

Improving Communication Skills: Students' Viewpoint on a Content & Language Integrated Learning Project

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Abstract—The development of the European Higher Education Area (EHEA) scheme in Spanish universities implies a greater participation of the students in their own process of learning and competence-based teaching. Competences are the ability to apply knowledge, skills and attitudes and one of such competences is communication. Students must be able to communicate using their mother tongue, but they should be able to use a foreign language, especially English, too. This paper presents strategies applied in the School of Engineering at Manresa (EPSEM) (Barcelona), in order to improve students' communication skills in English. An experimental research has been conducted, focusing on the point of view of engineering students, to check the efficacy of implementing content and language integrated learning (CLIL). First, second and third year students have been surveyed to test hypotheses about English level and implications on language and subject specific content learning. The data provide support to our hypotheses, showing an increasing positive attitude of the students towards studying subjects in English.

Keywords—CLIL; language skills; on-line resources; engineering students; technical vocabulary.

I. INTRODUCTION

The arising of the European Higher Education Area (EHEA) brought up the implementation of a new competence-based model of teaching and learning throughout Universities. Competences are the ability to apply knowledge, skills and attitudes and one of such competences is multilingual communication, with special emphasis in scientific and technological communication in engineering degrees. Students must obviously be able to communicate using the official languages of their country (Catalan and Spanish in the case of Catalonia), but they should also be able to use a third language, especially English although other languages are possible, with a certain level of proficiency.

This paper presents some strategies applied in the School of Engineering at Manresa (EPSEM) (Barcelona), in order to improve students' communication skills in English in relation with specific contents of interest for engineers, from electronics to mechanics, including chemistry, management, etc. The initial hypothesis of the authors was that the overall

level of English was low (compared to the reference level B2), but despite that, students were willing to improve it. As a second hypothesis, lecturers thought that it would be appropriate to implement a Content and Language Integrated Learning (CLIL) experience in selected subjects of different years, in order for students to gain self-confidence in their language skills without losing insight into the subject specific contents.

A review of the relevant literature was carried out in order to analyze the pros and cons of CLIL and the different possibilities to implement it (currently, good examples would be [1], [2], [3], [4] and their references).

Since the academic year 2009-2010, research activities have been conducted in order to assess the implementation process of CLIL at EPSEM. Currently, after three years doing CLIL, research focuses on the performance and final outcomes of the process. This paper corresponds to an early stage of such study and aims at gathering the views of the students. Much has been written on CLIL. It has been termed "one of the buzz words from the noughties (2000-2009) in education" [5]. Besides, Spain is one of the leading countries in implementation and research on CLIL [6]. But what makes this paper unique is that it focuses on the point of view of the true main figures of CLIL: the students, because everything that lecturers do is oriented towards the students. In particular we are interested in our students' own perception because motivation and attitude have a strong influence in the achievement of competences [7]. Of course one cannot forget about lecturers, but they are out of the scope of this paper. In the future, lecturers are going to be surveyed in order to gain insight into their motivations, their difficulties, their achievements and even their fears, because teaching in English requires an additional effort to create slides or handouts and to prepare the oral sessions. Besides, professors may be placed in uncomfortable situations when they hesitate or they cannot make themselves clear in front of the audience.

Despite the huge amount of innovative methods and tools presented at the Frontiers in Education conferences, it seems necessary to pay attention to the issue of teaching technology with CLIL methodology or bilingual tuition. Some papers

presented at previous conferences focus on communication as a key student learning outcome for accreditation in the United States [8] and other explain the support given to English language learners in universities in the United States to improve their written skills [9]. All they refer to an English speaking country. Other papers are about communication (in English as a foreign language) [10] but in countries where university subjects have been taught in English for many years [11]. This paper focuses on a non-English speaking country where teaching and learning in English at Engineering Schools is something new and therefore research is necessary.

II. THINKING OF CLIL

In 2009, six bachelor degrees in Engineering adapted to the EHEA started in the School of Engineering at Manresa (EPSEM): Electrical Engineering, Electronic and Control Engineering, Chemical Engineering, Mechanical Engineering, Mining and Energy Engineering and interdisciplinary Engineering on Information and Communication Technologies (ICT). The Technical University of Catalonia (UPC) includes the mastery of a “third language” (mainly English) as a generic competence for all engineering disciplines. While in other universities students can only demonstrate their fluency by providing a certificate of language skills, the UPC allows several different ways to prove their knowledge of a third/foreign language: (i) by providing a certificate at level B2 or above according to the Common European Framework of Reference for Languages [12], (ii) by taking subjects taught in a foreign language and awarding a minimum of 9 ECTS credits (one academic year corresponds to 60 ECTS credits that are equivalent to 1500–1800 hours of study), (iii) by spending a semester in a foreign university (for example, on an Erasmus Scholarship) and awarding a minimum of 9 ECTS credits or (iv) by writing a final project in a foreign language.

In these circumstances, in the context of engineering degrees, with the support of the school’s board, some lecturers thought that, whether the students have a certificate in English or not, it would be interesting to teach some subjects in English (or to combine English with Catalan/Spanish). The reasons are:

- Specific vocabulary (Electronics, Chemistry, Management, Math...) is not taught in conventional foreign language classes, and actually it is essential for an engineer.
- The opportunity to practice English (in subjects taught in English) is supposed to help students improve their level of general English (Oral and written skills).
- Subjects in English should encourage mobility: it is easier for local students to go abroad, since they are used to lectures in English but also international students may come to our school because they know they can understand lectures and tasks. That makes necessary (for both teachers and students) to know the basic vocabulary for the everyday classroom life.

After reviewing selected literature on CLIL, and taking into account that the CLIL methodology is considered as a model of good practice and that the Council of Europe [13]

and the European Commission [14] promote the teaching of non-linguistic subjects in foreign languages, we decided to go ahead and our experience gradually started. The main concern was whether English would hinder students from learning the specific content of every subject.

Broadly speaking, lecturers are used to English because of their research activity (reading and writing journal articles), but they do not have experience in teaching in English. To be sure of the feasibility of the project, faculty members were asked about their proficiency in English, their experience lecturing in English and the amount of time spent abroad as visiting scholars and, of course, their availability and willingness to teach in English [15]. The sample of valid answers was 70% of full-time professors.

Far from being experts in English (Fig. 1), results showed that there were enough people able to teach in English, at least to a certain extent, and what is more important, enough people interested in this experience. The main drawback that some lectures put forward was that they felt not confident enough in their linguistic skills. Thus, some faculty members involved in the CLIL project created the u-Linguatech Research group on Multilingual Communication in Science and Technology, in the frame of the Project on Research and Innovation in Learning Methodologies promoted by the Institute of Education Sciences of the UPC.

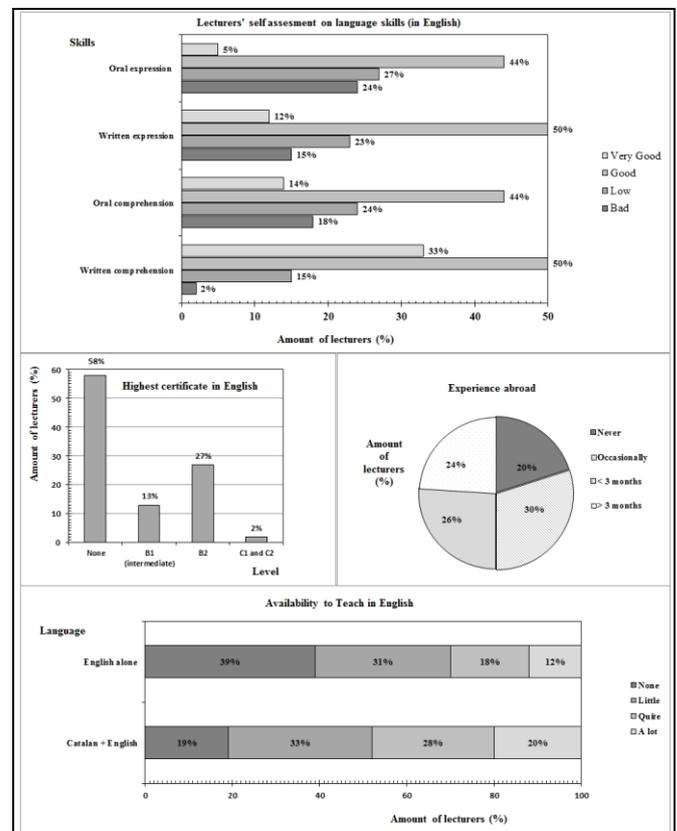


Fig. 1. Lecturers' assessment about their English level and experience.

Usual innovative resources (such as glossaries, assessment rubrics, handouts and slides) and activities (such as class debates, text comprehensions, watching videos from YouTube, role-playing, etc.) were designed by lecturers for their own subjects [16], but that was not all. From several studies of language communication difficulties [18], professors of u-Linguatex research group developed new global on-line teaching materials, with the help of some grants from the university and the government of Catalonia.

One of such resources is the university teaching phrasebook Class-Talk (<http://www.upc.edu/slt/classtalk/>) [17], an open access conversation guide (Fig. 2) with relevant vocabulary for the classroom in Catalan, Spanish and English.

Another one is the application Multilingual Formulae (<http://mformulae.epsem.upc.edu/>) [18], which was created by lecturers from six different departments. Multilingual Formulae allows reading in English (and other languages) hundreds of mathematical expressions used in scientific and technical subjects (Electricity, Electronics, Math, Business, Chemistry, etc.) Both tools include recorded pronunciation.

III. ASSESSING THE PROCESS

The first step was to ask students starting in the fall semester of 2010 about their proficiency in English to contrast the first hypothesis. A sample of 160 students took a small questionnaire implemented on the university's e-learning platform about their English level and their willingness to take subjects in English [15]. Results supported the initial hypothesis [18] that their level was low (with respect to level B2); in fact 80% of the students did not have any certificate in English. However, 45 % of the students showed their interest in taking subjects in English. While the majority stated that they were able to understand written texts and oral presentations, they confessed that writing was difficult for them and 25% stated that they were unable to speak. Probably this is due to the way English is taught at primary and secondary schools. These results confirmed the need for CLIL, but they warned us that additional resources should be designed to support students learning and that adjustments would be needed to adapt the way we teach to the students' limited command of English.

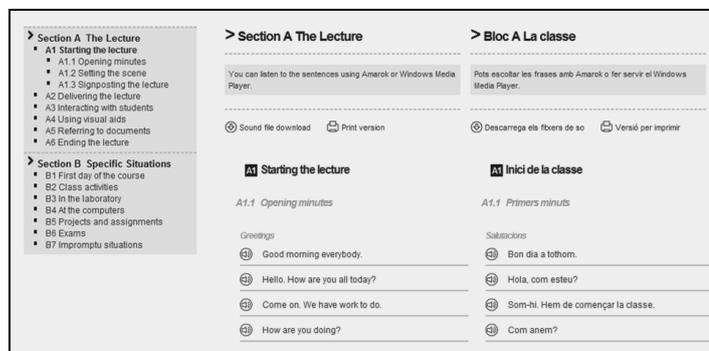


Fig. 2. Image from the university teaching phrasebook Class-Talk.

The same experiment was repeated in 2011 with a sample of 250 students, yielding similar results.

Eventually, since one of the pillars of the EHEA approach is the active participation of the students, during the fall semester of 2013, questionnaires were designed to evaluate the CLIL experience from the point of view of students and to contrast the initial hypotheses. The sample was made up of students enrolled in some of the subjects that are completely or partially taught in English corresponding to different academic years: Chemistry (1st year, first semester), Business (2nd year, third semester) and Chemical Analysis (3rd year, fifth semester).

The questionnaire is made up of different parts. The first part has six questions that focus on how much English students know and their previous exposition to English: (i) Certificate achieved by the student; (ii) is the student taking English lessons currently? (iii) Besides taking English at primary and secondary school, how many courses has the student taken outside school? (iv) How long has the student been abroad (in an English speaking country?), (v) has the student taken any subjects in English before university? (vi) Rate their level of English.

The second block of questions includes five items. They refer to the learning of English through CLIL: (i) do you like English? (ii) Are you willing to take subjects in English? (iii) Do you think that you are learning English? (iv) Which general skills of the language have improved through CLIL? (v) Which specific aspects? (From a list of options).

The third group of questions focuses on content learning. It includes the following items: (i) do you like the content of this subject? (ii) Do you feel that English hinders you from learning the content? (iii) Explain why /why not (from a list of options), (iv) Do you find it difficult to understand oral presentations? (v) Do you find it difficult to understand the slides? (vi) Do you find it difficult to understand the exercises? (vii) Do you find it difficult to make questions in English?

The following block of questions is named "Proposals" because it makes the students think about (i) what sort of resources might help them improve their performance, (ii) what the lecturers should do to help them, (iii) What they should do to improve their learning of the contents and (iv) what they should do to improve their English. It also includes questions to survey their opinion about which resources help them to learn, in order to elaborate more:

The last group of questions is about "assessment". Students have to state (i) their opinion on the effort made by the lecturer of the subject, (ii) their opinion on learning the subject in English; and finally (iii) their global opinion on CLIL.

IV. RESULTS AND DISCUSSION

A. Level of English

Our results show that 80% of the 60 surveyed students have no certificates in English (Fig. 3). The three groups in Fig. 3 refer to different people.

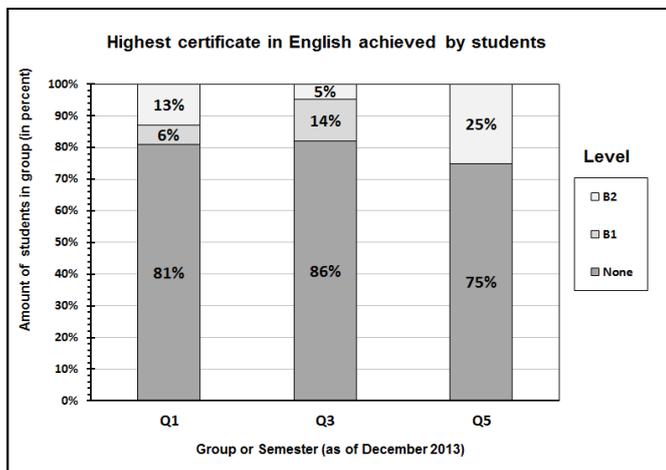


Fig. 3. Students' current certificates in English.

The reader must notice that this is not a longitudinal study and thus we cannot compare the same students when they were in their first semester, then in the third one and currently in the fifth one. In consequence, students in the three groups might have different levels of English when they started university and therefore it is not possible to analyze the differences between students' proficiency in English. Unluckily, because current data are anonymous, it is not possible to follow the evolution of each group. Besides, more and more lecturers get involved in the CLIL project over time. As a consequence, students currently in the third semester surely will take more subjects in English than their mates in the fifth semester did. A 76% of the students are not currently taking English lessons, but 18% of those who have no certificates are taking English lessons. According to our experience, many students take exams such as the Cambridge's "First Certificate" or the "Advanced level" of the Catalan Official School of Languages (EOI) in mid-June at the end of the fourth semester. This may justify why a 25% of students in the fifth semester hold a certificate.

A 20% of the students have never attended a language school. Among the rest, a 25% has been studying English for more than four years (Fig. 4). All the students that have earned a certificate have been studying English for four years or more.

We conclude that the level of English of the students is low (compared to the reference level B2). Some students do not seem to be aware that without an intermediate level of English they cannot graduate. Students need our help to ease the achievement of this competence, or at least, to realize that English is necessary for them. Around 80% of the students do not have studied non-linguistic subjects in English before university. Few students have international experience: 38% have never been abroad and 45% only for tourism. That makes us also think that many students, who mainly come from close locations, belong to the working class or the lower middle class, with not many resources to devote to education. The results support the first hypothesis.

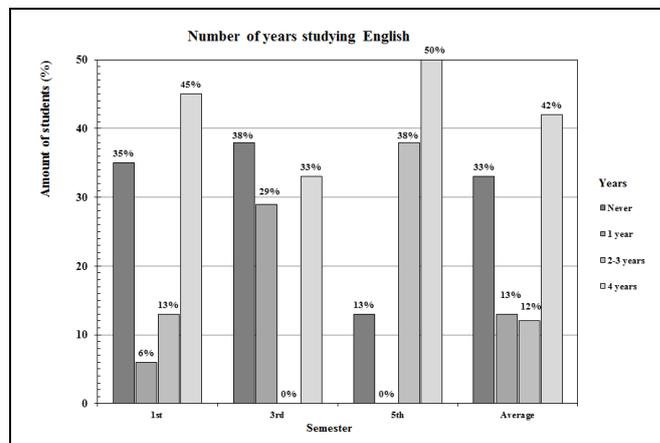


Fig. 4. Students' number of years studying English.

B. Learning English

In the second section of the questionnaire, 83% of the students admitted that they liked English, and 67% were willing to take subjects in English. Only 8% stated that they were not learning English through CLIL.

If we consider the results for each group (Fig. 5), all these figures improve year after year (for example, no-one in the third year states that he/she is not learning English). We fear that these results might be misleading because for many students "learning English" means "learning grammar", as if they were attending a language school. Our approach is different: by "learning English" we mean that the student can understand a technical text, can improve what he/she understands when watching an academic or professional video on YouTube or can write a better report on a topic related to Engineering.

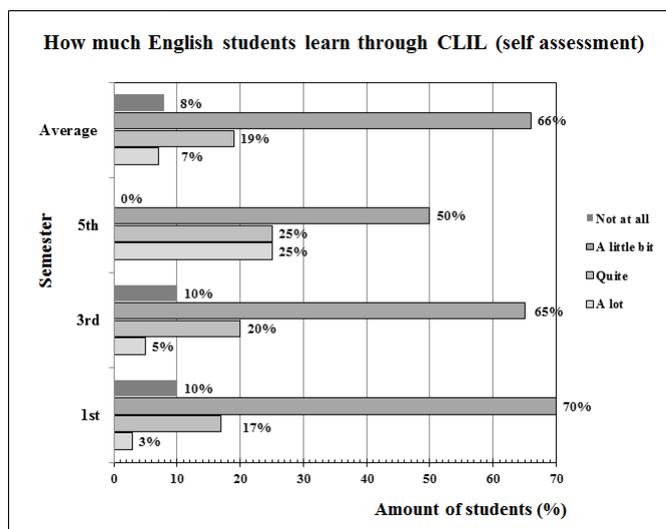


Fig. 5. Students' self-assessment on English learning through CLIL.

When asked about the specific aspects that improved as a result of the implementation of CLIL (Fig. 6), amongst different options, students highlight their learning of vocabulary (82%), which corroborates one of our reasons for starting the CLIL project, followed by oral comprehension, which is also connected to the resources created by lecturers to reinforce listening. These results support, in part, the second hypothesis. The self-assessment might be a threat to the validity of the study if our goal was to determine how much English the students know. In that case, a better tool would have been a simple English test. But on the one hand, in this paper /we were not interested in an objective measure of the level of English, but on the students' own perceptions, which have a natural influence in their learning. On the other hand, the competency on a third language is assessed in different subjects through activities such as content-related written exercises and exams, watching videos (oral comprehension) or oral presentations. In a fourth-semester subject taken by exactly 100 students, June 2014 results show that 33 students show a proficiency that would be around the B2 level and 52 students fall below the required level but have been able of completing the different activities of the course. The remaining 9 students fail.

C. Learning the Content of the Subject

The third block of the survey provides information on the comprehension of the technical content of subjects taught in English, which is an aspect that lecturers are especially worried about.

First of all, students were asked whether they liked the content of the subject to check about their motivation and attitude. Results depend on the subject but, on average, 77% gave a positive answer.

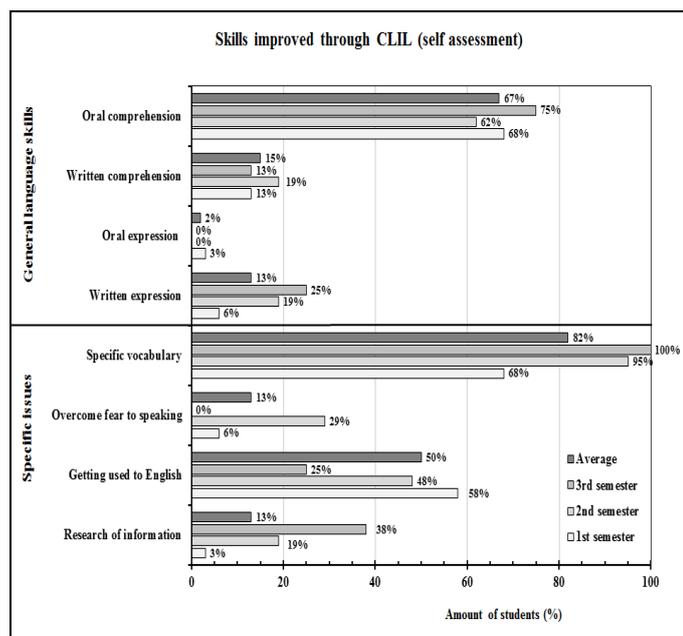


Fig. 6. Students' English skills improved through CLIL.

The most important, students were asked whether the fact that the subject is taught in English hinders them from understanding the content of the subject. The overall result from all the students in any year is that 50 per cent are of the opinion that English deters them from learning the content of the subject, but this result is misleading and it should be interpreted correctly.

Answers show significant differences, depending on the year, as shown in Fig. 7: nearly two thirds (65%) of the students in 1st year think so, but the majority (57%) of the 2nd year students does not think so and finally, only 12% of 3rd year students thinks that English makes the subject more difficult. The average result is meaningless because the number of surveyed students per semester is not constant: there are more students enrolled in first year than in second year and there are even less students in third year, and therefore, the weighted average reinforces the opinion of first year students. It is precisely the difference between years that gives support to our second hypothesis: those differences between groups can be explained by the gain in maturity, experience and motivation of students with both English and content through the years. Being exposed to English semester after semester, students get used to English, and namely to documents written in English, to videos in English and to studying in English. When students are allowed to choose between Catalan and English in an exam, they progressively answer in English because they remember what they have studied from the slides in English and do not need to translate anymore.

The reasons put forward by the students finding difficulties are that their knowledge of English was small (23%), they could not understand the handouts (30%), they did not understand the oral explanations (12%), giving support again to our first hypothesis. It is remarkable that 33% state that they needed more time to study.

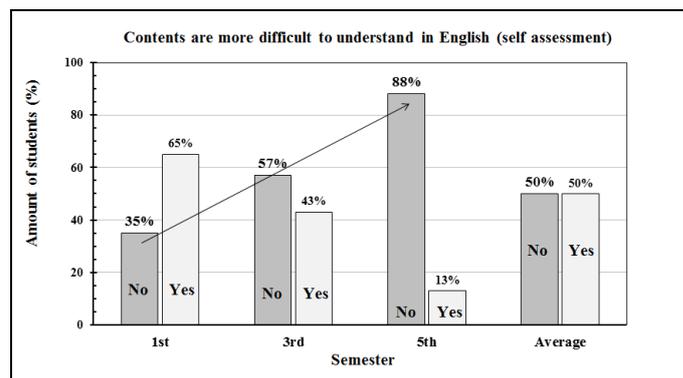


Fig. 7. Students' assessment on difficulties on contents due to CLIL.

D. Proposals

Students were asked to rate how useful the different resources, from elements of English grammar to audio-visual aids, had been. Their answers (Fig. 8) confirmed the usefulness of the resources provided by the lecturers. Since the list of resources includes multilingual technical glossaries and audio-visual aids that reinforce listening, the results are consistent with the aspects that were most valued by students in order to improve their learning of the language. The usefulness of English grammar related resources (such as links to web pages about grammar) is only voted by 5% of the students. Students demand lists of technical vocabulary (55%) much more than additional non-compulsory activities to practice English (22%).

When students are asked what activities they can do to learn more English and to learn the contents of the subjects taught in English, many answers arise, but 47% state that all they need is to devote more time to study.

E. Assessment

Students admit that their lecturers have spent time creating materials (43%) and preparing the classroom activity (32%). They feel that lecturers are more receptive to their doubts (38%). Students think that lectures accept teaching in English in order to help them practice English (43%) and provide them with more opportunities in the future (45%). These results mean a positive assessment of the lecturers' work. Fig. 9 has two parts. The first one shows the global perception of the students on CLIL, which is positive. The second part shows the global perception on studying a subject in English (namely, the subject that they were taking in English at the moment of the survey). There is a positive correlation between the percentage of opinions in favor of taking subjects in English and the semester, achieving a 100 per cent in the fifth semester.

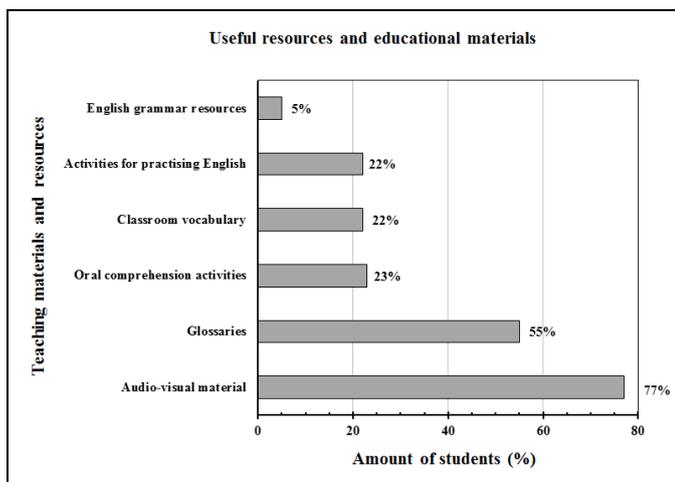


Fig. 8. Students' assessment of useful resources.

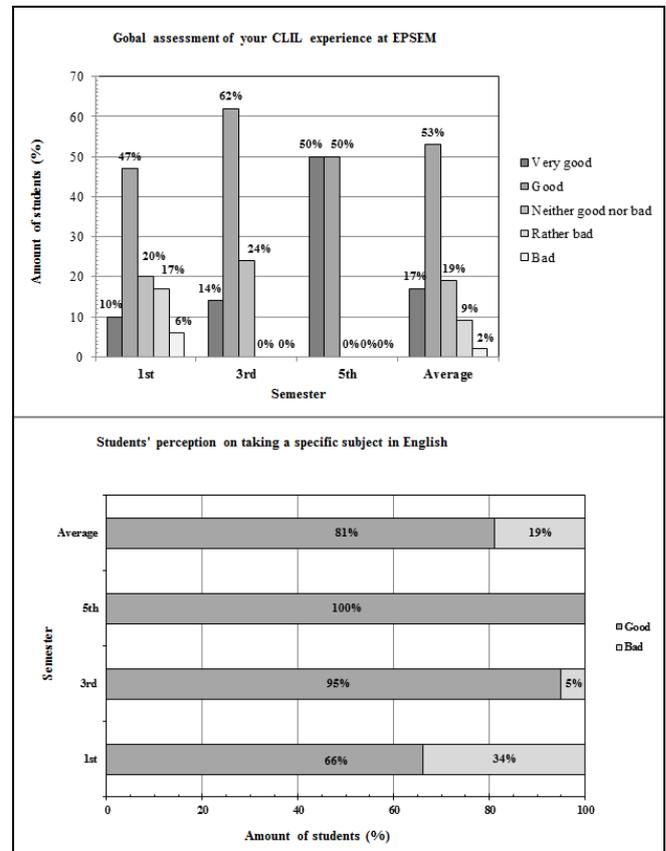


Fig. 9. Students' assessment on CLIL in engineering degrees at EPSEM.

V. CONCLUSIONS

The paper addresses a program to incorporate English language learning with content learning on a non-English speaking country where teaching and learning in English at engineering schools is being introduced as a consequence of the Bologna process. This is the case of universities in many countries. They may benefit from the experience described in this paper.

Experimental data of this research provides support for the suitability of Content and Language Integrated Learning strategy in Engineering degrees, being one of the first studies on that context.

The analysis of results confirms the low students' English overall level and the need of innovative resources and tools to improve communication competence for engineers.

Since the lecturers who take part in this experience do not teach English but use English as a medium of instruction, the focus of this research is on subject content, not in language. Although learning English is important, the main goal of this research is to make sure that English does not hinder students from learning the specific contents of the technical subjects. Findings about English and content learning show the efficacy of implementing CLIL without losing insight into the subject specific contents.

The main conclusion of this paper is that students show a positive attitude towards English and that students' attitude towards engineering subjects taught in English is positive correlated with students' maturity.

Future directions for research may be the professors' point of view; an objective study of language learning; a study of the correlation between the performance of the students and their proficiency in English; and a longitudinal study that may show how students' attitudes and communication skills in English improve semester after semester. Such study would also reveal if there are differences between groups and their causes.

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