Engineering students' perceptions of the role of ESP courses in internationalized universities

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A R T I C L E   I N F O

A B S T R A C T

Recently there has been a trend towards English-medium instruction (EMI) with increasing numbers of programs taught in English (Wächter & Maiworm, 2014). At the same time, there has been a long tradition of ESP courses aiming at preparing students for effective academic and professional communication. In an increasingly internationalized context, it is necessary to reappraise current ESP courses in order to find out the extent to which they are adapted to the ever-changing needs of engineering graduates in a globalized world. Within this context, this study looks at the impact of ESP courses on university students of engineering in two European universities (Spain and Austria). Specifically, our research was based in three campuses: two campuses from *Universitat Politècnica de Catalunya* (Spain), UPC-Vilanova ($n = 52$) and UPC-Barcelona ($n = 26$), and a third campus at *FH Joanneum* University of Applied Sciences (FHJ) in Austria ($n = 17$). This research set out to track participants' perceptions of how ESP courses prepared them for academic communication in general and EMI in particular ($N = 95$). Data stem mainly from surveys administered both at the start and at the end of an ESP course. Students were asked about their perceived initial level of proficiency, their expectations, and their learning objectives (first survey, T1) as well as their perceived development in the different skills, the degree of fulfilment of their initial learning objectives, and their evaluation of the ESP course as preparation for international academic and professional communication (second survey, T2). These data were complemented with qualitative diary entries from students ($n = 7$) who reflected on their learning at different stages of their ESP course. Results point to overall satisfaction with ESP courses and greater awareness of the nature of specialized communication and yield deeper insights into students' strategies and areas where ESP can contribute to better student preparation and empowerment.

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1. Introduction

English for specific purposes (ESP) lecturers are facing new demands in the light of increased globalization, in a context characterized by a constant growth of English-medium instruction (EMI) in higher education (Fenton-Smith, Humphreys, & Walkinshaw, 2017; Wächter & Maiworm, 2014). This growing trend towards EMI may place ESP courses at risk. As EMI courses can be perceived as spaces in which to practice and develop disciplinary communication, they may occupy the position of ESP courses (see Arnó-Macià & Mancho-Barés, 2015; Aguilar, 2017), which points to the "fragility" of ESP:

> [...] we do know that a significant part of ESP's fragility is that almost every time there is a change in the senior administration, there will be an increase in ignorance about what it is that we do and why it is important. Educating administrators is an ongoing and exacting task. (Swales, Barks, Ostermann, & Simpson, 2001, p. 455)

Just learning through English as in EMI settings, however, may not sufficiently cater for students' needs to acquire academic skills and subject disciplinary language. It is in the context of universities with a strong ESP tradition and with the recent emergence of EMI that this study is set. More specifically, it investigates how engineering students perceive ESP courses as preparation for academic and professional communication. Thus, in this changing context in which EMI can be seen to be gaining ground in front of ESP, it is necessary to find out how ESP courses can be made even more valuable to students, and reappraise them so that they are more closely aligned with learners' perceived needs and specialized communication practices.

1.1. Literature review

In an increasingly internationalized environment, there are growing demands for graduates to be able to communicate skillfully in English in academic and professional settings. A combination of two definitions of EMI may help set the context for this study. The first one is a broad definition offered by Dearden (2014, p. 4): "the use of the English language to teach academic subjects in countries or jurisdictions where the first language (L1) of the majority of the population is not English". The second, more specific, definition is that offered by Airey (2016), which contrasts EMI with CLIL and EAP, as EMI simply involves the teaching of content through English, as opposed to EAP courses that involve a focus on language. Indeed, Dearden (2014) also relates the growth of EMI to a move away from the teaching of English as a foreign language. Similarly, ESP researchers have noted the rise of EMI as it co-exists with or replaces ESP courses (Fortanet-Gómez & Räisänen, 2008; González Ardeo, 2013; Woźniak, 2017; Yang, 2016), which makes it necessary to investigate the current state of ESP teaching and learning in such contexts. As EMI is often seen as a way of familiarizing students with discipline-specific discourse, which used to be the traditional purpose of ESP courses, there are tendencies to regard ESP courses as remedial language support, and thus dispensable (e.g., Arnó-Macià & Mancho-Barés, 2015). Furthermore, the changing higher education landscape may also entail a re-orientation of EMI teaching faculty and ESP specialists (Dearden, 2018).

A core element in the definition of ESP is needs analysis, as ESP teaching is based on learner needs (Dudley-Evans & St John, 1998; Hutchinson & Waters, 1987; Offord-Gray & Aldred, 1998). Part of a needs analysis is probing students' perceptions of a course — present-situation analysis, or PSA (Brown, 2016; Flowerdew, 2010) — that may allow teachers to draw inferences about potential target needs, which in turn would be the objective of a target situation analysis (TSA).

Students' beliefs and perceptions of ESP in higher education form an indispensable part of course and program evaluation (Kazar & Mede, 2015; Lu, 2018; Trinder, 2013; Wang, 2017). Program evaluation, as Tsou and Chen (2014) note, "measures whether the goals of an ESP program have been met and ensures the program's continuous improvement" (p. 39). Investigations of course effectiveness are gaining ground in ESP and aim at evidence-based decision making in program design (Wette & Hawken, 2016). Investigations into students' individual learning goals can inform ESP teachers and course developers (Berwick, 1989; Poedjiastutie & Oliver, 2017), albeit these investigations will depend on students' awareness of (and ability to articulate) their subjective lacks and wants (Hutchinson & Waters, 1987). In semi-structured interviews about an ESP course for Turkish cabin crew members, for instance, all respondents "explicitly stated that they would like to be fluent and accurate while talking to the passengers" (Mede, Koparan, & Atay, 2018, p. 166). Apart from its value for ESP course design, this statement is interesting, as in spoken interaction some teachers may attach greater importance to fluency than accuracy, although their students may want to improve in both areas. In such a case, student voices can inform teachers about objectives that would have remained unnoticed without giving students the opportunity to contribute to needs analysis.

However, rather than a monolithic whole, needs analysis is "a complex, multiple, and conflicting concept" (Liu, Chang, Yang, & Sun, 2011, p. 277). Conflicting views may occur at several levels. Liu et al. (2011) argued that students could be aware of perceived needs and yet desire to do other tasks not aligned with these needs in a course. On a different note, Bacha and Bahous (2008) found that business students regarded their writing skills as more satisfactory than faculty did, meaning that students felt rather proficient in writing, whereas faculty perceived student writing levels as much lower, which points to conflicting views among different stakeholders. Nevertheless, just because divergent viewpoints may emerge from needs analysis, these cannot be ignored and student voices must be heard.

The intricacies of needs analysis are often aggravated by constraints related to "inadequate time, money or access to insiders" or "inadequate expertise [...] of the needs analysts themselves" (Serafini, Lake, & Long, 2015, p. 24). Another source of complexity emerges when students are dissatisfied with tertiary ESP courses, which points to the importance of PSA. Akbari (2016), for instance, detected that current practices in a health sciences program were "not consistent with the perceived

needs of students" (p. 32). Similarly, Liu et al. (2011) survey of 972 non-English major EFL students in Taiwan revealed an "inconsistency between their perceptions of needs and their actual course-taking action" (p. 277), implying that students had given preference to language skills development in accordance with their academic and professional goals rather than their desired personal wants. Such findings suggest that course reviews by means of PSA and ongoing needs analyses can help improve ESP course and program designs (cf. Yogman & Kaylani, 1996) to ensure students' satisfaction.

Needs analysis should also be adapted to EMI contexts (Ellison, Aráujo, Correia, & Vieira, 2017), both to describe the language skills that EMI students need and to redefine ESP courses to increase their relevance to the disciplines (Jendrych, 2013), so that they lay the linguistic foundations for complementing and supporting EMI courses. Hence, the first step is to inquire into students' beliefs about the impact of ESP courses as preparation for EMI (Green, 2015). Some existing research into EMI does include student voices (e.g., Bradford & Brown, 2018; Clark, 2017; Tatzl, 2011), or calls for a deeper involvement of participants (Nikula, Dafouz, Moore, & Smit, 2016), thus acknowledging the value of students' contributions to needs analysis in globalized educational settings.

There are indications in the literature that ESP courses may facilitate student learning in EMI. For example, Terraschke and Wahid (2011) found that a pre-sessional EAP course for international students in Australia had improved study skills in reading and writing for their degree program. Similarly, Green (2015) reported significant transfer of writing skills from EAP to content courses in Thailand. Beyond writing, integrated-skills courses also appear important to develop professional communication among engineering students, for whom the "ability to write and speak clearly about design and research is critical" (Poe, Lerner, & Craig, 2010, p. 147). In another study addressing the question of which linguistic subskills to teach in preparation for EMI (Clark, 2017), 41% of the respondents rated all language skills as very important.

1.2. Context of this study

This study focuses on engineering students from different universities, with varied profiles, and enrolled in a variety of ESP courses. This diversification of contexts, backgrounds, and course designs was an attempt at complying with Serafini, Lake, and Long's (2015) call for a triangulation of methods and sources and an increase in the "quantity and quality of available resources" (p. 24) when conducting needs analyses. A total of five ESP courses were included in this study so as to capture a diverse picture of the ESP landscape in Europe. Three university contexts, where the authors currently work, were analyzed for this study. In each of the first two campuses (belonging to UPC), two ESP courses were offered simultaneously during the autumn semester of 2015, when data collection took place, while in the third campus (belonging to FHJ), one ESP course was offered. The different course arrangements and differing numbers of students in the three campuses reflected each of the ESP realities at that time.

1.3. Aims of the study

This study aims at providing a present-situation analysis of classroom learning and university students' voices on ESP, with special emphasis on how ESP courses can be made relevant to current academic and professional communication needs, thus re-situating ESP courses in a curricular environment where EMI is gaining prominence. Accordingly, the following research questions were posed:

1. What are students' profiles and expectations of their ESP courses?
2. In which academic and professional scenarios outside their ESP courses do students use English? And what actions do they take (if any) to improve their English?
3. How do students assess their ESP courses in terms of contents, objectives, and perceived learning gains?
4. To what extent do students perceive that ESP courses prepare them for academic and professional communication, especially in a context dominated by EMI in an internationalized higher education setting? How confident do they feel to operate in such scenarios?

2. Methods

2.1. Data collection: Courses and participants

Data for this study come from engineering students in five ESP classes ($N = 95$) from two European universities (Spain and Austria): Technical University of Catalonia, *Universitat Politècnica de Catalunya* (UPC), Spain ($n = 78$) and *FH Joanneum* University of Applied Sciences (FHJ), Austria ($n = 17$), and were collected in the autumn of 2015 (September–December). For the purposes of this study, we will refer to the three settings as UPC-1, UPC-2 and FHJ-3. At UPC-1, the classes analyzed were Technical Writing and Oral Communication Skills, two elective courses of 6 credits in the European Credit Transfer System (ECTS) and 4 weekly contact hours each. UPC-1 students were taking one (or both) of the two elective courses offered during the autumn term of 2015. The technical writing course had 49 students enrolled, in one section, and the technical speaking course had 78 students enrolled, in two sections. The technical writing course followed a process-genre approach, using Bombardó, Aguilar, and Barahona (2008) as the course textbook. Thus, the course syllabus was organized according to the

stages in the writing process, with an introductory module contextualizing technical writing and its main features, and a concluding module presenting the genre features of common professional and academic texts, such as the résumé, email writing, and reports. Apart from regular classes combining theory and practice, the course included fortnightly practical sessions in which smaller groups reviewed and offered comments on each other's texts. In addition, the main course project, a piece of professional writing, was developed in the context of telecollaboration, which involved the development of a procedural text (together with a US partner), in which engineering students took on the role of subject-matter experts (see Maylath, King, & Arnó, 2013). The speaking skills course followed mainly a situational-functional approach, based on situations commonly encountered in academic and professional settings, featuring modules on campus communication, academic listening, reporting research, professional communication (telephoning, meetings, negotiations, etc.), oral presentations, and job interviews.

At UPC-2, the classes analyzed were two elective courses, one on technical English (3 ECTS, combining writing and speech) and another on written communication (4.5 ECTS), which are offered in the second and fourth year of the Bachelor's level respectively. Students at UPC-2 were taking one of the two elective courses over a 13-week period and the courses initiated undergraduate students into academic literacy in different ways. One was a task-based course, worth 3 ECTS (2 weekly contact hours), and aimed at initiating undergraduate second-year students into technical discourse. This introductory course emphasized (in)formal style and (im)personal tone depending on the communicative situation (i.e., audience and purpose). The rest of the course revolved around technical product and process description and required students to develop their ability to convey the technical specifications of a product in writing. The other course, worth 4.5 ECTS (3 contact hours per week) was on written communication and, sharing the same core objectives as the writing course at UPC-1, was addressed to final-year bachelor's students who wanted to write their thesis in English (Glasman-Deal, 2010; Swales & Feak, 1994) and improve their academic and professional writing skills.

At FHJ-3, data came from the compulsory course on professional communication and presentation skills (2 ECTS), focusing on formal oral presentations (Tatzl, 2017). FHJ-3 students were from the field of aeronautical engineering, whereas UPC students came from a variety of engineering degrees. The FHJ-3 policy on the language of instruction is German for the bachelor's program and English for the master's program. The ESP course investigated is part of this three-year bachelor's program, the last course in a series developing students' specialist language skills for their ensuing postgraduate EMI education. A further ESP course is taken by learners in their second semester of the master's EMI program. The bachelor's ESP course under scrutiny was designed to teach the professional preparation and delivery of content-area presentations. For this purpose, students are asked to give a series of talks in class, which both offers them the opportunity to practice formal public speaking and exposes them to a variety of thematic areas presented by their colleagues.

This variety of contexts, ESP courses, and participants in the study provides findings that offer the potential to be generalizable across university ESP settings.

2.2. Data collection: Survey data

Data were mainly collected through surveys on students' perceptions of ESP courses and how ESP courses prepare them for academic and professional communication, taking into account the growth and promotion of EMI programs in the three increasingly internationalized institutions, a general trend in Europe (Wächter & Maiworm, 2015). In UPC-1 and UPC-2 (Spain), EMI is espoused as a preferred internationalization strategy to promote the use of English within the disciplines, often at the expense of ESP (Arnó-Macià & Mancho-Barés, 2015). EMI courses are being promoted by institutional policies although their presence is still scarce in bachelor's degrees in the general context in which UPC-1 and UPC-2 are set, probably due to general low proficiency levels among students and instructors (Mancho-Barés & Arnó-Macià, 2017; Arnó-Macià & Aguilar-Pérez, 2018). Specifically in UPC-1, the offer of EMI involves a one-semester capstone project (with accompanying short courses), which is mainly open to incoming international students (and a few domestic students) as well as three EMI courses (in electronics, materials science, and computing, respectively). As to UPC-2, six EMI courses are offered in the final semester of the bachelor's degree, 'competing with' ESP courses, which are also offered in the same semester. EMI presence is more prominent at the master's level, however, with three fully English-taught master's programs and two programs offering some EMI courses; only one master's program includes an optional ESP course on business English. In both UPC-1 and UPC-2 (two campuses from the same university), ESP courses (as opposed to EMI) are not backed by explicit institutional policies and 'survive' in areas where they have traditionally been present, such as engineering (Arnó-Macià & Aguilar-Pérez, 2018). Thus, ESP teaching is never mandatory, and its existence can be attributed to long-serving teachers.

At FHJ-3 (Austria), selected EMI courses feature at bachelor's level in some degree programs, but most EMI courses are associated with several fully English-taught master's programs. Whether or not a master's program is offered as an EMI program is primarily a faculty decision at the corresponding institute, yet the introduction of new EMI programs takes time, as they need to be approved by a national accreditation agency like other degree programs. Master's programs may or may not include mandatory ESP courses, which again is a curriculum decision taken by the teaching faculty at the respective institute. Since all courses in a degree program form part of a curriculum designed by the teaching faculty, they are backed by the institute in question, examined and confirmed by the university's teaching and research council, and then forwarded to the national accreditation agency for approval. Major curricular changes can only be made after having undergone this thorough and time-consuming procedure. In general, universities of applied sciences in Austria integrate ESP courses into bachelor's programs. As undergraduates, the study participants at FHJ-3 (Austria) had had no previous EMI experience because their

bachelor's program did not include any EMI courses. Table 1 provides an overview of ESP and EMI courses in the faculties of engineering at the three research settings.

In order to analyze students' needs, expectations, and outcomes in relation to ESP courses, two surveys were administered, one at the start of the term (pre-course survey, T1) and one at the end (post-course survey, T2). In T1, students assessed their self-perceived level of English (both general and common core academic/professional English) and stated their course expectations. In T2, they had to assess their achievement, in terms of fulfilment of expected learning objectives and of overall learning outcomes. Students also evaluated their courses and provided information regarding their extracurricular practices in professional and specialized communication, also specifying the extent to which they considered the ESP course to have prepared them to cope with EMI.

Most of the questions were closed and quantified. Some open questions required short answers, which were analyzed to derive keywords and then grouped into thematic categories. These keywords were refined as the analysis progressed, through a recursive inductive-deductive process. The final categories obtained were then listed, and the responses assigned to each quantified. Only the data for those students who had completed both surveys (T1 and T2) were analyzed and reported here: UPC-1 ($n = 52$), UPC-2 ($n = 26$), FHJ-3 ($n = 17$), 95 in total.

Given that information about stakeholders' feelings and attitudes, needs and interests are key (Brown, 2016), a mixed-methods methodology was adopted, so that the quantitative survey was complemented with qualitative information from learner diaries, in which students reflected on their progress and learning strategies.

The pre-course survey (T1)[1] included a demographics part on students' language background and intercultural experience, followed by general questions on course and personal language learning expectations. The post-course survey (T2) asked students about their use of academic/professional English during the term, as well as to reflect on their own learning as a result of the ESP course and, especially, on the application of the communication skills developed in academic and professional situations (with a focus on EMI). The specific survey questions analyzed are included in the appendix.

2.3. Data collection: Learning diaries

Quantitative data from the survey were complemented by qualitative data from students' reflections by means of learning diaries, an instrument that has a long tradition in language learning studies for capturing learners' processes and views that do not normally come to the surface (Allwright & Bailey, 1991; Pavlenko, 2007). A mixed-methods approach was considered appropriate to expand on the larger sample of quantitative data and to "extend the breadth and depth of inquiry" (Riazi & Candlin, 2014, p. 145).

A total of seven students volunteered to submit their diaries (two at UPC-1, two at UPC-2, and three at FHJ-3), accounting for 7.3% of all the participants. At UPC, the diaries consisted of three entries (at the start, middle, and end of the semester). Some broad guidelines were given at the start of the term, to prompt students to reflect on progress, strategies, and use of learning aids, while encouraging free expression. With diaries from students taking all five courses, we expected to gather a broad perspective on students' learning, offering insights into the views, strategies and perceived progress during the ESP courses. At FHJ-3, different guidelines were given. Rather than asking for three entries during the term, the lecturer collected one reflection sheet at the end, to encourage reflection on oral presentation strategies. During the analysis, data were assigned to different categories through a recursive induction-deduction process, whereby key terms were identified and assigned to the general categories of *Goals & Objectives*, *Strategies Used*, *Progress*, and *Difficulties & Future Prospects*. Despite the different format of the UPC-1/-2 and FHJ-3 diaries, most of the categories identified were common to the three settings.

Table 1
Provision of ESP and EMI courses across the three settings (2018/19), *estimated.

University setting	ESP courses offered	EMI courses offered
Universitat Politècnica de Catalunya (UPC-1), Spain	Bachelor's: 5	Bachelor's: 1 one-semester capstone program + 3 courses
	Master's: 0	Master's: 30 credits (strand of a joint degree)
Universitat Politècnica de Catalunya (UPC-2), Spain	Bachelor's: 3	Bachelor's: 1 full EMI program + 10 courses
	Master's: 2	Master's: 6 full EMI programs + 9* courses
FH Joanneum University of Applied Sciences (FHJ-3), Austria	Bachelor's: 16*	Bachelor's: 0
	Master's: 10*	Master's: 4 full EMI programs + 12* courses

Note: FHJ-3 data refer to courses offered in the Department of Engineering, as participants in the study were engineering students from the Institute of Aviation, affiliated with the Department of Engineering.

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[1] The language background in the demographics was based on students' self-perceived skills, and was accompanied by the Common European Framework of Reference for Languages (CEFR) grid with the descriptors for each skill and level (Council of Europe, 2001). The European CEFR levels (A2: elementary (iBT TOEFL: n/a); B1: lower intermediate (iBT TOEFL: 42); B2: upper intermediate, independent user (iBT TOEFL: 72); C1: advanced user and above (iBT TOEFL: 95).

3. Results

3.1. Demographic information about students

According to the demographics (Table 2), UPC-1 students' age was mostly in the range of 20–24, all were domestic students, most of them had no knowledge of other foreign languages apart from English, and all reported little foreign language or intercultural experience. The most common activity related to the use of English was attending language schools, but also using English for work ($n = 4$), participating in stays abroad (from 2 weeks to 3 months, $n = 7$), and other activities involving international contact ($n = 6$).

UPC-2 students were 21.4 years old on average, mostly domestic students (only 23% were foreign), and approximately half of them spoke another foreign language (mostly French). Around 80% reported linguistic or intercultural experiences (from 2 weeks to 1 year, usually in the UK or the USA).

FHJ-3 students were 22.1 years old on average (age range of 20–26). All were male, most of them of Austrian nationality, and all but one of them German native speakers. They had formally studied English for 7–17 years. Approximately half of them spoke another foreign language. Around 80% of the students reported one or several linguistic or intercultural experiences ranging from stays of one week to six months, in different countries.

3.2. Self-perceived level at start of term

One of the aims of T1 was to identify students' perceived language proficiency level at the start of the term. Students were asked to self-assess their level in each of the skills according to the Common European Framework of Reference for Languages (CEFR), on a scale from basic (A1–A2) to independent (B1–B2) and advanced user (C1–C2). Those ratings yielded the averages in Table 3.

The average level among UPC-1 students was A2–B1 (elementary to intermediate). Only two students possessed official certifications (the Cambridge First Certificate of English or FCE, B2, upper intermediate level), while a few of them held a B1 certificate. UPC-2 students reported an average level of B2: 13 of them had the FCE (B2), four had the Cambridge Certificate of Advanced English (C1), one had a B1 certificate, and two of them (French students), the Test of English for International Communication (TOEIC), awarded by Educational Testing Service (ETS). At FHJ-3, students indicated an average level of B2–C1, and none reported to have an official certificate of English.

A breakdown of students' levels (Table 4) shows that the results are quite evenly distributed across skills for each setting. More specifically, we can see that for UPC-1, the strongest skills are reading and writing, at level B1, and the weakest skill would be spoken production (A2). UPC-2 also shows a homogeneous distribution, at B2 level. Most FHJ-3 students reported a level of B2 or C1 for all skills, with some students reporting a C2 level in listening and reading. In contrast, a few students indicated a B1 level for the productive skills.

Table 2
Summary of demographics.

	UPC-1	UPC-2	FHJ-3
Age range	20–24 years* (12 students in the range 25-37)	19–25 years	20–26 years
Foreign language(s)	5 (French/German)	Approx. 50% speak 2 foreign languages	Approx. 50% speak 2 foreign languages
Intercultural experience	25% with short stays abroad	80% with short stays in UK or USA	80% with short stays abroad

Table 3
Students' self-assessed English language level according to CEFR.[2]

Self-perceived CEFR levels	UPC-1 (n = 52)	UPC-2 (n = 26)	FHJ-3 (n = 17)
A1	3.85% (2)		
A1–A2	3.85% (2)		
A1–B1	7.69% (4)		
A2	1.92% (1)		
A2–B1	**40.38% (21)**	11.54% (3)	
A2–B2	1.92% (1)		
B1	15.38% (8)	7.69% (2)	
B1–B2	11.54% (6)	19.23% (5)	17.65% (3)
B1–C1	1.92% (1)		11.76% (2)
B2	1.92% (1)	**26.92%** (7)	
B2–C1	5.77% (3)	7.69% (2)	**41.18%** (7)
B2–C2	1.92% (1)	3.85% (1)	11.76% (2)
C1		**23.08%** (6)	
C1–C2			17.65% (3)
C2	1.92% (1)		

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[2] Explanations of CEFR levels and equivalent TOEFL iBT scores are provided here: A1, beginner; A2, elementary (no TOEFL equivalent); B1, lower intermediate (TOEFL 42); B2, upper intermediate (TOEFL 72); C1, advanced; C2, proficient user (TOEFL 95). The comparison of CEFR and TOEFL scores was obtained from https://www.ets.org/toefl/institutions/scores/compare.

Table 4
Breakdown of students' English language level into skills.

UPC-1*	Listening	Reading	Spoken interaction	Spoken production	Writing
A1	3.7% (2)	3.7% (2)	14.8% (8)	11.3% (6)	9.4% (5)
A2	32% (17)	9.2% (5)	**37% (20)**	**43.3% (23)**	16.9% (9)
B1	**47.1% (25)**	**61.1% (33)**	**37% (20)**	28.3% (15)	**54.7% (29)**
B2	7.5% (4)	16.6% (9)	9.2% (5)	13.2% (7)	16.9% (9)
C1	7.5% (4)	7.4% (4)	0% (0)	1.8% (1)	0% (0)
C2	1.8% (1)	1.8% (1)	1.8% (1)	1.8% (1)	1.8% (1)
UPC-2	**Listening**	**Reading**	**Spoken interaction**	**Spoken production**	**Writing**
A1	0	0	0	0	0
A2	0	0	15.3% (4)	11.5% (3)	11.5% (3)
B1	26.9% (7)	19.2% (5)	19.2% (5)	**30.7% (8)**	30.7% (8)
B2	**38.4% (10)**	**50% (13)**	**38.4% (10)**	30.7% (8)	**38.4% (10)**
C1	30.7% (8)	26.9% (7)	26.9% (7)	26.9% (7)	19.2% (5)
C2	3.8% (1)	3.8% (1)	0	0	0
FHJ-3	**Listening**	**Reading**	**Spoken interaction**	**Spoken production**	**Writing**
A1	0	0	0	0	0
A2	0	0	0	0	0
B1	0	0	11.7% (2)	23.5 (4)	5.8% (1)
B2	**41.1% (7)**	**47% (8)**	**52.9% (9)**	**41.1% (7)**	**47% (8)**
C1	**35,2% (6)**	**35.2% (6)**	**35.2% (6)**	**35.2% (6)**	**41.1% (7)**
C2	23.5% (4)	17.6% (3)	0	0	5.8% (1)

*A few students selected more than one level for some of the skills, which is why some columns total 53 or 54.

3.3. Expectations and personal learning objectives

In order to answer RQ1, we analyzed two items in the questionnaire, ESP course expectations (question 1.1) and learning objectives (question 1.2). As open-ended questions, they were analyzed in terms of contents and grouped according to keywords, which constituted the categories that emerged from data analysis. Each response was assigned to only one category, even when more than one idea was expressed in the same sentence (e.g., "I will improve my English level and practice my speaking"). In such cases, the option chosen was to assign that item to the more specific category — this response was categorized as speaking, for example — thus yielding a more detailed overview of students' expectations. Each of the categories is illustrated by sample answers (Table 5).

UPC-1 students expect to improve their overall level of English, although they show certain awareness of the distinction between ESP and general English, as revealed by their references to professional and academic communication. An overview of the different categories shows that students' expectations — i.e., their views on the ESP courses — relate to communication rather than knowledge of language as a system (i.e., grammar, vocabulary, etc.). They expect ESP courses to help them improve their confidence and fluency, as well as their expression and understanding, which points to students' view of language as a tool for communication, an indicator of instrumental motivation. Some students also referred to complying with the foreign language requirement in Spanish universities (students have to provide evidence of foreign language competence either by providing an official certificate or completing English-taught courses), hence the references to the requisite for graduation. Speaking features most prominently as the skill to develop (it should be remembered that one of the ESP courses focuses on speaking skills), especially fluency. The wording of "spoken interaction" is also noteworthy, as students — probably influenced by the CEFR self-assessment grid — make a distinction between speaking and spoken interaction.

Students from UPC-2, with an average B2 level, also want to improve their English with emphasis on professional communication skills, thus showing awareness of the technical and formal register as differentiated from general purpose English. The course seems to have raised awareness of their need, as future engineers, to go beyond their general English knowledge and gain higher, fine-tuned competence about the technical register. For this reason, they show interest in learning specific and technical vocabulary, as well as in writing technical reports accurately in the appropriate register. These students expect to enrich and deepen their academic and discipline-specific vocabulary, and they assign less importance to speaking/communication skills or obtaining credits, in comparison with students at UPC-1, either because they were enrolled in a technical writing course or because they do not perceive communication and speaking skills to constitute as important a challenge as technical writing for them. In a word, these students also seem to be driven by instrumental motivation and have relatively high expectations of the ESP course as a pathway to learning scientific and technical English.

FHJ-3 students also expect improvement in specialized communication, while three of the students further anticipated linguistic development in more general terms (including an element of fun). Their learning objectives center on the improvement of spoken interaction skills in a specialized context. In particular, the course focus on formal presentations seems to have influenced the formulation of learners' objectives. In other words, these students are determined to improve their subject-specific presentation skills and practice speaking. As students will embark on their professional internships in the semester after this course, their expectations and objectives express a real need to prepare for industry demands, which include oral talks in internationalized settings. Two students further mentioned the objective of expanding their vocabulary,

Table 5
Students' expectations and learning objectives.

	UPC-1		UPC-2		FHJ-3	
	Expect.	Objectives	Expect.	Objectives	Expect.	Objectives
Learning English (in general)	**15 (28.8%)**	**10 (19.2%)**	5 (19.2%)	4 (11.7%)	3 (18.7%)	0
"I want to improve my English"						
"I want to learn English and improve my level"						
Specialized communication (academic/technical/professional)	**9 (17.3%)**	**10 (19.2%)**	5 (19.2%)	**12 (35.2%)**	**9 (56.2%)**	**4 (30.7%)**
"Write technical English for professional purposes"						
"Learn how to speak properly in engineering language"						
Communication/expression/understanding	8 (15.3%)	7 (13.4%)	0	**9 (26.4%)**	0	1 (7.6%)
"Learn to express myself better than now"						
"express my ideas without spending as much time and effort"						
Speaking skills	7 (13.4%)	**19 (36.5%)**	3 (11.5%)	4 (11.7%)	2 (12.5%)	**5 (38.4%)**
"Improve all my English skills, especially oral communication"						
"Improve my spoken interaction"						
Confidence and fluency	5 (9.6%)	*	0	*	1 (6.2%)	*
"I will practice and learn English with more fluency and confidence"						
"fluency through presentations and discussions"						
Getting credits/requisite for graduation	4 (7.6%)	2 (3.8%)	1 (3.8%)	1 (2.9%)	0	0
"improve my English level and get the credits to finish my degree"						
"reach necessary level for graduation"						
Writing skills	2 (3.8%)	1 (1.9%)	**6 (23%)**	1 (2.9%)	1 (6.2%)	1 (7.6%)
"writing in English"						
"Improve writing"						
Vocabulary	2 (3.8%)	3 (5.7%)	**6 (23%)**	3 (8.8%)	0	2 (15.3%)
"improve range of vocabulary in technical areas"						
"Using phrases and words correctly"						
Total	52 (100%)	52 (100%)	26 (100%)	34 (100%)	16 (100%)	13 (100%)

* Subsumed under other categories.

which points to the importance of lexis in ESP, as students need to master technical vocabulary as part of their disciplinary literacy (e.g., coping with specialized concepts and new advances in industry).

Survey data on students' initial goals and objectives largely coincided with those views expressed in the learning diaries, ranging from broad goals (improving English) to particular skills or areas (e.g., grammar, vocabulary). These goals were developed in further entries as the course progressed. For example, one of the UPC-1 students identified both general goals ("to improve my English level") and specific ones, detailing the areas of vocabulary, grammar and listening. Looking at the student's general objectives, he seems to be aware of the notion of register ("learn new abilities that allow me [to] communicate properly in different situations"). In his second entry, he narrowed down his learning objectives to oral skills, to improve his vocabulary and spoken fluency. Except for one student's mention of technical communication, the goals expressed focus more on general than specific-purpose English.

Overall, in all three sites — and considering that students' expectations are largely shaped by the focus of the ESP courses — it can be seen that students' expectations and objectives cover a variety of areas. Less proficient students from UPC-1 seem to focus more on general purpose communication, whereas intermediate to advanced students from UPC-2 and FHJ-3 expect and aim at specificity — without neglecting general language improvement. Students demonstrate an awareness of the specificity of ESP as well as expressing their aim to gain confidence and fluency in (specialized) communication. In either case, the fact that the objective of enhancing the ability for specialized communication appears as one of the main objectives across the three settings is an indicator that students' expectations and goals are in line with current views of ESP oriented towards specificity and the development of students' disciplinary communicative practices (Hyland, 2012), as well as with claims arguing that EAP should be grounded in discipline-specific discourses (Swales, 2019).

3.4. Using and learning English outside the ESP class

In relation to RQ2, i.e., gathering data on students' experience in using and learning English for academic and professional purposes, the questions analyzed were numbers 2 and 3 from the post-course survey (T2). Students were asked about those situations in their academic or professional lives in which they had used English (question 2), as well as those actions undertaken to improve their technical/academic English (question 3). As similar responses were obtained for both questions, the results were combined, thus yielding the overall summary presented in Figure 1. The answers were classified into different areas according to how students reported using/learning English. If several areas were mentioned in a single response (e.g., watching TV and writing emails at work), then that response was broken down into two different items and assigned to two areas, namely exposure to English/leisure and job-related, respectively.
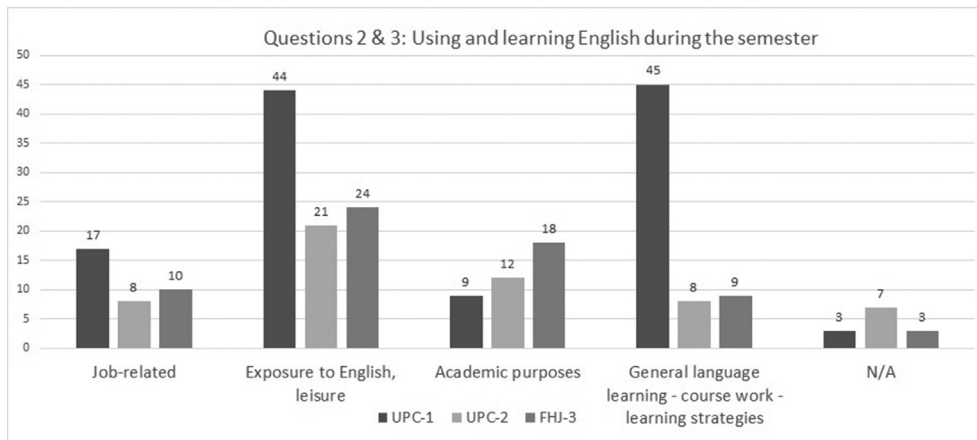
Figure 1. Summary of students' use and learning of English during the term.

As can be seen in Figure 1, the most common category for all settings appears to be exposure to English and leisure activities, such as watching TV/movies, holidays or surfing the Internet. While the survey specifically elicited responses concerning academic or professional English, students mentioned all uses of the language. Thus, together with exposure to English, for students in UPC-1 the most common category is also "general language learning – course work – learning strategies". This category includes mentions related to course work (e.g., homework), using media for purposes that go beyond mere exposure (e.g., TED talk videos for "technical stuff", or doing language exercises on the Internet), and interacting with other speakers for language learning purposes ("when I meet with a friend to discuss about a topic"). Other items assigned to this category include extracurricular courses – quite common among UPC-1 students, who are the most concerned about improving their English language level – as well as work related to the class ("I've done several exercises from the different modules of the subject"). The second-most frequent category for students in UPC-2 and FHJ-3 is academic English, which includes participation in or preparation for EMI courses or other courses that require academic English, and preparation for the bachelor's thesis:

"reading scientific papers and writing reports for some assignments" (UPC-2)

"Bachelor's thesis: vocabulary regarding laws and regulations" (FHJ-3)

These survey data were complemented with diary data, in which students identified those actions that help them achieve their learning goals, and that were categorized as strategies and activities (Table 6), which included both learner-initiated actions — i.e., strategies (Griffiths & Oxford, 2014) — and course activities perceived to be conducive to learning. Thus, the former include listing vocabulary (an often-repeated strategy) or writing down ideas for a presentation, while class activities include listening to business meetings or speaking with classmates.

As shown in Table 6, the strategies reported by students in their diaries vary depending on the orientation of the course(s) taught (e.g., in FHJ-3, all strategies are related to preparing and delivering oral presentations) and also on students' level of proficiency. Thus, students in UPC-1 report on general activities aimed at improving their English, while UPC-2 and FHJ-3 students also report more sophisticated strategies to deal with the nuances of formal/specialized writing and oral presentations.

This information is crucial for ESP lecturers, firstly, because knowing what students do in parallel to ESP courses can offer a wider perspective on students' needs and practices. Secondly, a detailed analysis of different students' academic needs and practices (e.g., assignments, types of texts, and language required in the EMI courses they follow) would allow ESP instructors to make their courses more relevant to students' present-situation needs, drawing interrelations between ESP and EMI courses and incorporating tasks and approaches, so that students can feel better prepared for EMI after having followed an ESP course. In other words, ESP teachers may be better informed about EMI requirements through learners' responses and thus align ESP courses with content-curricular considerations.

Finally, another important area of English language use/learning is in job-related activities, with students reporting on job interviews, internships or other professional activities (sending emails, participating in discussions, contacting foreign partners or doing professional presentations). As with the information gathered from academic needs, these data can feed into future ESP courses, and it is especially relevant in those cases, like UPC-1, in which ESP courses are offered in the final year of the degree, when many students combine work and studies.

Overall, these results show that exposure to general English outside the classroom is frequent, in particular for less proficient students. However, the use of English for academic purposes other than in the language class is especially noteworthy in UPC-2 and FHJ-3 and can be expected to grow with the trend towards EMI. These findings can help ESP lecturers and course designers in two ways: as an insight into students' practices and needs according to their proficiency level, and as an indication of the importance of making students aware of the need to learn specialized communication.

Table 6

Strategies and course activities reported by students.

UPC-1	UPC-2	FHJ-3

• **Language learning**
  – annotated lists of vocabulary
  – grammar books
  – exam preparation
• **Listening and speaking**
  – watching films
  – listening to TED talks
  – using *Linguee* to improve pronunciation
  – listening to business meetings
  – speaking with classmates
• **Practicing language functions**
  – doing presentations
  – giving advice
  – describing
	• **Formal writing**
	  – paying attention to organization of texts
	  – using thesauri
	  – writing/reading technical and formal reports
	• **Speaking**
	  – watching TV
	  – speaking accurately
	• **Reading**
	  – reading scientific texts
	• **Language learning**
	  – remembering and imitating language
	  – annotated lists of words
	• **Personal study skills**
	  – time management
		• **Preparing a presentation**
		  – writing down ideas
		  – "going through" [i.e., rehearsing] presentation
		  – preparing and memorizing
		  – time management
		  – referencing
		• **Vocabulary**
		  – finding synonyms
		• **Delivery of a presentation**
		  – speech delivery and pace
		  – welcome and conclusion phrase
		  – not reading
		• **Multimodality**
		  – interpreting graphs
		  – volume

3.5. Objectives attained

Also in the post-course survey (T2), students reflected on the learning objectives accomplished during the ESP course (question 4), rating them on a 1–5 scale (question 4.1). These data are connected to RQ3, in particular to perceived learning gains.

The learning objectives attained by students in the three settings are summarized in Table 7, both in terms of total number of objectives and average number of objectives per student. The table also includes the average level of attainment as a result of the ESP course(s). According to these figures, students highlight an average of two objectives, which they rate over 3 (above the middle point) in terms of achievement (higher at FHJ-3 and UPC-2 than at UPC-1).

Table 7

Summary of learning objectives attained.

	UPC-1 ($n = 52$)	UPC-2 ($n = 26$)	FHJ-3 ($n = 17$)
Total n of learning objectives reportedly accomplished	123	53	36
Average n of objectives per student	2.37	2.04	2.12
Rate of achievement (1–5) Mean (SD)	3.37 (1.41)	3.64 (1.03)	3.86 (0.71)

The list of learning objectives reportedly accomplished by students was analyzed, and each response was assigned to a broad category, such as *Speaking* or *Fluency*, in order to systematize this learner-generated data. The different areas are shown in Table 8.

Table 8

Breakdown of objectives achieved.

Objectives achieved	UPC-1 students ($n = 52$)	UPC-2 students ($n = 26$)	FHJ-3 students ($n = 17$)
Speaking	**33**	3	**6**
Presentation skills	8	3	**17**
Vocabulary	8	**12**	**5**
Improve/practice English	**14**	**8**	1
Writing	10	**9**	1
Technical/professional/engineering/academic English	**14**	3	0
Listening	**13**	2	0
Communication	6	0	1
Pronunciation	5	0	1
Reading	4	2	0
Fluency	2	3	1
Grammar	4	1	0
Recognition of level (B2) for graduation	2	1	0
Referencing (quotations)	0	0	2

The main objectives highlighted in the table largely coincide with the expectations expressed at the start of the semester. For UPC-1 students, the main objective attained was the skill of speaking (the focus of one of the courses) and to a lesser extent, specialized language and general language learning. Compared with their expectations, in the post-course survey students were more specific in the expression of their objectives, listing specific areas, such as grammar, vocabulary, pronunciation, or fluency, for example. It appears that by the end of the term, students have become aware of the distinction between specialized and general language learning. UPC-2 students' responses also match the expectations expressed in the

pre-course survey, especially with regard to technical and formal vocabulary as well as writing (probably influenced by the orientation of one of the ESP courses towards technical writing). Another main objective was improving and practicing English. The main difference between these objectives and initial expectations is professional English. At the beginning of the course, many students mentioned learning professional and technical English, yet very few mentioned it at the end. One is, however, left in doubt as to what extent some students regard technical vocabulary or report writing to be equivalent to professional/technical English. FHJ-3 students also seem to have reached the objectives set at the beginning of the course. As shown in the table, most objectives were accomplished in relation to technical/professional presentations, speaking, and vocabulary. In general, considering the number (and variety) of objectives reportedly attained, together with the afore-mentioned average ratings in terms of achievement across the three settings, it appears that ESP courses have boosted student learning in several areas. Results also hint that some room for improvement is still possible.

Diary data help us probe into students' perceptions of those actions that aid their progress during the term. When analyzing diaries, the category *Monitoring progress* was assigned to students' evaluation of their learning in the ESP course. As progress monitoring refers to reflections made over the course of time, it only applies to UPC-1 and UPC-2 diaries (given that FHJ-3 students only wrote one reflection sheet at the end). These reflections were grouped into different skills (Table 9). What these outcomes have in common is that they refer to specialized communication (writing emails and CVs, lectures, meetings, and interviews). Another point that stands out is the notion of *accuracy*, both in grammar and vocabulary, which indicates students' aim at precision and correctness in their writing.

Looking at some of the entries of a UPC-2 student, we observe good knowledge of the skills she has developed during the course (technical writing and reading), and her weaknesses as a language learner. She also self-prescribes actions to undertake and is able to identify difficulties ("trouble when it comes to communicat[ing] technical information either written or oral because the English I have most contact with is mainly conversational and informal"). She also finds ways of addressing such difficulties, through the use of strategies to monitor her progress:

> I believe that the improvement has come mainly from the reading of scientific papers that use a lot of technical information and is sometimes hard to read but every time I do it, it gets better and better (…) it is easier for me to write in a way that I don't have to rewrite a lot of times my texts […] here I guess the 'less is more' comes in handy. (Student 2 – UPC-2 – Entry 2)

She stands out as a mature language learner who is determined to follow her learning path autonomously:

> I have accomplished a lot with this course and I feel comfortable when communicating in a written way, when it comes to verbal communication I still get problems but that will be just a matter of practice. (Student 2 – UPC-2 – Entry 3)

A student from UPC-1, who was taking both the technical writing and speaking courses simultaneously, also deploys good metacognitive knowledge, as he is able to identify areas of improvement in both speech and writing. The following quote shows that he is able to pinpoint specific aspects of technical writing that he has improved after taking the ESP course:

> Finally I improved my writing skills; I express my ideas more accurate, because I learned a lot of vocabulary and expressions. I improve the way that I made technical documents because I learn how to make more efficient these types of documents and also I identify the wrong parts of the documents that contain irrelevant information. (Student 2 – UPC-1 – Entry 3)

3.6. Application of skills learnt in the ESP courses

Closely related to the previous questions on students' English practice and perceptions of learning, question 5 enquired about the extent to which students had applied the skills learnt in the ESP courses. These answers also provide information for RQ3 in terms of perceived usefulness of ESP courses. Table 10 provides a summary of the answers. As opposed to questions 2 and 3 (on the use of English during the term), in which students, particularly the less proficient ones, referred to general English, these answers mostly referred to academic and professional English.

Table 9
Monitoring progress.

	UPC-1	UPC-2
Writing	Email and CV writing, linkers, argumentative essays, accurate words, better structure	Write good introductions, accurate vocabulary and grammar, well-organized texts; impersonal communication, Confidence
Listening/Reading	MIT lectures, Business meetings, Confidence in job interviews	Understand, identify and learn formal and technical register
Speaking	Presentations Describing & Giving advice Pronunciation	Improve technical communication

Following the same procedure as with previous questions, students' answers were classified into general categories. It should be noted that a large number of students did not answer the question (marked as N/A, No Answer).

Table 10
Application of skills learnt in the course.

UPC-1	Mentions[3] (sts = 52)	UPC-2	Mentions (sts = 26)	FHJ-3	Mentions (sts = 17)
Job(-related)	**15 (27%)**	Job(-related)	4 (15%)	Job	2 (10%)
NO (not yet)	9 (16%)	NO (not yet/only in ESP class)	9 (35%)	NO (not yet)	7 (35%)
N/A	8 (15%)	N/A	2 (8%)	N/A	5 (25%)
Presentations	5 (9%)			**Presentations (for other courses or unspecified)**	**3 (15%)**
Skills (reading, writing), pronunciation, vocabulary	5 (9%)			Writing	1 (5%)
Others	5 (9%)	Others	1 (4%)		
Email/phone	4 (7%)				
Academic needs/student projects	4 (7%)	**Academic needs/bachelor's thesis**	**10 (38%)**	Bachelor's thesis	2 (10%)
Total mentions	**55 (100%)**		**26 (100%)**		**20 (100%)**

As shown in Table 10, a considerable number of students have applied the skills learnt in their ESP courses in a variety of situations, both academic (projects and assignments for other courses or the bachelor's thesis) and professional (especially the job interview, which is not surprising given students' forthcoming graduation). Considerable similarities are found in the three settings – leaving aside that some differences may be due to different course orientations, e.g., the focus on oral presentations in FHJ-3 and in one of the UPC-1 courses. In order to illustrate the range of applications mentioned, below are some examples for the main categories found:

Job-related

"Yes, I've done a job interview in English and this course has helped me a lot for this." (UPC-1)

"I hope to do it in the next job interviews" (UPC-2)

Academic needs

"These skills have helped me in other subjects" (UPC-1)

"Yes, in my report writing process for my bio-ceramics subject it was highly helpful" (UPC-2)

Bachelor's thesis

"For my bachelor thesis, to structure it better" (UPC-2)

"Referencing in Bachelor Thesis" (FHJ-3)

Hence, greater knowledge of how students use the skills learnt in their courses must form part of the needs analysis that is necessary to make ESP courses even more relevant to students' actual academic and professional practices. In turn, making such connections between the ESP classes and students' immediate academic and professional world also opens up opportunities for enhancing the profile of ESP courses in institutional contexts that tend to favor EMI as the way to develop disciplinary communication skills (e.g., Arnó-Macià & Mancho-Barés, 2015).

3.7. ESP courses as preparation for academic and professional communication

One of the key questions in a study looking at the effectiveness of ESP courses is to find out the extent to which students perceive ESP courses to prepare them for prospective English-medium instruction courses (question 6.1, which students were required to answer on a 1–5-point scale). The overall result is quite positive, with an average mean for the three settings of 3.83 ($SD = 0.95$). A breakdown of the different means follows:

UPC-1: 50 answers (two students left this question blank) – Mean: 3.55 ($SD = 0.96$)
UPC-2: 26 answers – Mean: 4 ($SD = 0.75$)
FHJ-3: 17 answers – Mean: 4.38 ($SD = 1.27$)

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[3] *Mentions* include the absolute number of mentions made by students in each setting. Percentages are given separately for every setting.

These means show that students from FHJ-3 and UPC-2 (with higher self-reported proficiency levels) show greater readiness. This result may suggest that students at B2 level and above feel better prepared to grasp the nuances of disciplinary language. By contrast, students below B2 (low-intermediate level) feel less prepared because they may think that they need to consolidate their English before they can add a more complex layer of competence. Another possible explanation may be that higher-proficiency students may be more prepared to make the most of ESP courses to focus on specialized language and, therefore, to feel better prepared for EMI courses.

To answer RQ4, on the extent to which students perceive that the ESP course has helped them improve their confidence in academic and professional communication, we analyzed question 7.1 (*Has this course helped you to improve your confidence in academic/professional communication in English?*). Answers were overwhelmingly positive, with an average of 87.37% (Negative answers: 11.58%; N/A: 1.05%). A breakdown of the figures in each setting follows:

UPC-1: Yes 86.5% (45 out of 52 students)
UPC-2: Yes 88.4% (23 out of 26 students)
FHJ-3: Yes 88.2% (15 out of 17 students)

Question 7.2 enquired into perceived benefits students gleaned from the ESP courses taken, whose results are summarized in Table 11. UPC-1 students highlighted overall confidence as the most mentioned benefit, followed by speaking, fluency, and oral presentations. Some of the reported benefits (speaking, fluency, etc.) coincide with the categories for previous questions on expectations and objectives attained, but the most common one, overall confidence, appears to stem from participation in the course, which has made students, usually not accustomed to using English, feel more at ease. UPC-2 students underscored two main areas of improvement, namely technical/professional English and vocabulary, followed by confidence, spoken fluency, and general language improvement. The two most notable areas students reported to have improved coincide with two of their initial expectations (general improvement, professional communication and vocabulary). At FHJ-3, students reported that the ESP course had boosted their general presentation skills, their confidence as well as speaking skills (interaction and fluency).

Table 11
Summary of reported benefits from ESP courses.

	UPC-1		UPC-2		FHJ-3	
Confidence "I have more confidence as compared with beginning of the course" "I am generally shy and practicing presentations helped me overcome this to some extent."	**12**	**30%**	2	10%	**4**	**27%**
Speaking, interaction, fluency "improving the fluency in speech" "fluent speaking"	**9**	**23%**	2	10%	**4**	**27%**
Oral presentations "I feel confident in presenting in front of an audience" "knowing what kind of communication and presenting strategies are good"	**8**	**20%**	0	0%	**6**	**40%**
Writing, email, technical and professional English "writing emails, writing my cv and reading technical English" "Now I approach communication more properly trying not to be as informal and more technical"	6	15%	**9**	**43%**	0	0%
The course is beneficial, but more learning is needed "yes, but it's necessary to have more time" "yes, but I need to go out to improve my English"	3	8%	0	0%	0	0%
Language improvement "I learned some of my weak points and I've tried to improve them" "write in English and correct myself"	1	3%	1	5%	0	0%
Vocabulary and listening "more expressions and listening" "now I have more fluency and more vocabulary"	1	3%	**7**	**33%**	1	7%

These last two questions provide useful information about students' perceived takeaways from the course. While they mention a wide range of areas (such as speaking, writing, vocabulary or specialized language), there are two key ideas cutting across them, and these are confidence and fluency. Thus, regardless of the skill students may work on, they perceive ESP courses as empowering, so that they feel more confident (and prepared) to communicate in English and, therefore, to participate effectively in those situations that emerge in an increasingly internationalized academic and professional environment.

4. Discussion

This study reports on engineering students' perceptions of their ESP courses in three engineering schools in Europe. The uneven number of students in the three settings under study reflect naturalistic contexts of ESP implementation. Rather than being a limitation of this study, the diverse ESP pictures obtained reflect the variety of ESP settings that can be found across Europe, and from which lessons can be learned for future implementation. Despite the great variety of learner profiles, class size, course length, and course orientations, some general trends can be identified, which can be applicable to other ESP

contexts. The value that students see in ESP courses — and distinguishable from general English courses — is especially important, particularly as ESP courses compete to some degree with EMI, which is explicitly promoted by institutional policies, and which is usually viewed as a way of achieving the twofold goal of increasing the international profile of the institution and of providing a context for authentic discipline-specific communication. In this context, ESP can respond to the new demands on academic communication skills posed by participation in EMI courses.

With reference to our first research question, our findings portray different profiles of students across all three institutions in terms of their proficiency levels and expectations. Thus, UPC-1 lower-level students report on their English practice, increased confidence and general language improvement, while higher-proficiency students in UPC-2 and FHJ-3 aim at grasping the nuances of specialized communication. Our data speaking to the second research question, on students' assessment of their ESP courses in terms of contents, objectives, and perceived learning, point to a high level of satisfaction, as students consider ESP courses to be valuable and report different types of learning gains, regardless of their proficiency level. Among the most notable objectives reportedly accomplished are improved English fluency, accuracy, and an expansion of technical (and general) vocabulary. Most importantly, students seem to be aware of the difference between university ESP courses and general English courses, the former allowing them to hone increasingly sophisticated academic and professional communication skills. Thus, these students, all of whom are studying at internationalized institutions where EMI is present, are particularly sensitive to the accuracy and nuances of proper technical communication and hence, regardless of their English competence, acknowledge the role of ESP courses in helping them hone their academic and professional communication skills, even those students with higher proficiency levels. On the whole, these engineering students appear to be strongly motivated towards developing their English, which could be due to their deep-seated problem-solving skills and to a utilitarian view of communication in English in an internationalized environment, with students taking a "task-oriented approach to communication" (Paretti, McNair, & Holloway-Attaway, 2007, p. 343).

Their motivation — and determination to improve their English — leads students to take actions outside the classroom to practice their English. Both surveys and diaries reveal a number of learning strategies that are as varied as the learners. While some students do not go beyond exposing themselves to English, others deploy more sophisticated strategies (creating word lists, memorizing new structures and patterns, working with specialized texts, attempting to acquire technical writing strategies, etc.), and still others deploy metacognitive strategies — related to planning and monitoring one's learning (Chamot & Kupper, 1989) — such as identifying their own strengths and weaknesses, from which they set further learning goals. Some of these strategies oriented toward self-directed learning beyond the classroom appear as an extension of course activities, which would point to the potential of ESP courses for raising awareness of the literacy skills that Poe et al. (2010) and Clark (2017) deem essential for university students. A teaching goal for (engineering) ESP course designers that can be derived from the present study is the need to pay greater attention to strategy training and metacognition, to increase students' awareness of learning strategies and help them become more effective (autonomous) learners (e.g., Little, 1995).

Information about students' learning strategies as well as about those academic and professional scenarios in which students use their skills relate to our third research question. We found that many students reportedly still do not use English for academic or professional purposes outside the ESP class, which indicates that these courses are their only source of exposure to academic and professional communication. On the other hand, those who use English outside class report applying their skills to meet their academic needs — which would allow ESP course designers to resolve the possible tension between ESP and EMI courses (Tatzl, 2011; Dafouz & Camacho, 2016). Course designers can strive to ensure ESP classes play a better and more integrated explicit and/or intensive preparatory role with regard to EMI. If the contribution of ESP to helping students develop their academic and professional English was acknowledged, EMI lecturers — who often complain about their students' poor English proficiency (Doiz, Lasagabaster, & Sierra, 2013) — might be more receptive toward ESP and even recommend that students take ESP courses prior to EMI, to ensure their learners are better prepared for their engineering content courses. Likewise, these results can also inform ESP course designers as to the need to highlight the importance of adjusting ESP courses to better meet target situation needs. These areas merit further exploration in EMI implementation and ESP course design.

The fourth research question focused on students' confidence in academic and professional communication. Survey and diary data substantiate students' acknowledgement of the learning objectives attained in ESP courses. Students' positive opinions, in line with Poe et al. (2010), underscore the central role of professional language instruction in engineering curricula. Students value the technical language and, in particular, the productive skills (speaking and writing) developed in their ESP courses because they are aware of their usefulness and applicability, not only in their future professional career but also in a growing internationalized academic environment. Not only do students show greater awareness of their development in specialized communication skills after their ESP course but also a higher perceived readiness to cope with an EMI course. A longitudinal study tracking the same students would yield useful information on students' objectives and needs once in the labor market.

Overall, students gave a varied and informed assessment of their ESP courses and provided elaborate metalinguistic descriptions of their experiences. Their positive evaluations reveal the relevance they accredit to ESP in all three settings. Their ESP courses seem to be a catalyst to improve their linguistic proficiency, and students seem positively disposed toward these courses. What these findings indicate is that engineering students can be highly motivated to take ESP courses, which is encouraging for ESP lecturers, but such positive evaluations are contingent on certain preconditions, especially the quality of courses and their relevance to students' perceived needs. Demonstrating the relevance of ESP courses is crucial in a context in which ESP is often overshadowed by EMI.

5. Conclusions

To conclude, the results of this study can inform needs analyses that help reappraise ESP courses to better meet emerging academic demands. From the application of skills learnt in ESP courses as reported by students, it can be inferred that ESP course designers may well need to support learners in both academic and professional specialized communication. Academic tasks like reporting on project work, completing EMI course assignments, and writing technical theses are equally as important as professional situations such as email correspondence, job interviews or specialized oral presentations. In that sense, ESP teachers can base their course design decisions on empirical evidence gained from tailored needs analyses instead of teacher intuition. Further needs of engineering students that should be catered for in ESP courses are building confidence when using the language, practicing fluency, and expanding specialized vocabulary. As this study has also shown, ESP course designers would be well advised to consider different proficiency levels of students, as there are indications that pre-intermediate and intermediate students may profit from more support in improving their general English, whereas upper-intermediate and advanced students may require less assistance in that area. All engineering students, however, will benefit from specialized communication activities contextualized in their academic disciplines and future professional settings. Such activities should aim at improving students' ESP proficiency in emerging EMI environments and cover the skills range of reading, listening, writing, and speaking.

ESP lecturers face the challenge to adapt to this increasingly internationalized context and prepare university students for successful participation in a variety of changing academic and professional environments. Considering the importance, at this level, of both acquiring expert content knowledge and achieving precision in specialized communication, and within a growing EMI context, it makes sense for university policymakers to set up coherent programs featuring both content courses taught by disciplinary experts and ESP courses taught by language experts, ideally in an atmosphere that fosters interdisciplinary dialogue and collaboration. Indeed, well-designed ESP courses may even constitute an enrichment to the EMI realities that many students are facing nowadays, particularly as explicit linguistic support may increase learners' confidence, fluency, and accuracy in specialized communication.

Appendix
Survey questions analyzed in this study

Pre-course

Expectations (at the beginning of course):

1.1 What are your general expectations of this course?
1.2 What are your personal language learning objectives for this course?

Post-course

2. In which situations of your academic/professional life have you used English during this semester outside the English class?
3. What have you done to improve your technical/academic English this semester outside the English class? (be as specific as possible)
4. Which of your personal learning objectives have you fulfilled after taking this course and to what extent? You may refer to the previous page to recall what you wrote last September (under *Expectations*). Please rate each fulfilled objective on a scale from **1 (not much) to 5 (very much).**
     O1: _____ Rating: _____
     O2: _____ Rating: _____
     O3: _____ Rating: _____

5. Have you applied any of the skills/contents learnt in this course to any academic/professional situation? Try to be as specific as possible.

Preparation for English-medium instruction (EMI)

6.1 Do you feel prepared to study a content program or course which is taught through English after the ESP support you have received? **Circle your answer from 1 to 5.**
   1 (*not at all*) - **2** - **3** - **4** - **5** (*yes, completely prepared*)

Confidence

7.1 Has this course helped you to improve your confidence in academic/professional communication in English? Yes - No
7.2 If so, in what way(s)?

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