, and heightened stress and tension during classes conducted in English. To address these concerns [32], underscores the necessity for comprehensive language training to address lecturers' linguistic deficiencies and enhance their confidence and proficiency in English instruction. Although many years have elapsed since her work, overall English proficiency in Spain remains comparatively low, suggesting that further refinement of specialised lecturer training and EMI teaching strategies may still be improvable. Additionally, teachers observe that teaching in English reduces their capacity to improvise and their spontaneity, thereby negatively affecting the emotional links and good rapport they are used to establishing with their students when teaching in their mother tongue [30]. This reduction in spontaneity can hinder the dynamic and interactive nature of classroom interactions, further complicating the instructional process in EMI contexts. Furthermore, the study conducted by [33] reveals that while lecturers may feel adequately prepared to teach in English, they express doubts about their students' readiness to utilise English in their future careers, reflecting broader concerns about language proficiency within the educational system.

In response to these challenges, recent research has emphasised the pedagogical value of incorporating translanguaging as a supportive practice in EMI settings. As noted by [34], lecturers often alternate between L1 and L2 not due to linguistic inadequacy, but to facilitate more effective teaching and learning. These translanguaging practices—as early conceptualised by [35] as the fluid use of multiple languages within a speaker's repertoire—have been shown to serve key functions, including fostering students' emotional well-being, enhancing cognitive comprehension, and enabling lecturers to navigate their own linguistic limitations [36]. Such strategies contrast with traditional "English-only" ideologies [37], which remain prevalent in many EMI contexts yet may be counterproductive, particularly in environments where both teachers and students have limited English proficiency.

Another important dimension involves instructional considerations—specifically, adapting teaching approaches to meet the language demands of EMI programmes. Several studies underscore the pivotal role of methodology in these contexts [12, 38–40]. In [41], lecturers' reservations about the suitability of their instructional approaches in English-language environments are revealed, shedding light on this crucial area of concern. Furthermore, research by [42] suggests that Humanities lecturers, in particular, demonstrate a higher propensity to modify their approaches compared to their STEM counterparts when teaching in EMI settings. These findings underscore the complexity of adapting pedagogical practices to meet the linguistic and educational needs of EMI programmes. In a similar vein, insights from [43] indicate that lecturers are willing to undergo CLIL (Content and Language Integrated Learning) training courses, and many are open to language specialists observing and providing feedback on their lessons. This receptiveness may stem from lecturers' experiences in EMI and their role as initiators

of EMI initiatives within their courses. Moreover, both [43, 44], refer to the perceived inadequacy by EMI lecturers of resources at their disposal, which makes them resort to creating and adapting their own materials. This suggests a need for the development of more tailored instructional materials to support effective EMI instruction that not only aligns with the content of the subject but also facilitates language acquisition.

The lack of support and feelings of isolation exacerbate these instructional concerns [45]. The need for institutional frameworks that promote collaboration and mutual support is critical. Lecturers often feel isolated when transitioning to EMI, lacking peer support and adequate professional development opportunities. Creating communities of practice and fostering collaborative environments can mitigate these feelings and enhance teaching effectiveness [6, 45]. Additionally, there is a need for collaboration between content and language lecturers, as EMI teachers would benefit from the support of language experts who focus on linguistic improvement proposals [30, 46].

Across various studies, the refusal of teachers to join EMI programmes has been consistently linked to the lack of incentives [6, 26, 28, 30, 31]. A survey at a Spanish university in [41] corroborated this sentiment, highlighting the critical role of incentives in fostering participation and commitment to EMI programmes. According to the findings in [41], additional incentives were highly valued by EMI lecturers, echoing the recommendations of [47] to scale up incentives for participants in EMI programmes at the tertiary level. The focus group interviews conducted by [41] delved into specific types of incentives desired by lecturers, encompassing various fronts. Firstly, lecturers expressed a need for extra support in the classroom, especially from native speakers who could act as language assistants and assist in correcting written materials. Secondly, there was a strong call for intensified training, particularly at advanced levels and through intensive courses, indicating a desire for continuous professional development. Additionally, lecturers emphasised the importance of increased mobility programmes, urging for greater funding for language and methodological training abroad. Economic incentives were also highlighted, including salary increases and gratuity of language courses and language level certification exams, which could serve as motivating factors for lecturers. Furthermore, lecturers advocated for teaching rebates to be assigned greater weight in credit recognition, accreditation, and promotion purposes. Finally, there was a desire to extend EMI courses beyond individual subjects with foreign students, aiming to foster internationalisation at home, a sentiment aligned with the recommendations of [48].

3 Methodology

This study adopts a descriptive, cross-sectional design with a quantitative approach, using surveys administered via LimeSurvey from 2022 to 2024. The objective was to examine the perceptions and challenges of English-Medium Instruction (EMI) among engineering students and lecturers at the UC in Spain, in direct alignment with the research questions (*RQs*) presented in Sect. 1

3.1 Participants and sampling

- *Student Sample*: The population comprised 2,090 engineering students enrolled at UC during the 2022–2024 academic years. We recruited a voluntary convenience sample by distributing the survey link through class mailing lists for each engineering degree and year. In total, 311 students (approx. 15% of the population) completed

the survey. The resulting sample closely mirrored the population in gender, degree track, and year of study, and it included both students who had previously taken EMI subjects and those who had not. Surveys with incomplete responses were excluded from the analysis.

- *Lecturer Sample*: We invited all 45 lecturers actively teaching EMI engineering subjects at UC during the same period. Of these, 30 completed the survey (67% response rate). They also formed a voluntary convenience sample, given that all EMI lecturers were contacted. The inclusion criterion was to teach one or more EMI engineering subjects at UC in 2022–2024.

3.2 Survey development and validity

Two parallel surveys, one for students and one for lecturers, were created to address the specific research questions (*RQs*) presented in Sect. 1. Both surveys, with the whole list of questions, are included into the *Supplementary Material* added to this article.

Each survey comprised:

- *Sociodemographic items*: Age, gender, degree or subject area, teaching experience, etc.
- *Language proficiency items*: Whether participants held an official English certification, their self-assessed skills in reading, writing, listening, and speaking.
- *Perception and attitude items*: Directly mapped to the RQs, covering topics such as the perceived importance of English, comfort teaching in English, views on compulsory versus elective EMI, perceived challenges, institutional support needs, and the impact of EMI on content learning.

The study aims to systematically and rigorously identify relationships among the variables examined in the survey to determine whether there are significant commonalities, challenges, or difficulties perceived by students and faculty. Additionally, it seeks to explore the ways in which both groups believe these issues can be addressed, enabling our university and other institutions to implement measures to effectively resolve these challenges. The analysis is designed to be reproducible and statistically significant. Based on the statistical nature of the survey variables under analysis, various statistical methodologies have been applied, which are detailed in Sect. 3.4.

Before dissemination of the survey, it was reviewed by five academics for clarity and face validity. A pilot test ($n = 15$ students; $n = 5$ lecturers) was conducted, resulting in minor wording refinements. This process ensured that each question aligned with the intended *RQs* and that the instructions were comprehensible.

3.3 Data collection and ethical considerations

Surveys remained open from 2022 to 2024, allowing participants flexibility in responding, and participation was voluntary. All participants were informed about the nature and scope of the research and gave their consent by completing the survey after reading the introductory information. They agreed to the use of their anonymised responses for research and publication purposes. No identifiable information was collected, and all data were handled confidentially. The University of Cantabria's Code of Good Scientific Research Practice was followed throughout.

3.4 Data analysis and statistical procedures

3.4.1 Correlation between categorical non-ordinal independent variables and ordinal dependent variables

When comparing an ordinal outcome (e.g., self-assessed proficiency on a 0–5 Likert scale, see [49]) across groups defined by a categorical non-ordinal independent variable (e.g., gender), parametric tests (Student's t-test, ANOVA) or non-parametric tests (Mann-Whitney, Kruskal-Wallis) were chosen based on normality (assessed by the Shapiro-Wilk test, see [50, 51]) and variance homogeneity (assessed by the Levene's test, see [51]).

- *Student's t-test* (parametric) compares the means of two groups; it requires approximate normality in each group and similar variances.
- *ANOVA (Analysis of Variance;* parametric) extends this comparison to more than two groups; if a significant difference is found, a post-hoc test can be conducted to identify which groups differ from each other.
- *Mann-Whitney* (non-parametric; see [52]), is the analogue to Student's t-test, using ranks rather than raw values, making it more robust to outliers or skewed data.
- *Kruskal-Wallis* (non-parametric; see [53]), generalises Mann-Whitney to multiple groups. A significant result indicates at least one group's distribution differs; post-hoc comparisons (e.g., Dunn's test; see [54]) are then used to pinpoint these differences.

By relying on ranks instead of raw scores, non-parametric methods reduce sensitivity to skewness or outliers, making them suitable when assumptions of normality or homoscedasticity are violated.

3.4.2 Correlation between two nominal categorical variables

For nominal (non-ordinal) independent and dependent variables (e.g., gender vs. yes/no responses regarding EMI perception), the chi-square test of independence was employed. This test evaluates whether there is a statistically significant association between two categorical variables by using a contingency table and examining the frequencies of the joint occurrence of each possible category combination being recorded.

The hypotheses for the chi-square test of independence are:

- *Null Hypothesis (H_0)*: The two variables are independent (i.e., there is no relationship between them).
- *Alternative Hypothesis (H_1)*: There is a relationship between the two variables (i.e., they are not independent).

Based on this, if the p-value from the chi-square test of independence is smaller than $\alpha = 0.05$, the null hypothesis can be rejected, providing sufficient statistical evidence to conclude that a relationship exists between the variables.

3.4.3 Correlation between two ordinal variables

When examining the relationship between two ordinal variables (e.g., self-assessed proficiency and satisfaction with EMI on a 0–5 Likert scale), *Spearman's rank correlation* was used, which is a non-parametric method that measures both the strength and direction of the relationship between two ordinal variables. It measures how consistently the ranks of one variable correspond to the ranks of another. Its coefficient ranges from – 1

(strong negative correlation) to +1 (strong positive correlation), with 0 indicating no monotonic relationship. A p-value < 0.05 suggests that the correlation is statistically significant, reflecting a genuine monotonic association rather than random variation. The hypotheses are as follows:

- *Null Hypothesis (H_0)*: There is no monotonic relationship between the two ordinal variables.
- *Alternative Hypothesis (H_1)*: There is a monotonic relationship between the two ordinal variables.

In this study, a predetermined significance level of 0.05 was used for analysing the students' survey. This means that if the p-value is less than the significance level, the null hypothesis is rejected; otherwise, the null hypothesis is accepted. This implies a willingness to accept a 5% risk of committing a Type I error, that is, rejecting the null hypothesis when it is actually true (concluding that there is a relationship between the variables when none exists). The results of this analysis are presented in Sect. 4.

4 Results and discussion

4.1 Analysis of the students' survey results

Figure 1 suggests that many engineering UC students obtain their language accreditation during higher education. Among the 311 respondents, more than 60% of first-year students did not hold any official English certificate recognised by the Common European Framework of Reference for Languages (CEFR). Among those with accreditation, Cambridge English qualifications were the most common, followed by the British Council Aptis exam. Gender did not significantly affect the distribution of certificates.

On a 1–5 scale, Fig. 2 indicates that reading comprehension is the highest-rated skill, followed by oral comprehension and written production, while oral production receives the lowest rating. To address *RQ-S2*, which considers the influence of demographic variables on self-perceived proficiency, we performed the statistical tests described in Sect. 3 to compare these ratings by gender. No significant differences emerged, suggesting that

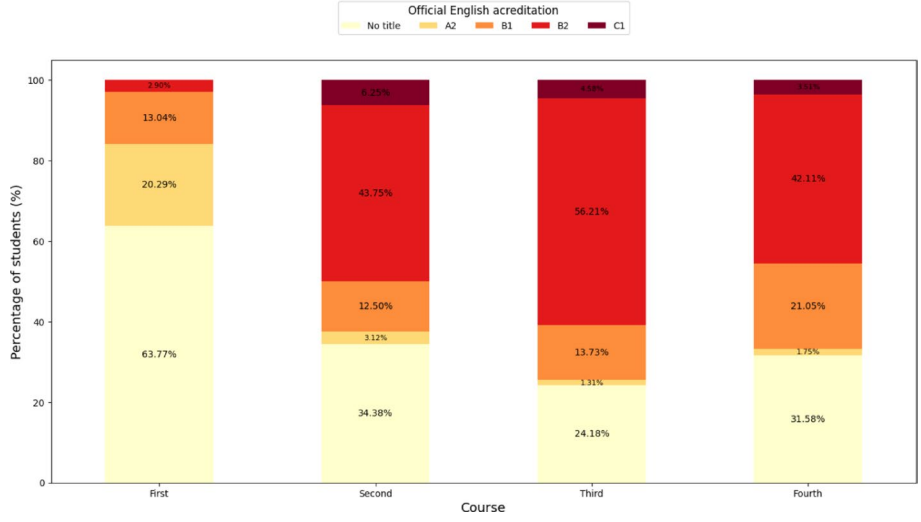


Fig. 1 Distribution of students' official English accreditation according to the degree courses in which they are enrolled

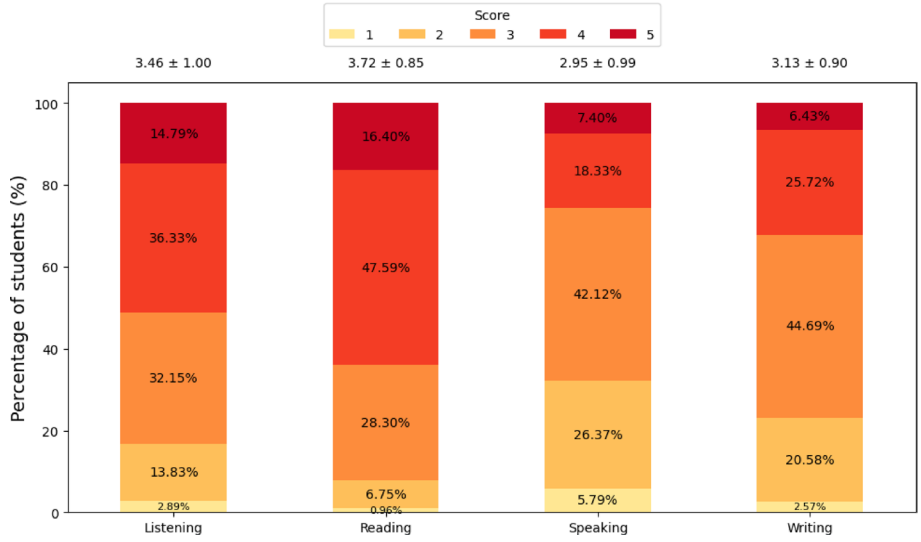


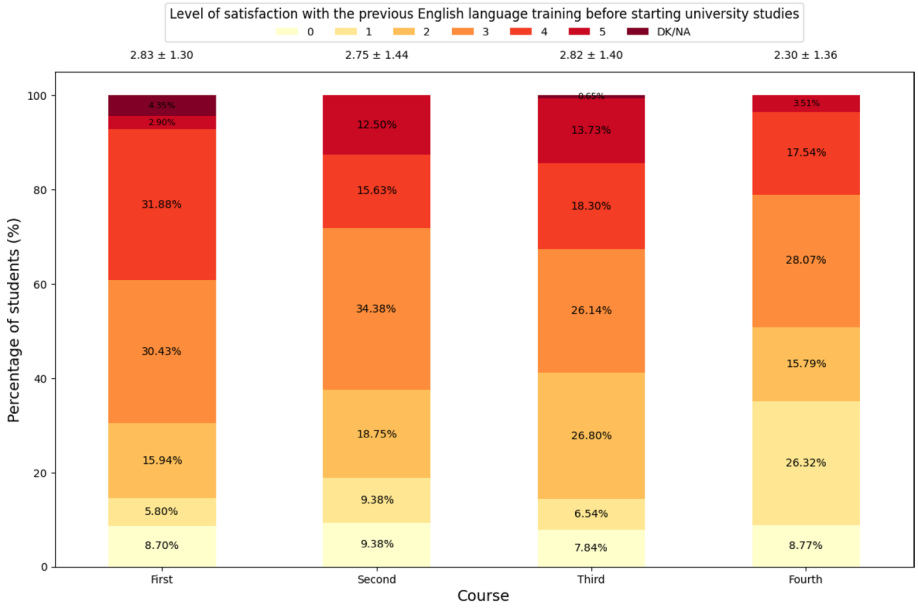
Fig. 2 Evaluation of students' self-perceived language skills

gender does not substantially affect students' self-assessed linguistic competences in this sample.

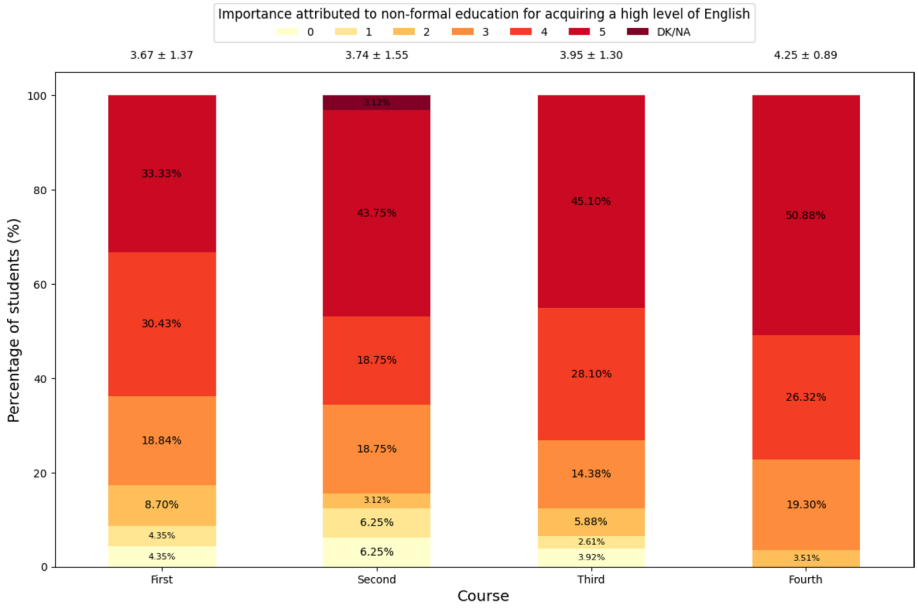
First-year engineering students reported an average listening comprehension score of 3.07, significantly lower than those of second-year (3.74) and third-year (3.64) students (Kruskal-Wallis $p = 0.00017$). Post-hoc Dunn tests confirmed these differences ($p = 0.01408$ and $p = 0.00039$, respectively). A similar pattern emerged for speaking scores, with first-year students (2.57) scoring lower than second-year (3.39) and third-year (3.08) peers (Kruskal-Wallis $p = 0.00043$; Dunn $p < 0.01$). These findings address *RQ-S2* by indicating that academic year meaningfully influences students' self-assessed language skills, a progression also observed among Korean engineering undergraduates in an EMI physics course by [14].

Figure 3(a) shows that students rate the English skills and knowledge they acquired in secondary school as only moderate overall, with fourth-year students reporting the lowest ratings. This satisfaction displayed a weak but significant positive correlation with self-assessed reading skills (Spearman $\rho = 0.2008$, $p < 0.001$), speaking skills ($\rho = 0.1336$, $p < 0.02$), and writing skills ($\rho = 0.1761$, $p < 0.002$), suggesting that prior schooling may slightly influence perceived competence. Meanwhile, Fig. 3(b) highlights that the importance attached to non-formal education was high across all academic years and proved statistically independent of both age and self-perceived proficiency. These findings tie directly into *RQ-S1*, as they indicate that many students—despite moderate satisfaction with their public education—still view private tutoring as crucial for achieving the English proficiency they desire.

Figure 3(c) shows that most surveyed engineering students rated English proficiency as highly relevant to their professional lives, suggesting they view it as a valuable asset for employment—a finding consistent with [9, 16]. Although these views were not influenced by academic year, a weak but statistically significant positive correlation emerged between students' self-assessed reading skills and their perceived importance of English for professional life (Spearman $\rho = 0.1202$, $p = 0.0345$). This addresses *RQ-S2* by indicating that students who rate their reading proficiency more highly are slightly more likely to consider English crucial for career development.



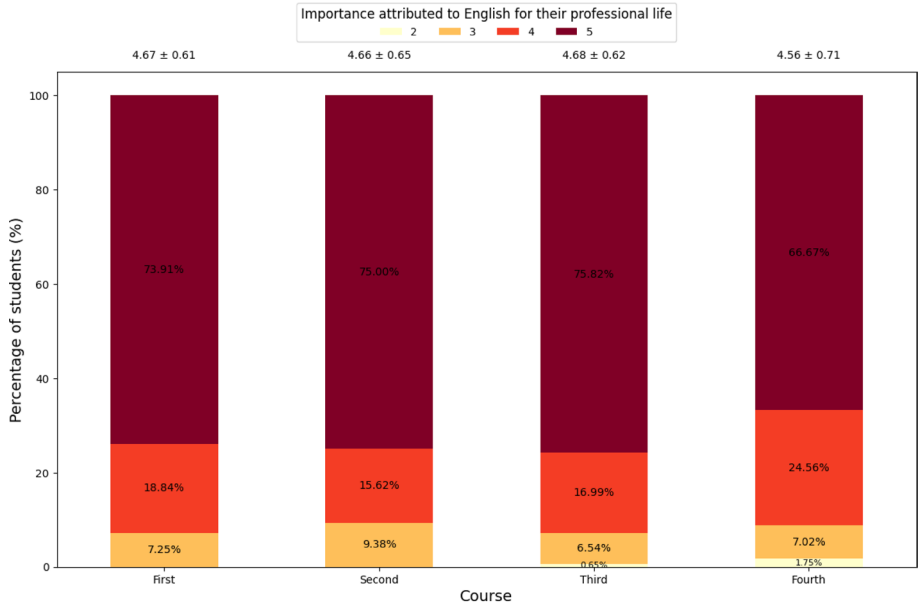
(a)



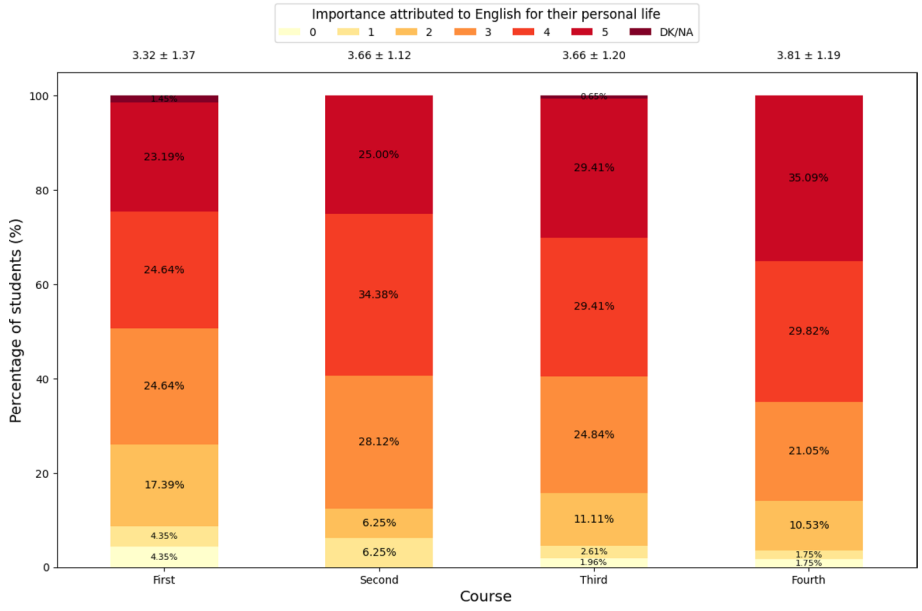
(b)

Fig. 3 (**a**) Distribution of student satisfaction with English language training; (**b**) Assessment of the necessity for non-formal education; (**c**) Evaluation of students' perceived importance of English language proficiency for professional development; (**d**) Evaluation of students' perceived importance of English language proficiency for personal development; according to the degree courses in which they are enrolled

Figure 3(d) shows greater variation in how students rate English's importance for their personal lives, with 12.3% assigning very low scores (0 or 1). Although these perceptions did not vary by academic year, a weak to moderate positive correlation emerged between self-assessed proficiency and the importance attributed to English, notably for speaking skills (Spearman $\rho = 0.3058$, $p < 0.0001$). This observation supports *RQ-S2* by indicating that higher self-rated proficiency—particularly in oral production—may heighten



(c)

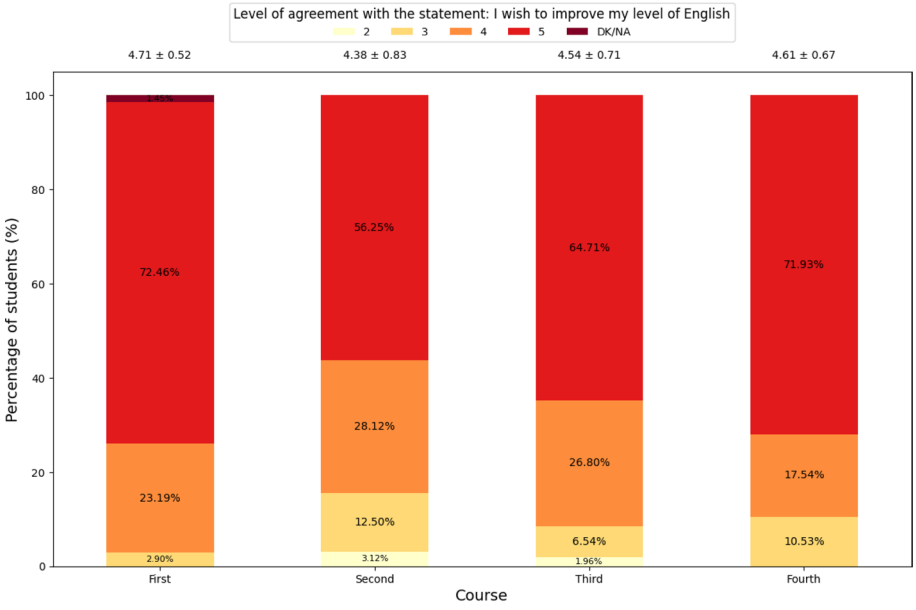


(d)

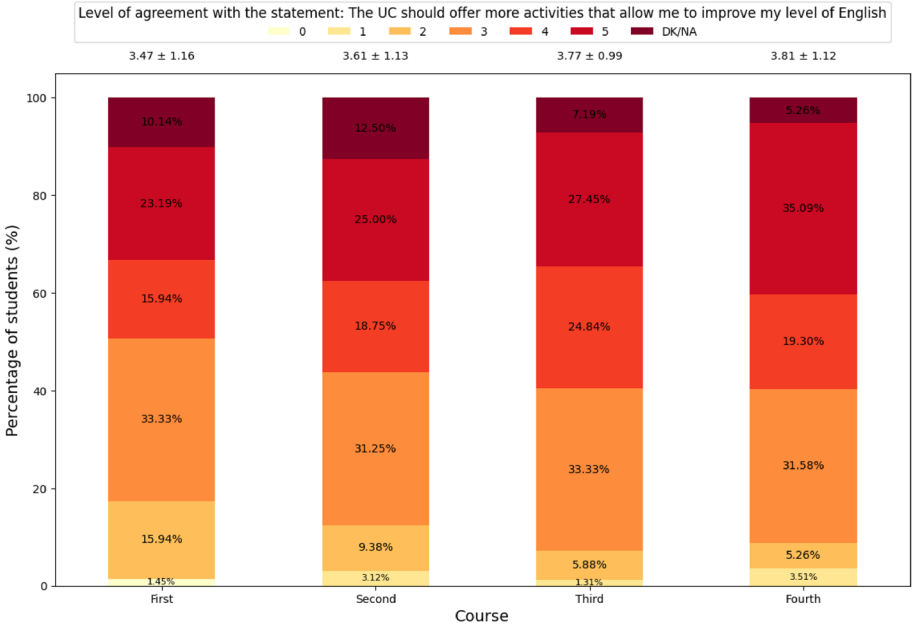
Fig. 3 (continued)

students' recognition of English as valuable in personal contexts, thereby influencing their overall EMI experience.

When asked about their aspirations to improve their English language proficiency, over half of the engineering students across degree courses rated this desire at the maximum score (5), see Fig. 4(a), indicating a broad recognition of its importance. Although *RQ-S2* explores the role of self-assessed proficiency in shaping motivation, the statistical tests showed no significant correlation here, suggesting that the desire to enhance English skills exists independently of students' current language level.



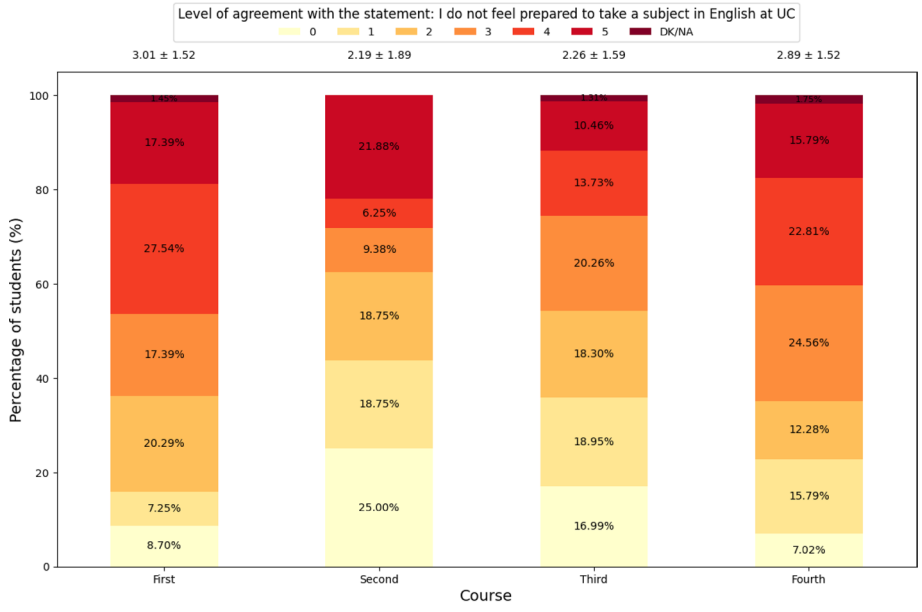
(a)



(b)

Fig. 4 Assessment of students' level of agreement with statements related to (**a**) their motivation to improve their English language proficiency, (**b**) the provision of English language training by UC, (**c**) their preparedness for content-based instruction in English, (**d**) the inclusion of compulsory English language courses in UC's curriculum

The survey data show that students, on average, rated the university's current provision of opportunities to improve their foreign language skills at 3.69 ± 1.07. As Fig. 4(b) illustrates, 3rd and 4th -year students tend to be more interested in institutional initiatives to enhance English proficiency—possibly reflecting their proximity to graduation and heightened focus on employment. Additionally, a weak but significant negative correlation (Spearman $\rho = -0.1223$, $p = 0.0388$) emerged between self-assessed writing skills and the desire for more activities, indicating that those who feel less confident in writing



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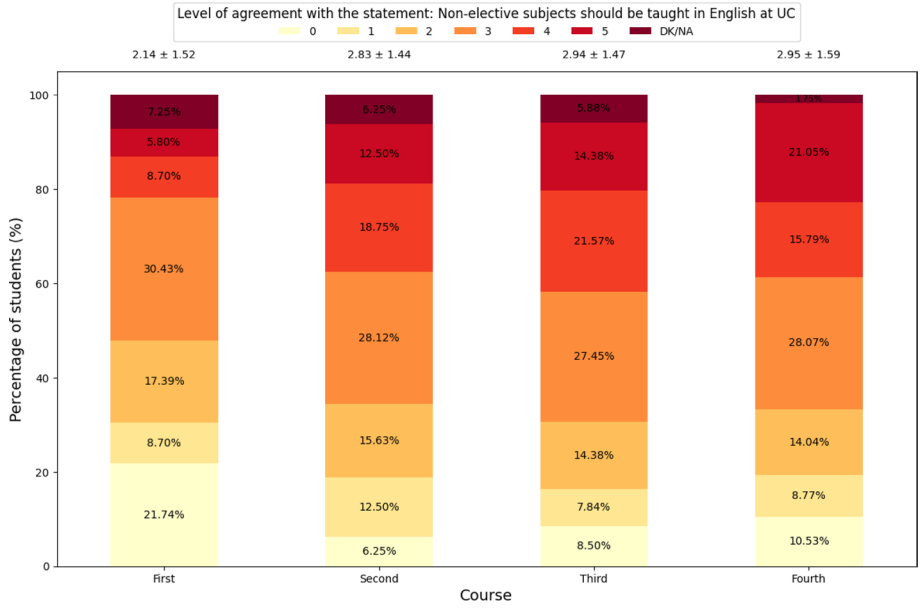


(d)

Fig. 4 (continued)

particularly want more university-led support. These findings address *RQ-S5* by suggesting that students expect the institution to offer additional resources for improving English language skills, especially as they approach the job market.

Figure 4(c) shows considerable variability in students' readiness to undertake content-based subjects taught in English, with this readiness remaining independent of academic year and gender. This variability reflects challenges such as language barriers to effective communication and comprehension, as highlighted by [9, 24]. In addition, Fig. 4(d) indicates that younger students are less supportive of non-elective English-taught subjects, possibly due to limited exposure to EMI or heightened concerns about language

barriers. Furthermore, weak yet statistically significant positive correlations were found between self-assessed listening ($\rho = 0.1611$, $p = 0.00571$) and speaking skills ($\rho = 0.1556$, $p = 0.00762$) and support for mandatory EMI. These findings address *RQ-S3* by demonstrating that greater self-perceived linguistic competence is linked to a higher level of preparedness for compulsory English instruction.

Furthermore, when evaluating the difficulty of improving their English proficiency on a scale from 0 to 5, students identified lack of time as the most significant barrier, followed by the intrinsic complexity of learning a foreign language. Economic constraints—which could hinder access to non-formal English instruction—had little impact, as most respondents indicated, see Fig. 5. These findings address *RQ-S2* by highlighting that personal and contextual factors substantially influence students' self-perception and motivation to improve, whereas economic factors appear less influential.

Approximately 40% of surveyed participants had experienced coursework delivered in English at UC and were prompted to assess their agreement with various statements on a scale from 0 to 5 points, as depicted in Fig. 6. Among these respondents, 38.6% acknowledged encountering additional challenges in their learning due to the use of EMI. This finding correlates with previous studies such as those by [9, 14, 15, 24], which highlighted the hurdles faced by students with lower language proficiency levels in EMI settings. These results directly relate to *RQ-S4*.

Interestingly, a discernible relationship emerges between the perceived extra difficulty and self-assessed language skills. Specifically, engineering students reporting additional challenges tended to exhibit lower language skill values compared to their counterparts without such difficulties: oral comprehension 3.08 vs. 3.88 (p-value 2.89e-06), reading comprehension 2.96 vs. 3.86 (p-value 6.88e-05), written expression 2.96 vs. 3.34 (p-value 0.01), and oral expression 2.67 vs. 3.22 (p-value 0.0007). There is general agreement on the adequacy of the teachers' English proficiency for teaching the course, see Fig. 6(a). Regarding the question of whether enrolled students had a homogeneous level of English and could adequately follow the subject, participate, and ask questions, 45.71% of

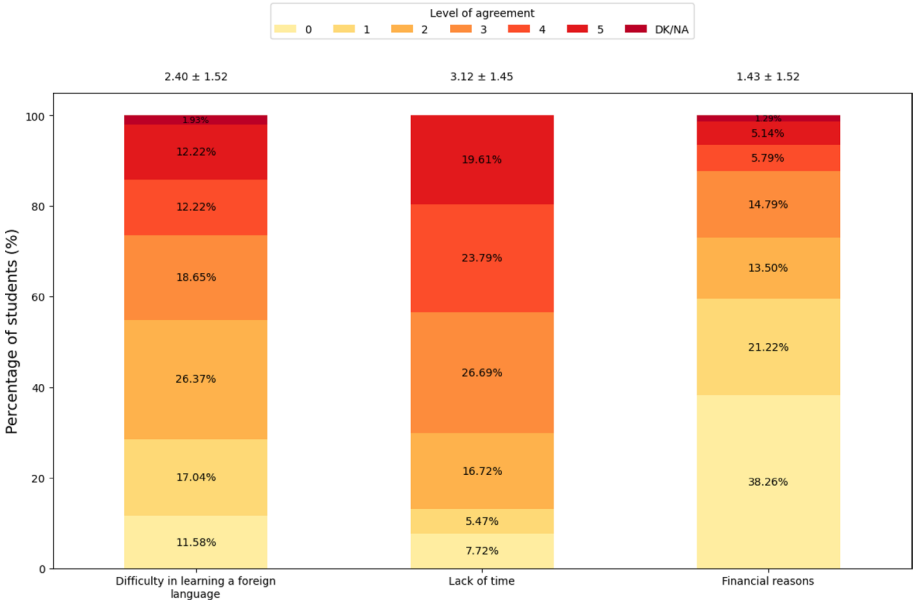
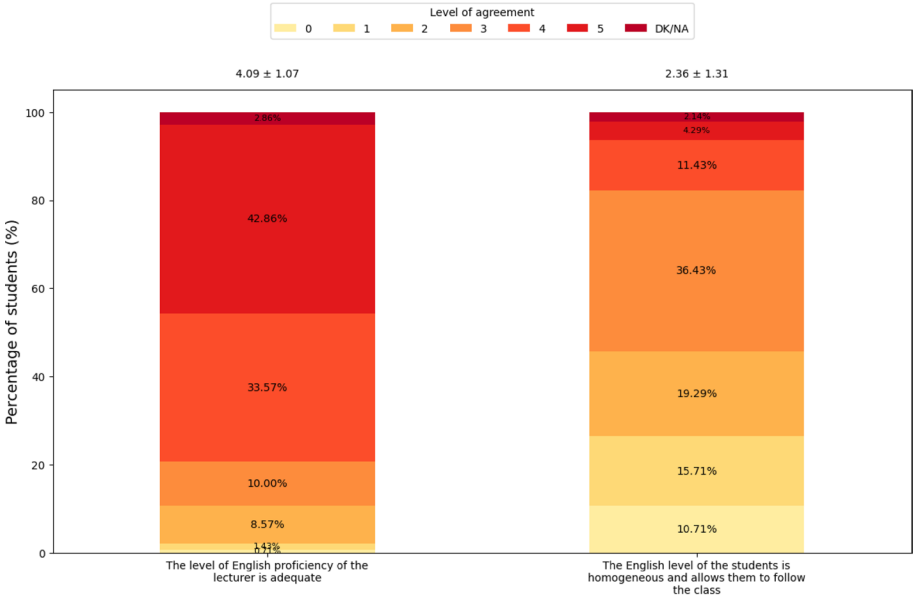


Fig. 5 Assessment of students' perceived importance of factors hindering language proficiency development



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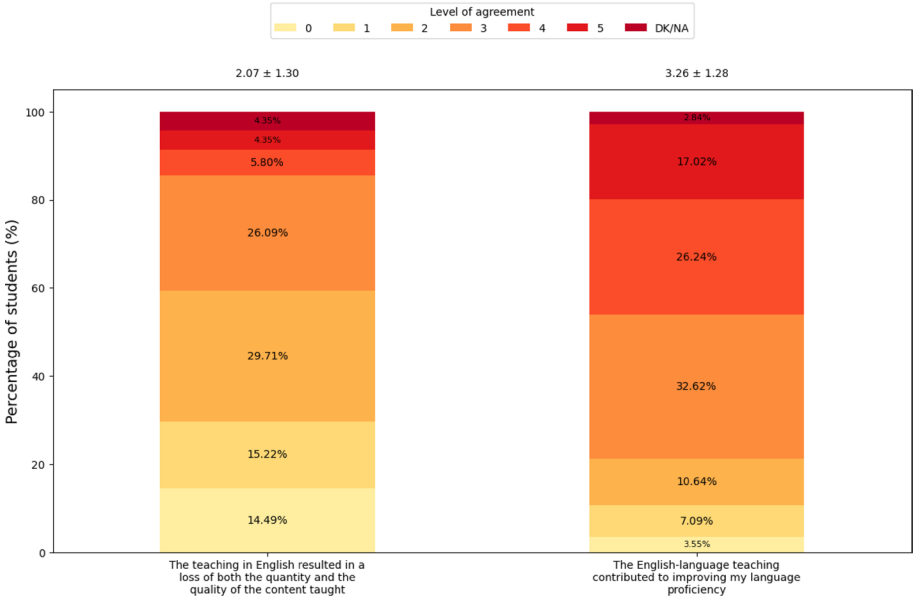


(b)

Fig. 6 Perception of different aspects of a content-based subject taught in English at UC. (**a**) Evaluation of teachers' and students' English language proficiency; (**b**) Assessment of the influence of vehicular language on the quality of teaching and student's English language proficiency development

the respondents rated it with 2 points or less, aligning with previous findings by [9] and [15], who likewise noted uneven language levels as a barrier to classroom participation.

Regarding the impact of teaching a content subject in English on the quality of instruction, or whether all the content was covered or addressed more superficially, 59.42% of respondents rated this statement with 2 points or less, see Fig. 6(b). However, a weak, negative, and statistically significant correlation was found between the belief that teaching in English worsens the quality of instruction and students with lower self-assessments of their reading skills; a Spearman correlation coefficient of −0.2014 was obtained (p-value = 0.02944). The perception of a potential decline in teaching quality when

subjects were taught in English aligns with the findings in [24], suggesting potential disparities in teaching effectiveness based on language of instruction.

When asked whether taking a subject in English had a positive impact on improving their language level, 43.26% of respondents rated their agreement with this statement as 4 or 5 points, as shown in Fig. 6(b). This aligns with previous studies by [48], which indicate a relative recognition among students of the language benefits associated with EMI programmes. When analysing whether there is a relationship between their response and self-perceived English skills, positive, weak yet statistically significant correlations were found between reading skills (Spearman correlation coefficient 0.2093, p-value = 0.0235) and writing skills (Spearman correlation coefficient 0.2509, p-value = 0.00593), indicating that students who rate these skills more highly are those who believe they have improved the most as a result of receiving instruction in English. Overall, these findings directly address *RQ-S4* by demonstrating that students' self-assessment of their language skills partially shapes their perceptions of the efficacy of EMI in enhancing their English proficiency.

4.2 Analysis of the lecturers' survey results

Thirty out of forty-five lecturers teaching content subjects in English in UC Engineering Degrees responded to the survey, providing a diverse representation of teachers across various professional categories and experience levels. Spanish universities typically classify lecturers based on academic qualifications, research, and teaching experience. The first category, "profesor asociado", is typically for lecturers without a doctorate but with professional experience. "Profesor ayudante doctor" follows, for those with a completed doctoral degree but lacking sufficient research and teaching experience. "Profesor contratado doctor" is for lecturers with a doctorate and enough research experience. "Profesor titular" is a higher position for lecturers showing excellence in research and teaching. Lastly, the top position is "profesor catedrático", held by lecturers with exceptional research and teaching achievements and an internationally recognised reputation in their field.

Two thirds of the survey respondents have been teaching in English for 5 to 10 years since the implementation of this teaching approach in UC undergraduate studies, see Table 1. Additionally, almost 70% of the respondents have attained a C1 level of English, which is the minimum level required at UC to be the teacher responsible for a subject taught in English, see Fig. 7. The majority of survey respondents have obtained their English proficiency certification through the University of Cambridge, followed by those who obtained it through the University of Cantabria's own exam. The category "Others"

Table 1 Distribution of surveyed lecturers' years of experience teaching in english

	Position							
Years	**Contracted Researcher**	**"Prof. Asociado"**	**"Prof. Ayudante Dr."**	**"Prof. Contratado Dr."**	**"Prof. Titular"**	**"Prof. Catedrático"**	**Others**	**Total**
< 10	3	3	-	6	6	2	4	24
10–15	-	-	1	2	-	1	-	4
> 15	-	-	-	-	2	-	-	2
Total	3	3	1	8	8	3	4	

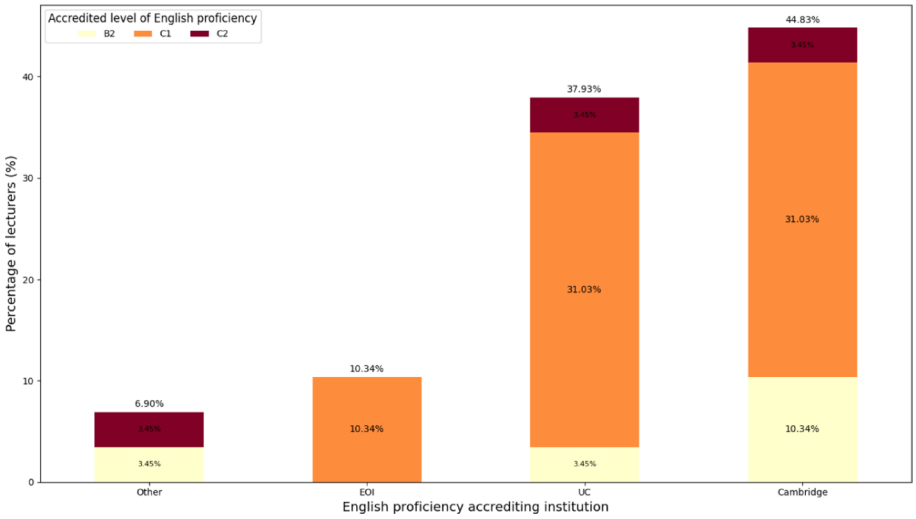


Fig. 7 Distribution of surveyed lecturers' accredited level of English

in Fig. 7 refers to doctoral or postdoctoral researchers who contribute to teaching across various courses but are not formally employed as lecturers by UC.

In the study, lecturers were asked to evaluate their language skills in English using a 5-point scale, as depicted in Fig. 8(a). Results showed that the skill most highly valued by lecturers was reading comprehension, followed by written expression. This result was expected, given that reading and writing scientific texts in English is a common activity for the majority of the respondents. Meanwhile, the average scores for oral comprehension and expression were lower. Furthermore, Fig. 8(b) shows that more than half of the cases where teaching in English was initiated was due to the initiative of the Department or UC Centre where the lecturers belong or where there was a desire to offer a particular subject in English. This finding directly addresses *RQ-L5*, underscoring the role of institutional and departmental actions in promoting EMI at UC.

Figure 9(a) illustrates the responses of teachers to the statement, "Currently, I feel just as comfortable teaching in English as in Spanish", with an average score of 2.86 ± 1.51. The wide dispersion of scores indicates that comfort levels among lecturers working in EMI contexts vary considerably. A statistical analysis was conducted to examine whether there was any relationship between responses to this question and teaching experience in English, but no significant relationship was found, indicating that other factors influence comfort levels when teaching in a foreign language. Interestingly, a moderate statistical correlation was identified between comfort levels and self-perceived listening skills in English, with a Spearman correlation coefficient of 0.3331 (p-value = 0.07742). These findings directly address *RQ-L1*, underscoring that lecturers' comfort in using English is influenced more by self-assessed language competence than by their length of experience teaching in English.

Figure 9(b) presents the responses to the question of whether they agree that teaching in English currently demands more time and effort than teaching in Spanish. Again, significant variability is observed. No statistical correlation was identified between the additional time and effort and either teaching experience or language proficiency, consistent with findings from previous studies, such as those by [28, 29], which highlight that increased workload and effort are common concerns among EMI teachers,

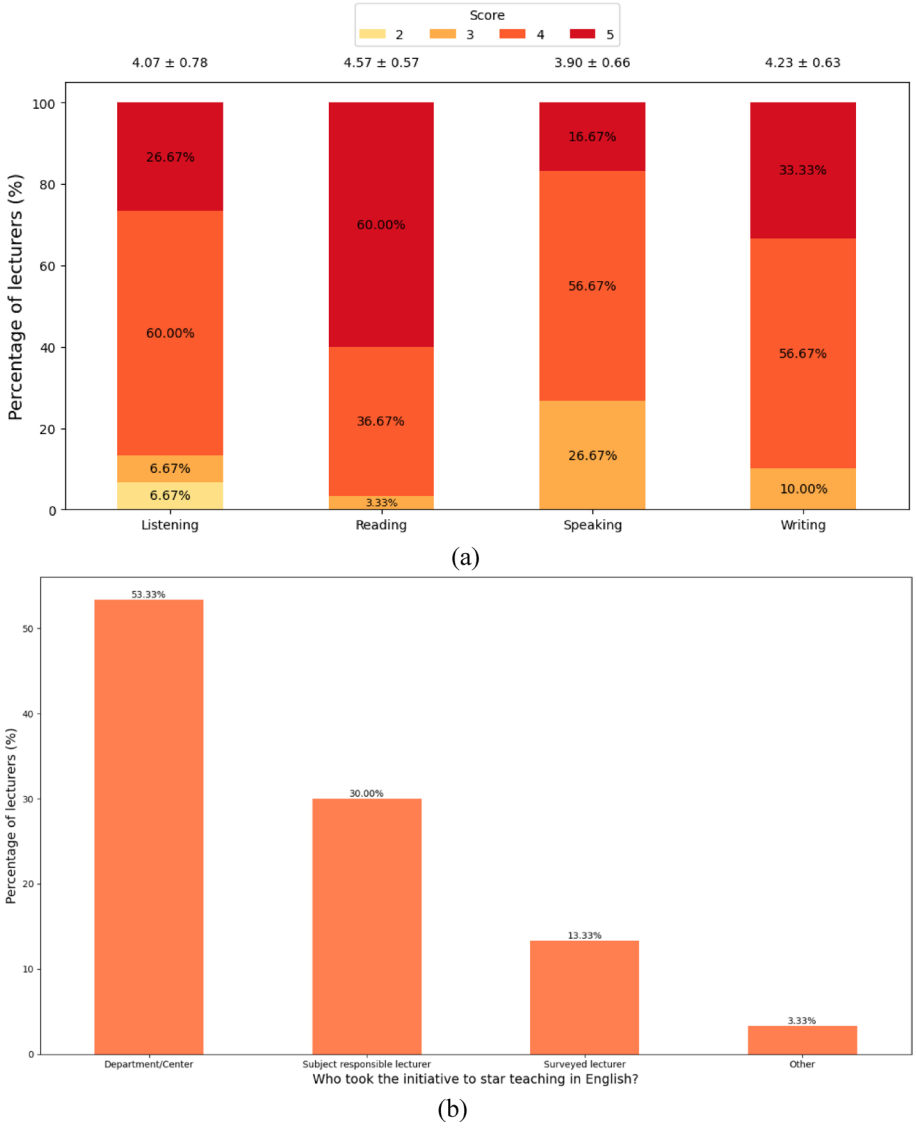
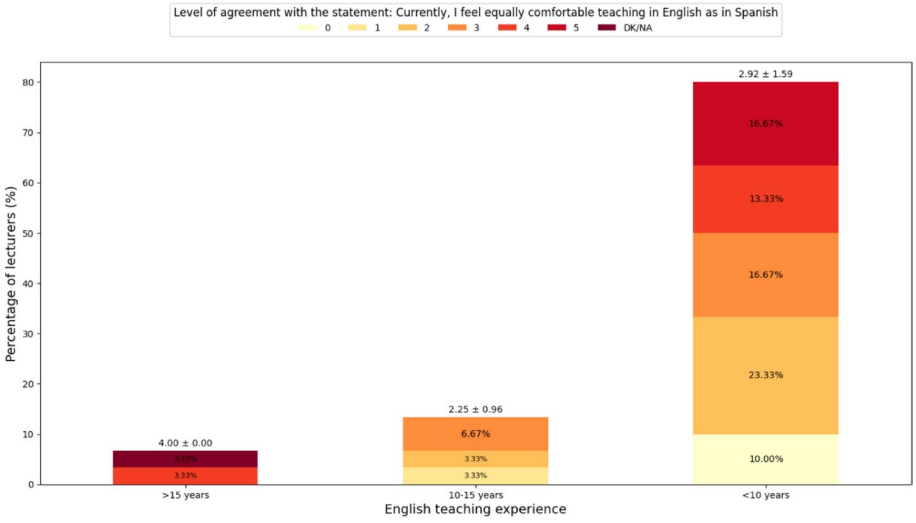


Fig. 8 (**a**) Evaluation of lecturers' self-perceived language proficiency; (**b**) Motivations for teaching in English

irrespective of their experience levels. The factors influencing teachers' perceptions of the additional time and effort required could include teaching style, subject matter complexity, availability of resources, and institutional support. These findings directly relate to *RQ-L2*, which examines whether lecturers perceive that teaching in English involves greater preparation and effort compared to teaching in Spanish.

Figure 10 presents lecturers' ratings on a 0–5 scale for several statements. Notably, the statement "When I started teaching in English, this was extra difficult for me compared to teaching in Spanish" was rated 4 or 5 by 60% of respondents. This finding, which aligns with [28] and Barrios & López (2019), is pertinent to *RQ-L1* as it illustrates how initial difficulties in transitioning to EMI may affect lecturers' overall comfort when teaching in English. In addition, Fig. 10(a) also shows responses to the statement "Currently, teaching in English requires more time and effort than when I teach in Spanish." Although these data were not disaggregated by years of teaching experience, the sustained perception of extra effort reinforces the notion that EMI imposes a higher workload. This



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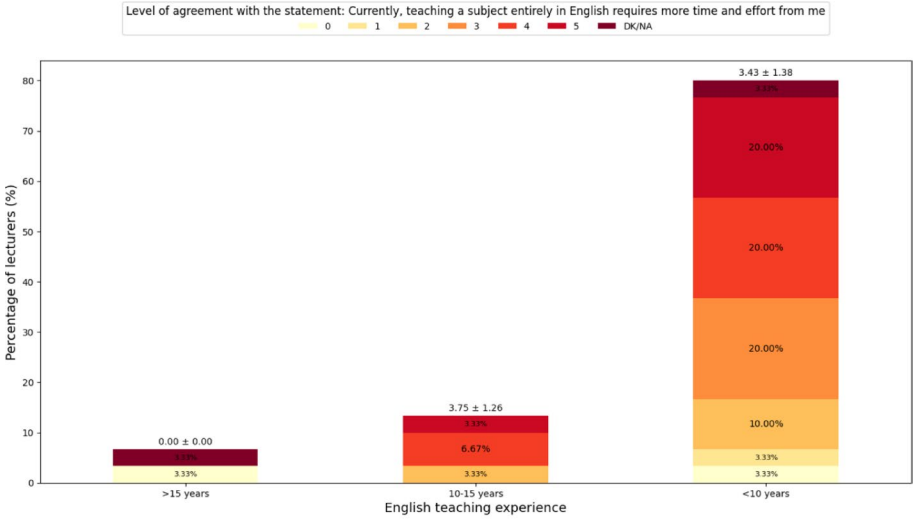


(b)

Fig. 9 Surveyed lecturers' perceptions of (**a**) teaching comfort and (**b**) time/effort requirements in relation to their years of experience teaching in English

observation directly addresses *RQ-L2*, which investigates the additional time and effort required for teaching in English compared to Spanish. Together, these findings underscore the ongoing challenges associated with maintaining English proficiency, as noted by [31] and [27], impacting both lecturers' comfort and workload.

There was considerable dispersion in responses regarding whether lecturers' English proficiency is deemed adequate for delivering satisfactory teaching. This variability suggests significant differences in comfort and confidence among non-native English-speaking lecturers, consistent with findings by [29] and [30]. These observations directly address *RQ-L1*, highlighting that lecturers' self-assessed language proficiency—and thereby their overall comfort in teaching in English—varies considerably within our sample.

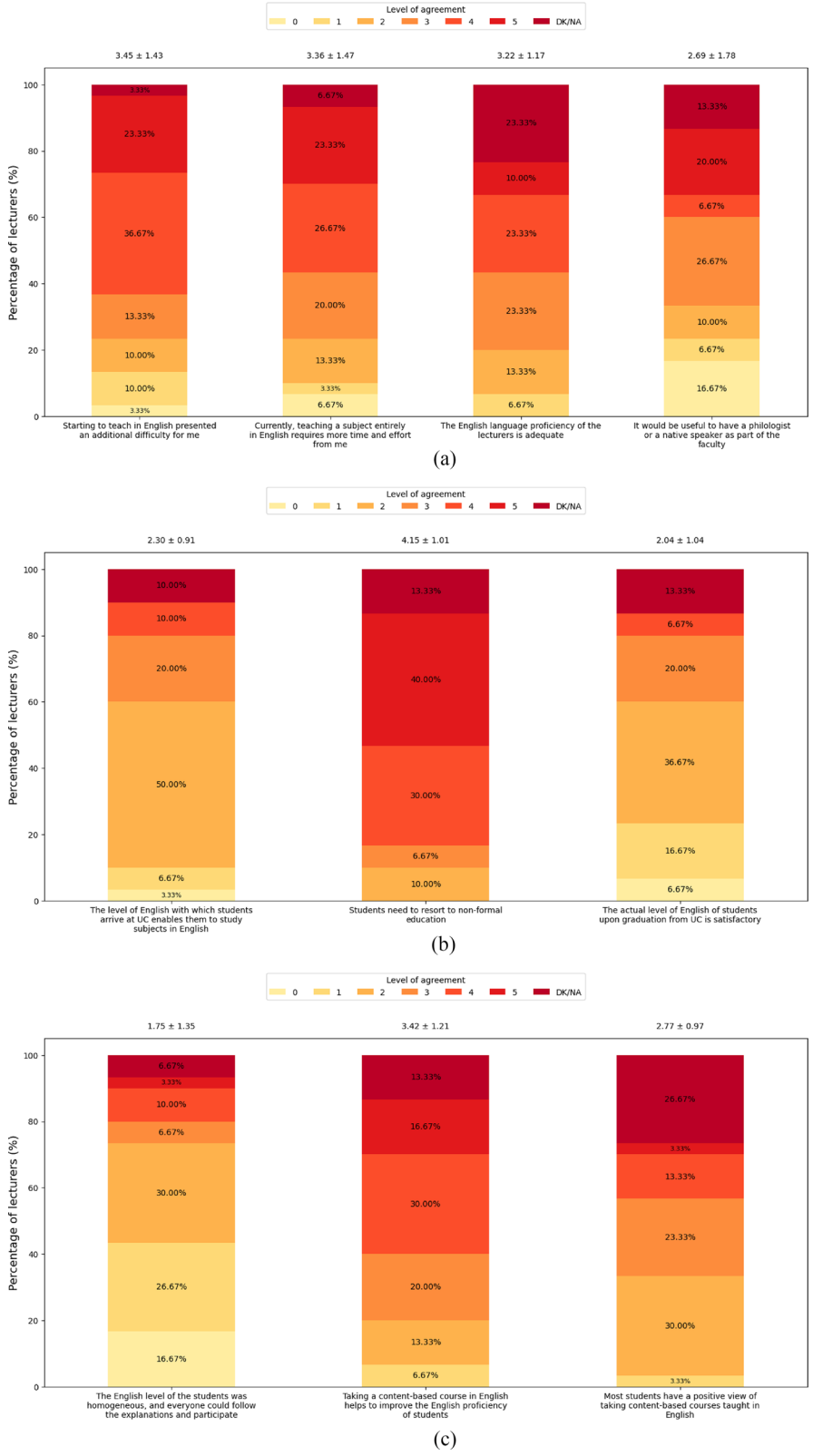


Fig. 10 Degree of agreement among surveyed lecturers on various statements related to (**a**) Perceptions of extra difficulty in teaching in English and their perception of teachers' English language proficiency; (**b**) Satisfaction with previous student training and its influence on subject teaching; (**c**) Opinions on the impact of English-taught subjects on students' English language level at graduation

In response to the question regarding whether the support of a philologist or native speaker in designing materials or activities would be beneficial, the responses were highly variable and statistically independent of years of experience. Nonetheless, 53.34% of engineering lecturers rated this item 3, 4, or 5, suggesting that a majority recognise the potential benefits of such collaboration. This finding aligns with previous studies that underscore the need for cooperation between content and language lecturers in EMI programmes [30, 46]. Moreover, a moderate, statistically significant negative correlation was observed between self-assessed writing skills and responses to this question (chi-square $p = 0.05262$; Spearman $\rho = -0.4789$, $p = 0.01332$). These findings directly relate to *RQ-L4*, which examines the extent to which lecturers support institutional or specialist assistance to enhance the EMI experience.

Figure 10(b) shows that engineering lecturers have a critical view of the English language proficiency of their students. The statement "Engineering students arrive at UC with a level of English that enables them to take subjects taught in English" received 0, 1 or 2 points in 60% of the survey responses, indicating a prevalent scepticism among teachers regarding students' readiness for EMI. Moreover, our results underscore the perceived necessity of non-formal education to enhance English language proficiency, with 70% of responses rating this aspect highly. This suggests the need for supplementary language support mechanisms to bridge the gap between students' current proficiency levels and the linguistic demands of EMI courses. Additionally, 60% surveyed lecturers gave a score of 2 points or less to the English language proficiency of graduates, indicating that the current requirement of a B2 accreditation (or equivalent) may not suffice to ensure students' proficiency in English upon degree completion.

Figure 10(b) shows that engineering lecturers hold a critical view of their students' English language proficiency. In fact, 60% of respondents rated the statement "Engineering students arrive at UC with a level of English that enables them to take subjects taught in English" as 0, 1, or 2, indicating widespread scepticism regarding students' readiness for EMI. The importance of accurately assessing and addressing language skills in EMI programmes, as highlighted by [55], remains both pressing and unresolved despite the passage of many years. Moreover, 70% of respondents emphasised the need for non-formal education to enhance English proficiency, underscoring the value of supplementary language support mechanisms to bridge the gap between current proficiency levels and the linguistic demands of EMI courses. Additionally, 60% of lecturers rated graduates' English proficiency at 2 or below, implying that the current B2 accreditation may be inadequate. These observations are directly related to *RQ-L3*, which examines how lecturers evaluate the impact of EMI on student learning and whether existing language proficiency levels sufficiently support academic achievement.

Figure 10(c) shows that 73% of lecturers assigned a score of 2 or less to the statement "The level of English of the students in my subjects is homogeneous and allows them to follow the explanations and participate in the class," suggesting a pervasive challenge in achieving consistent language proficiency within EMI classrooms. In addition, the evaluation of EMI's impact on students' language development was markedly variable, with 26.67% of respondents indicating "DK/NA" regarding whether students perceive EMI subjects positively. This marked dispersion underscores the complex interplay of factors—such as teaching practices, curriculum design, classroom dynamics, and student motivation—that influence language acquisition, as highlighted by [30, 32, 45]. Together,

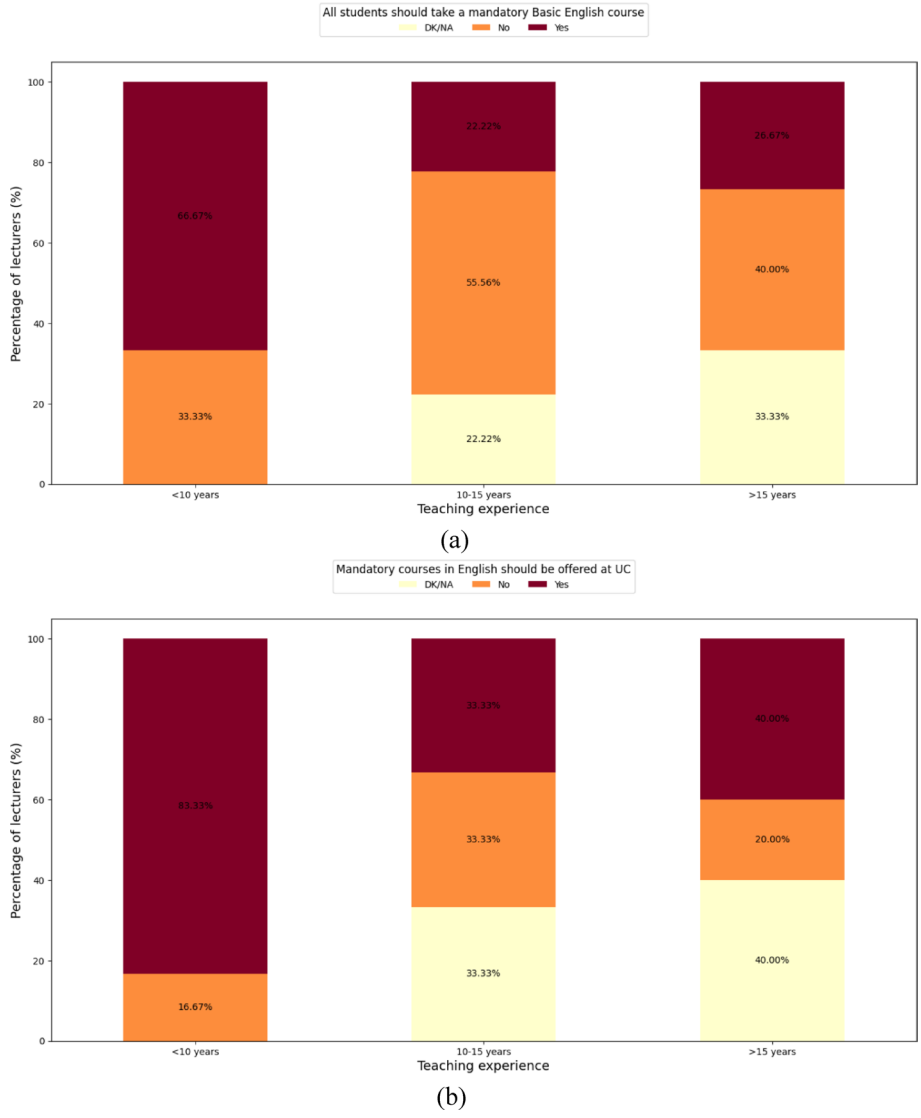
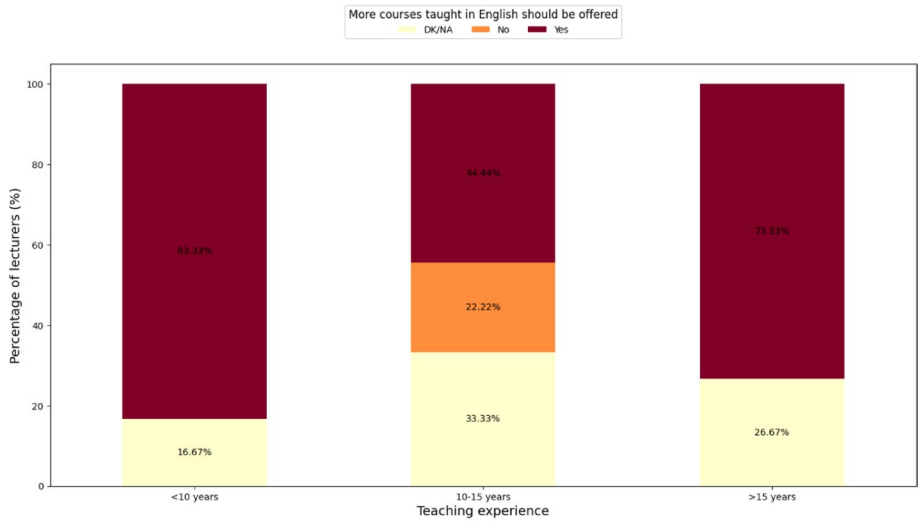


Fig. 11 Lecturers' responses (Yes/No/DK-NA) on (**a**) Allowing basic English course requirement; (**b**) Offering compulsory subjects in English; (**c**) Offering more English-taught subjects; (**d**) Developing activities to improve students' English level; depending on years of teaching experience

these findings directly address *RQ-L3*, which examines how lecturers evaluate the effectiveness of EMI on student learning, particularly regarding the adequacy of students' language skills and the associated challenges in instruction.

Figure 11 illustrates faculty opinions regarding the provision of English language instruction at UC, stratified by years of teaching experience, and directly informs *RQ-L5* on whether EMI should be mandatory or elective. During the academic years 2022–2024, an instrumental English subject was compulsory only for students unable to accredit a B2 level upon entry. As shown in Fig. 11(a), only 33.33% of respondents believed that this subject should be mandatory for all students, while 43.33% disagreed, and the remainder selected "DK/NA". Notably, engineering lecturers with fewer than 10 years of experience were more likely to favour compulsory English subjects. In contrast, Fig. 11(b) shows that 70% of faculty members supported the integration of additional mandatory courses in English, with their responses statistically independent of



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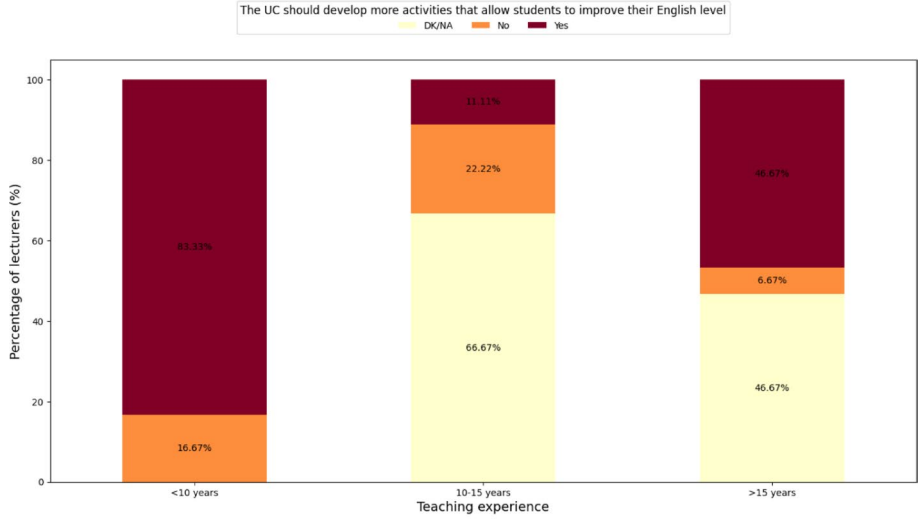


(d)

Fig. 11 (continued)

self-assessed language proficiency. Furthermore, Fig. 11(c) reveals that 70% of respondents agreed that more subjects in English should be offered, provided they remain optional. No significant correlations were identified between these responses and either age or English proficiency; once again, more experienced lecturers tended to respond "No" or "DK/NA." Together, these findings comprehensively address *RQ-L5*, demonstrating diverse views among faculty on whether and to what extent EMI should be a compulsory element of the curriculum.

There was considerable variation in responses to whether UC should implement more activities aimed at improving engineering students' English proficiency (see Fig. 11(d)), with these responses showing no dependence on teachers' self-assessed language proficiency. However, the chi-square test for independence indicated a relationship with years of teaching experience ($p = 0.0548$), with less experienced teachers more likely to support the introduction of additional activities. These results directly address *RQ-L4*, which explores lecturers' perceptions regarding the need for enhanced institutional support—such as specialised activities—to bolster students' English language skills.

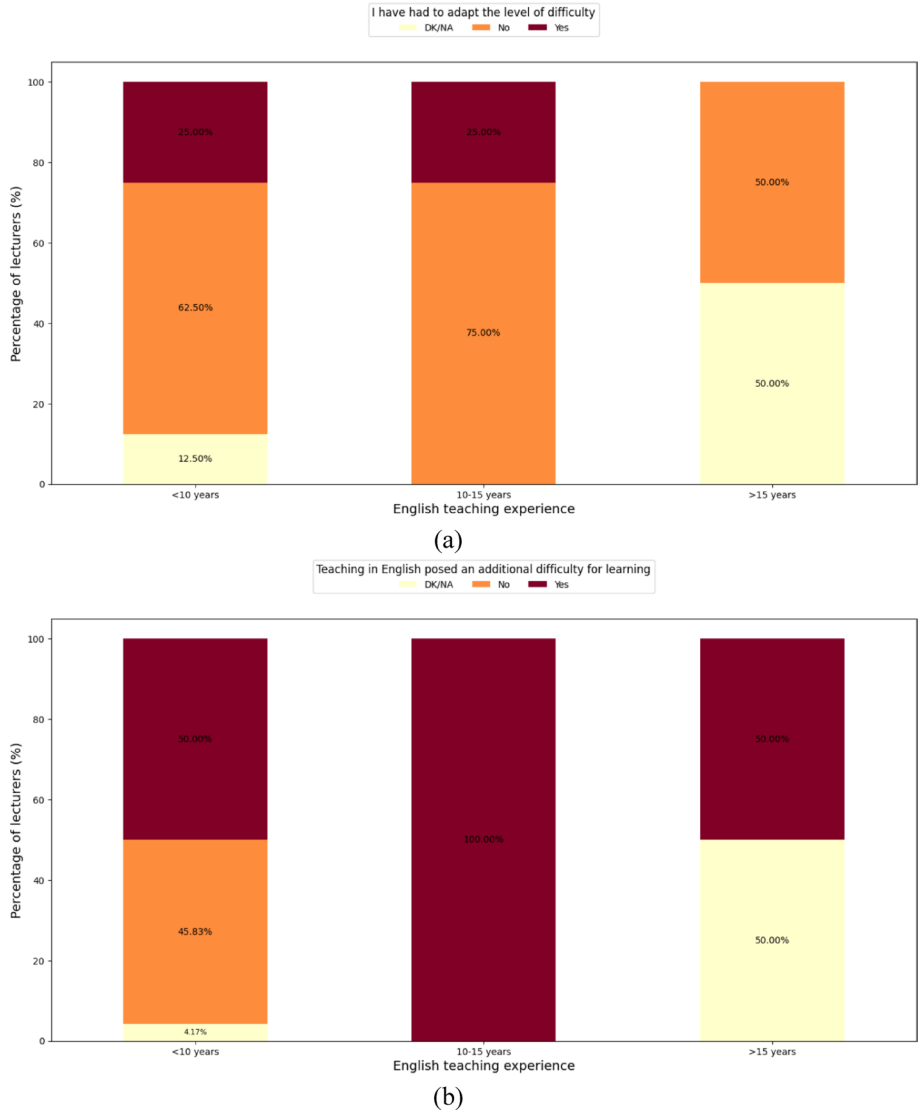
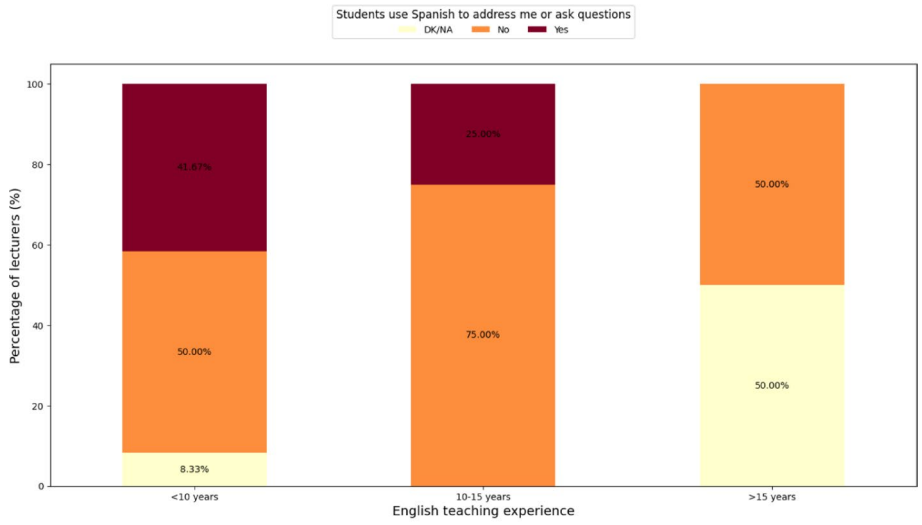


Fig. 12 Lecturers' responses (Yes/No/DK-NA) on (**a**) Adapting subject difficulty in English; (**b**) Whether teaching in English poses an added difficulty for learning; (**c**) Students' use of Spanish in subjects; (**d**) Their use of Spanish in subjects; (**e**) Allowing the use of Spanish in tasks and evaluations; (**f**) Focusing on content and/or language; depending on years of teaching experience

Figure 12 provides insights into adaptations of engineering subject levels in response to English-taught methodologies, with all questions addressing *RQ-L3* by examining adjustments in content difficulty and teaching approaches in EMI contexts. A notable finding emerged from the respondents' feedback: 63.33% reported no need to adjust subject levels due to language considerations (Fig. 12(a)). This response was found to be independent of the years of teaching experience and self-assessed language proficiency. This finding challenges conventional assumptions about the need for language-related adjustments in EMI contexts and suggests a level of confidence among teachers in maintaining the academic rigor of their subjects regardless of the language of instruction. However, 56.67% of surveyed teachers acknowledged the additional difficulty posed by language in learning, Fig. 12(b), and their responses were found to be statistically independent of their self-assessed language proficiency.



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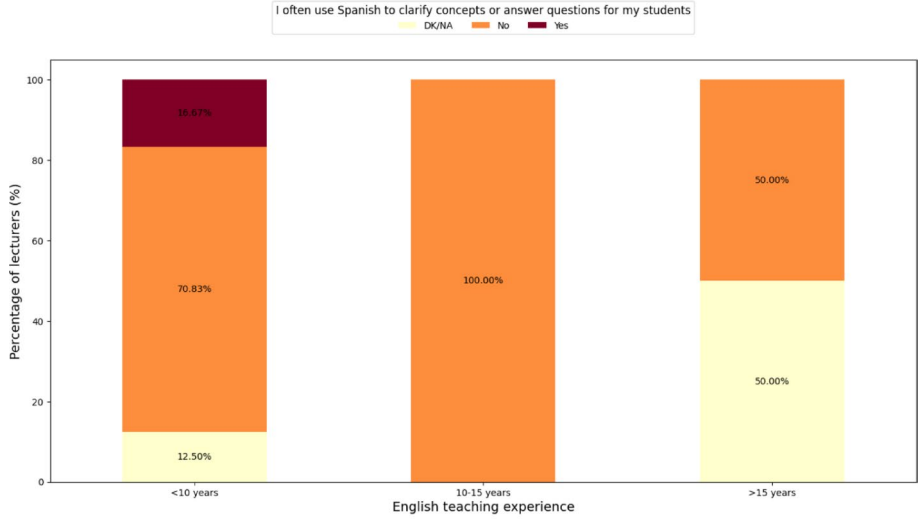
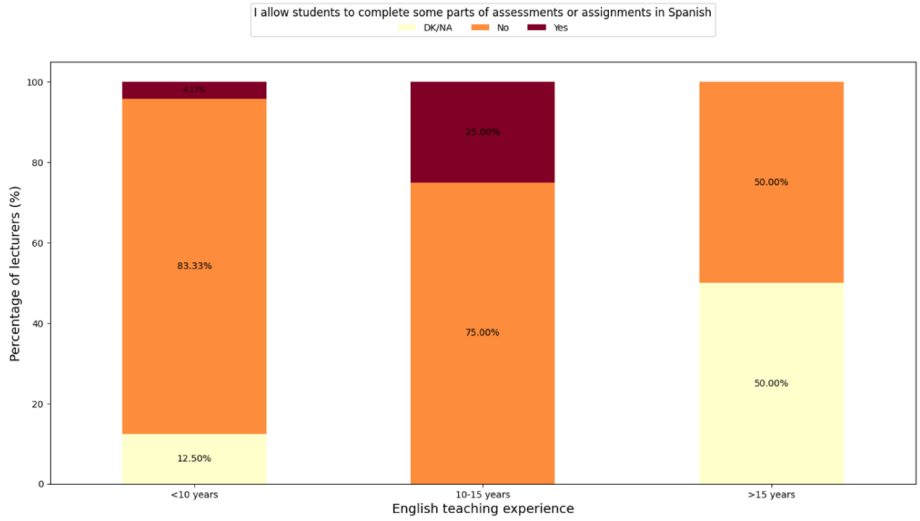


(d)

Fig. 12 (continued)

Figure 12(c) reveals that a significant portion of surveyed lecturers (53.33%) noted that students refrain from using their mother tongue to ask questions or address the teacher. This preference for English communication underscores the immersive language learning environment advocated in EMI settings, aligning with [9], who found that students are motivated by enhanced English language competence. This observation suggests a preference or expectation for English as the primary language of communication within the classroom, aligning with the immersive language learning environment advocated in EMI settings. Similarly, Fig. 12(d) highlights that 73.33% of teachers avoid using Spanish for clarifications or addressing doubts, emphasising the commitment to maintaining an English-speaking environment for instructional purposes, despite growing scholarly support for translanguaging as a strategy to enhance EMI delivery [34, 36].

Additionally, Fig. 12(e) indicates that 80% of surveyed engineering teachers do not permit evaluable activities to be conducted in Spanish, signalling a commitment to assessing English proficiency and reinforcing the pedagogical objectives of EMI programmes. This aligns with the emphasis on English language proficiency and academic achievement



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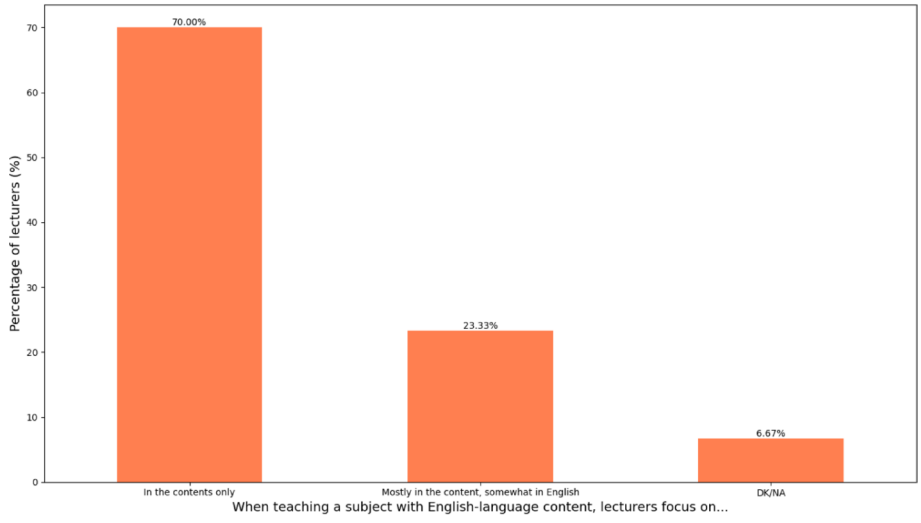
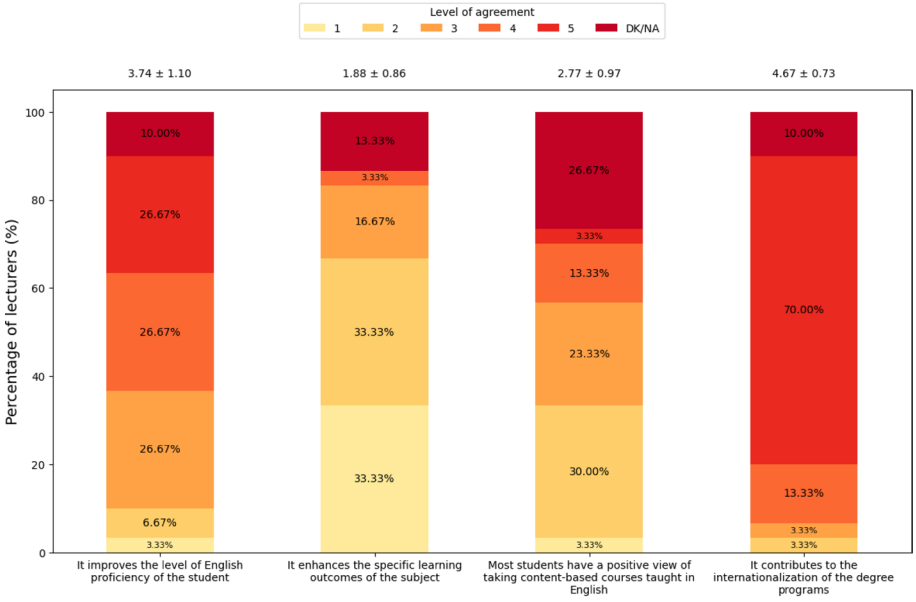


(f)

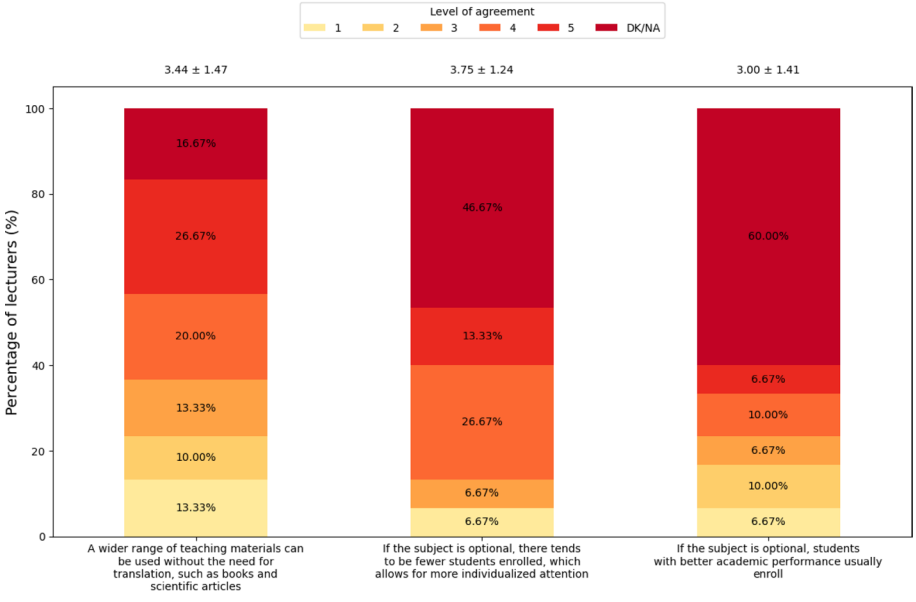
Fig. 12 (continued)

within the EMI framework, as discussed by [45]. Lastly, Fig. 12(f) showcases that a substantial proportion (70%) of surveyed lecturers employ an EMI approach in their courses emphasising content over language. The absence of CLIL methodology adoption among the surveyed teachers suggests a potential area for exploration and development in promoting interdisciplinary language and content instruction.

In Fig. 13, insights into the advantages of English-taught courses at the university level are depicted. Among these, enhancing the internationalisation of UC engineering degrees emerges as the most highly rated benefit, closely followed by the perceived improvement in student employability (see Fig. 13(a)). Additionally, when EMI courses are optional, smaller class sizes seem to allow for more personalised attention, yielding better learning outcomes. This observation aligns with Nieto & Fernández (2021), who note improved teaching conditions and student motivation in EMI settings. However, 60% of the teachers surveyed answered "DK/NA" to this question, likely because their subjects are not optional. These findings directly address *RQ-L3*, by highlighting how the



(a)



(b)

Fig. 13 Lecturers' assessment of the importance of various benefits of EMI related to (**a**) English proficiency, learning outcomes, motivation, and internationalisation; (**b**) access to materials, student performance, and classroom individualisation.

perceived benefits of EMI—such as internationalisation and improved learning quality—shape lecturers' evaluations of EMI's impact on student learning.

While the survey findings highlight several perceived advantages of English instruction, a notable dispersion in responses regarding its efficacy in enhancing engineering students' English proficiency underscores the complexity of language acquisition within these programmes. Their responses were found to be statistically independent of their self-assessed language proficiency. This observation suggests that while EMI programmes offer opportunities for language development, their effectiveness in this regard may vary. Other advantages that were valued include the ability to use more materials

without the need for translation and the tendency for higher-performing students to enrol in elective subjects in English. However, the perceived negative impact of English instruction on the depth of content comprehension, as indicated in Fig. 13(b), prompts critical reflection on the balance between language acquisition and subject mastery within EMI pedagogy—one of the central issues addressed by *RQ-L3*—and echoes the concerns about instructional effectiveness reported in [42] for so-called "bilingual" programmes.

5 Conclusions

In recent years, many Spanish universities have prioritised the internationalisation of higher education. However, the anticipated outcomes have not consistently materialised. While previous studies have largely focused on educators' perspectives, our investigation—by jointly examining both student and lecturer viewpoints—reveals several persistent challenges in English-Medium Instruction (EMI) within engineering programmes at the University of Cantabria (UC).

Across the university community, linguistic competencies are widely regarded as essential, with proficiency in English deemed crucial for engineering graduates seeking to compete in an increasingly globalised labour market. Both students and lecturers recognise the value of English-taught programmes in enhancing employability and raising the institution's international profile. However, as public education is currently provided, it falls short of equipping students with the necessary language skills. In particular, student satisfaction with previous English instruction is only moderate, regardless of self-assessed proficiency. Consequently, many students resort to private tuition, emphasising the very high importance they place on non-formal language education. These observations directly address *RQ-S1* and indicate that universities could adopt a more proactive stance in strengthening these language skills.

Regarding *RQ-S2*, our analysis reveals several important nuances. First, statistical tests show no significant gender differences in students' self-assessed language skills. Moreover, self-assessed skills seem to improve with academic exposure—as first-year students report lower proficiency compared to their counterparts in higher courses—while age itself does not affect the perceived professional importance of English. By contrast, when evaluating the personal relevance of English, students' self-assessed competencies play a more influential role. Finally, time constraints emerge as a major barrier to language improvement, indicating that personal and contextual factors significantly shape students' motivation to enhance their English skills.

For *RQ-S3*, our findings indicate that students with higher self-assessed language competencies are more inclined to support compulsory EMI courses and feel better prepared to undertake content-based subjects taught in English. This suggests that increased language confidence positively influences their readiness for EMI. Regarding *RQ-S4*, our results reveal that EMI's impact on student learning is multifaceted. Students with lower self-assessed skills encounter additional challenges—including heterogeneous language levels and difficulties in participation—while those with higher proficiency recognise improvements in their English abilities. This variability confirms that EMI's effect on content comprehension and language acquisition is not uniform.

More than half of the surveyed engineering students, regardless of their self-assessed language proficiency, expressed strong interest in improving their English skills. With

respect to *RQ-S5*, our survey data indicate that as engineering students approach graduation and the job market, they place increasing value on additional activities and resources aimed at improving their English proficiency. In particular, third- and fourth-year students demonstrate a greater demand for institutional language support, underscoring a heightened need for supplementary language development as students near the end of their studies.

On the lecturers' side, our study reveals that non-native English-speaking faculty remain divided regarding their linguistic confidence. Notably, our findings indicate that lecturers' overall comfort in teaching in English is independent of the number of years they have taught EMI, underscoring that self-assessed linguistic competence is more decisive (*RQ-L1*). Moreover, while many lecturers report that teaching in English requires additional time and effort, statistical analysis shows that this perception does not significantly vary with teaching experience. This suggests that the increased workload and initial transition difficulties are generalised concerns among faculty, addressing *RQ-L2*.

At the University of Cantabria, students are required to demonstrate foreign language proficiency to graduate, and many obtain their accreditation during higher education. However, our findings reveal that mandating students to demonstrate foreign language proficiency for admission to English-taught courses or as a graduation requirement does not necessarily guarantee adequate language skills. Lecturers express serious concerns about students' overall language preparedness, addressing *RQ-L3*. They note that engineering students often enter UC with insufficient English skills and graduate without achieving the required proficiency. Lecturers also highlight the inhomogeneity in classroom language levels and the limited subject-level adaptations to mitigate these challenges, indicating persistent difficulties in both content delivery and student participation. If all members of the academic community—both lecturers and students—acknowledge these issues, why is no concerted effort being made to resolve them?

Regarding *RQ-L4*, our survey data reveal that lecturers with lower self-assessed language skills are particularly supportive of incorporating language-specialist support into course design and delivery. Interdisciplinary collaboration between engineering departments and language instruction units is essential for developing students' linguistic abilities alongside their technical expertise, underscoring the need for a student-centred EMI approach that prioritises students' needs and expectations in order to achieve successful internationalisation in higher education. Such collaboration could take the form of joint syllabus design and occasional co-teaching between engineering faculty and an English-for-Specific-Purposes (ESP) specialist; embedded language coaching, whereby a language instructor observes EMI classes and offers targeted feedback clinics; or co-developed assessment rubrics that balance technical accuracy and communicative clarity.

Finally, in addressing *RQ-L5*, our analysis shows a dual perspective: lecturers with fewer years of EMI teaching experience tend to endorse compulsory instrumental English subjects—reflecting a belief that structured, mandatory language training can help bridge proficiency gaps—while a significant proportion also support expanding EMI offerings on an optional basis. This diversity of opinion highlights the ongoing debate over the most effective manner of integrating EMI into engineering curricula.

Integrating more English-taught content courses across all years of engineering programmes could help improve students' language competencies through continuous exposure. However, simply increasing the number of such courses is insufficient to ensure the development of both linguistic skills and the technical knowledge required in engineering. Most lecturers have received little to no pedagogical training prior to teaching content in English. While the university offers optional courses to prepare lecturers for EMI, it remains unclear whether this level of preparation is sufficient to ensure effective teaching. Our findings suggest an urgent need for specialised training to enhance the pedagogical skills of non-linguistic lecturers teaching in English. This need remains pressing even several years after Fernández-Costales & González-Riaño (2015) underscored the importance of accommodating the diverse needs of faculty transitioning to EMI settings—a concern that appears not to have been fully resolved.

Overall, our study provides an integrative view of EMI challenges in a Spanish engineering context, reaffirming that both students' and lecturers' experiences expose significant gaps in current practice. Based on our findings, we offer several policy and practice recommendations:

- Universities should enhance continuous language support beyond initial accreditation, ensuring that both foundational and advanced language skills are addressed.
- There is a pressing need for specialised training programmes to improve lecturers' pedagogical strategies in EMI settings.
- Greater interdisciplinary collaboration is essential to align content delivery with effective language instruction.

Several factors temper the generalisability of our findings. Although the student sample ($n = 311$) represents roughly 15% of the engineering cohort, it was recruited through voluntary participation and may reflect self-selection bias; surveying a larger, stratified sample would strengthen external validity. The study is also confined to a single institution and the 2022–2024 academic window, so the results may not capture institutional or temporal variation—multi-site, longitudinal designs could test the stability of the patterns reported here. In addition, all measures rely on self-reported perceptions rather than objective proficiency tests or classroom observations; triangulating survey data with performance assessments and qualitative interviews would provide a fuller picture. These limitations point to several productive avenues for future research: systematic evaluations of alternative instructional approaches in EMI, investigations into how comprehensive institutional support shapes faculty development and teaching quality, and comparative studies across diverse contexts to refine and contextualise EMI practices in higher education.

Supplementary Information

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Supplementary Material 1.

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Author contributions
Both authors contributed to the conception and design of the study. The survey was designed by C.O. and disseminated by both C.O. and L.M.P.. The literature review was conducted by L.M.P. Data collection and analysis were carried out by C.O.. The first draft of the manuscript was co-written by C.O. and L.M.P. Both authors have read and approved the final manuscript.

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Data availability
The authors confirm that all data generated or analysed during this study are included in this manuscript.

Declarations

Ethics approval and consent to participate
Approval was obtained from the ethics committee of the University of Cantabria, as the study was conducted in accordance with the University of Cantabria's Code of Good Scientific Research Practice. All participants were informed of the study's aims and provided written consent for the anonymous use of their survey responses in research publications.

Consent for publication
All participants in this study, including both students and lecturers, provided their informed consent to participate. They were informed that their responses to the surveys would be anonymised and used solely for research purposes, including publication in scientific journals. Their participation was voluntary, and they were assured that no identifying information would be disclosed at any stage of the research.

Competing interests
The authors declare no competing interests.

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