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Students' viewpoint on engineering subjects taught in English

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Abstract: The European Educational Institutions have the challenge and the commitment to enhance multilingual competence and teaching curricular subjects in a foreign language is seen as one of the most promising alternatives.

In that context, professors teaching different engineering subjects at the School of Engineering of the UPC at Manresa (EPSEM) have been involved in projects aiming at analyzing the current linguistic situation and developing some on-line open access materials using CLIL as a strategy. They formed the u-Linguattech Research Group on Multilingual Communication in Science and Technology in order to provide such resources in an effective and efficient way.

In this paper, we focus on students' perception of the improvement of their multilingual competence throughout their Engineering degree, by means of subjects taught in English by non-native speakers. Data about the English level of current students are taken into account. We also describe the use of the above resources to improve the quality of subjects learning related to Chemical Engineering curricula.

1. Introduction

Communication in several languages is a competence in engineering degrees that has become essential in the context of the European Higher Education Area, which seeks for an increasingly high level of internationalization. One of the recommended strategies to meet the challenge of improving multilingual competence, as it was proposed by the European Commission (Council of Europe, 1995), is learning curricula subjects in a foreign language.

Regulations for degrees at the Polytechnic University of Catalonia (UPC) allow and even promote the existence of subjects taught in English. In the School of Engineering at

Manresa (EPSEM), several faculty members actively involved in CLIL activities created the “Research Group on Multilingual Communication in Science and Technology” (u-Linguatech), as a part of the Research and Innovation Framework Project in Learning Methodologies (RIMA) promoted by the Institute of Education Sciences (ICE) of the UPC.

The research group has been involved in different activities ranging from a broad study of prior knowledge of English (of students and faculty members) to the development of teaching and learning resources that can be used in a wide range of degrees related to science and technology. The results on the English level of freshmen students corresponding to the courses 2010-11 and 2011-12 already warned that their level of English was low (cf. Alsina, Fortuny and Giralt, 2012). The level of lecturers and their availability to teach in English was also analyzed (cf. Alsina, de las Heras, Lao and Gamisans, 2012) because this information was critical to develop a meaningful plan. The analysis of the results led us to develop interdisciplinary teaching resources to support both, teachers and students, such as “Class Talk”, an open access resource on the Internet (see Fortuny and Alsina, 2012). It is a multilingual university teaching phrasebook in Catalan, Spanish and English, including everyday wording for the university classroom.

This paper is a part of a wider study that aims at monitoring the performance and the results of actions such as those explained above. Namely, it corresponds to an early stage of the project which aims at gathering the views of the students.

2. Method

In order to assess the performance of the Content and Language Integrated Learning (CLIL) project, some subjects that are completely or partially taught in English were studied. Specifically, the sample was made up of subjects corresponding to different years of the degree in Chemical Engineering. Thus the study focused on the subjects: Chemistry

(1st year, first semester), Business (2nd year, third semester) and Chemical Analysis (3rd year, fifth semester).

In this phase, the goal was to gather data on the students' point of view in order to test the following hypotheses:

- The students' level of English is low (with respect to the reference level B2).
- Learning engineering subjects in English encourages English proficiency.
- English does not hinder students from learning the content of the subject.

Students enrolled in the subjects taught in English were surveyed in order to know if their opinions supported the hypotheses.

Questionnaires were organized in different blocks. The first block corresponds to the initial knowledge of English. It asks about previous training courses conducted in English, travelling abroad and certificates obtained. Students are asked to state their level of proficiency according to their own perception. The second block refers to language learning, and willingness to learn the subject in English. The third block deals with the contents of the subject, one of the most concerning aspects for faculty members who wonder whether lecturing in English makes the comprehension of the lessons more difficult. The reasons for either response can be stated, as well as the difficulties that arose and the resources used to overcome them. Some questions asked the students to make proposals about resources and activities that might help them improve their English, to assess the motivation of teachers who lecture in English. Finally they were asked to make an overall assessment of their CLIL experience.

3. Results

In next pages, we discuss the most significant results from the blocks described above.

3.1 Level of English

Our results show that our students' English level is quite low (Figure 1). Only 20 per cent of the surveyed students have a certificate in English (corresponding to the European levels B1 or B2). The differences between different semesters are small and therefore not significant.

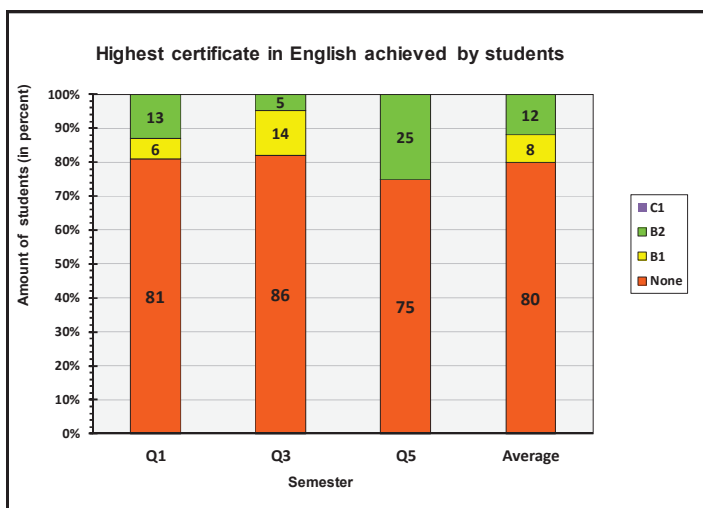


Figure 1. Students' proficiency in English, measured according the highest level of the certificates in English achieved by the students

The survey also provides information on the percentage of students who have been involved in CLIL in primary or secondary school (Figure 2). The result, 20% on average across the three courses, can be considered low.

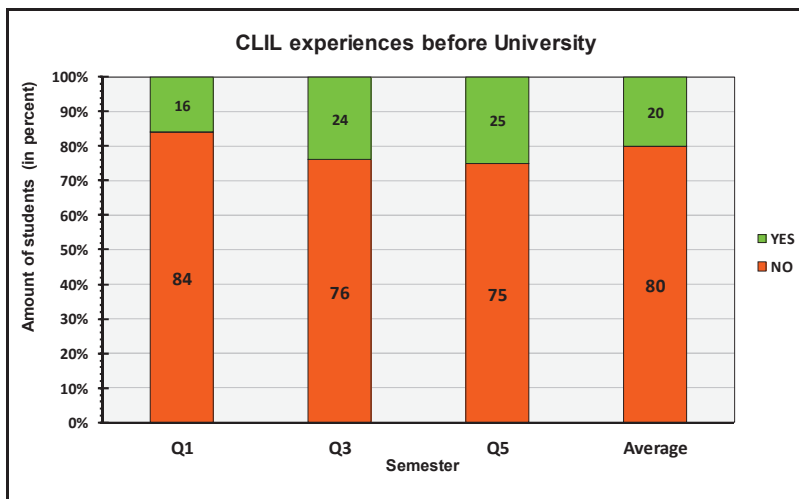


Figure 2. Amount of students (in percent) that had undergone CLIL experiences before University

3.2 Language Learning

The second group of questions assessed the aspects of language that improved as a result of the implementation of CLIL. Figure 3 shows the opinion of the surveyed students. Amongst different items, students highlight their learning of vocabulary and their improvement in listening.

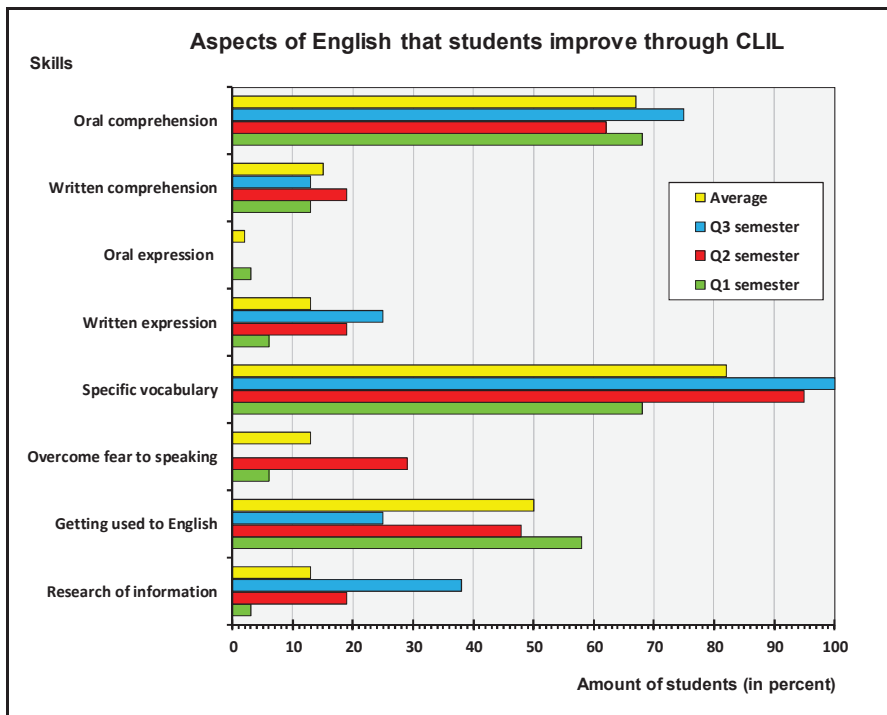


Figure 3. Skills or aspects of English that improved due to CLIL

Students were asked to rate how useful the different resources ,from elements of English grammar to audio-visual aids, had been. Their answers (Figure 4) 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.

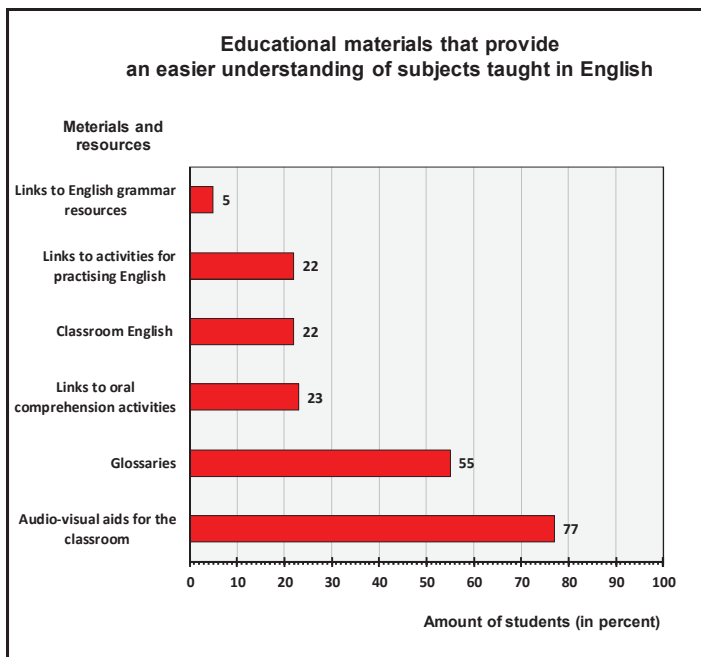


Figure 4. Teaching and learning resources that students consider that provide an easier understanding of subjects taught in English

3.3 Content Learning

The third section of the questionnaire provides information on the relation between lectures in English and comprehension of the technical content of the subject, which is the aspect that lecturers are especially worried about. When students are asked whether the fact that the subject is taught in English hinders them from understanding the content of the subject, significant differences arise in their answers correlated to the semester, as it is shown in Figure 5. Nearly two thirds of the students in 1st year think so, but this proportion decreases amongst the 2nd year students, where a clear majority does not think so. Finally, only 12 per cent of 3rd year students believe that English adds a difficulty. If we consider the total amount of surveyed students, regardless of the course, the result is that 50 per cent are of the opinion that English deters them from learning the content of the subject. However, this overall result is misleading because the number of surveyed students per semester is not constant because there are more students enrolled in first

year than in second year and there are even less students in third year. Besides, lecturers can better cater for students' needs in 3rd year classes with a small number of students than in 1st year crowded classrooms. In addition, the maturity, motivation and experience of students with both English and content, which increase through the years, contribute to explain the differences.

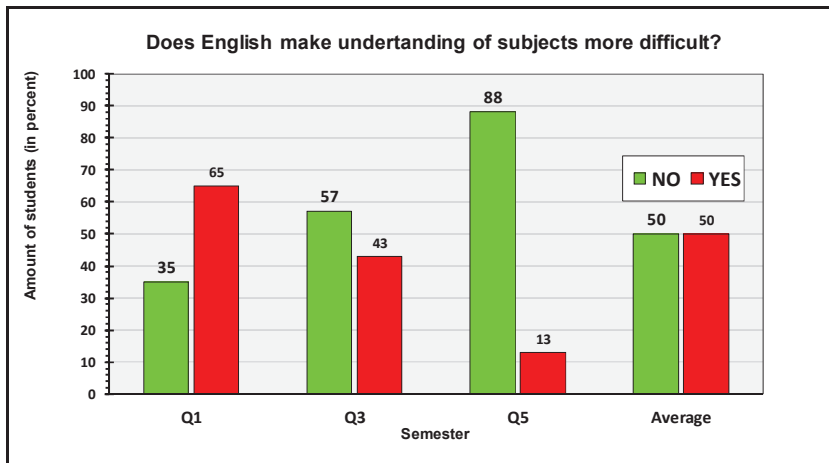


Figure 5. Answers to “Does English make understanding of subjects more difficult?”

3.4 Global Perception

In conclusion, the overall perception of the students about studying engineering subjects in English is positive. There is a positive correlation between the percentage of opinions in favor of CLIL and the semester, achieving a 100 per cent in the fifth semester (Figure 6).

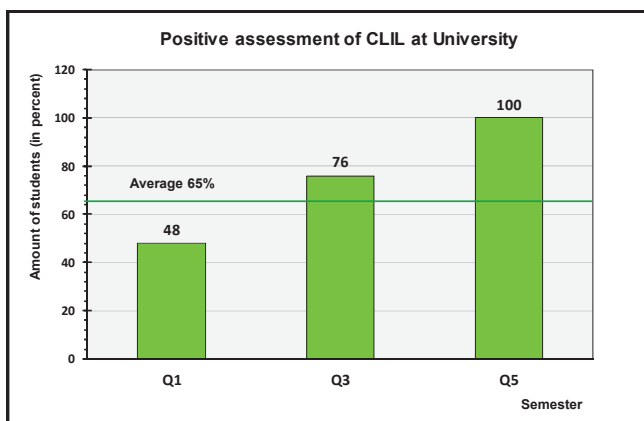


Figure 6. Students' overall assessment on CLIL at University

4. Teacher-generated Resources for CLIL

The positive rating of CLIL made by students is linked to the availability of teaching and learning resources that can make easier the comprehension of both English and technological content. Let us mention the task of the u-Linguattech research group, whose members have developed different resources, some of them intended to support specific subjects others conceived as interdisciplinary. The generation of learning resources is remarkable in the area of Chemistry, where we can find from a list of Periodic Table Elements sorted by name to specific glossaries and a visual dictionary on the Chemistry lab equipment, as seen in figures 7 and 8.

Notació utilitzada en química-Equilibri		
Símbol	Descriptor (CAT)	Descriptor (ENG)
K	Constant d'equilibri	Equilibrium constant
K_a	Constant de dissociació d'un àcid	Acid dissociation constant
K_b	Constant de dissociació d'una base	Basic dissociation constant
K_c	Constant d'equilibri en funció de la concentració	Equilibrium constant for a reaction in solution
K_p	Constant d'equilibri en funció de les pressions parcials	Equilibrium constant for a gaseous reaction
K_{sp}	Constant del producte de solubilitat	Solubility product constant
K_w	Constant d'autoionització de l'aigua	Self-ionization constant of water
α	Grau de dissociació	Degree of dissociation

Figure 7. Fragments of a list of chemical elements and a glossary on chemical constants

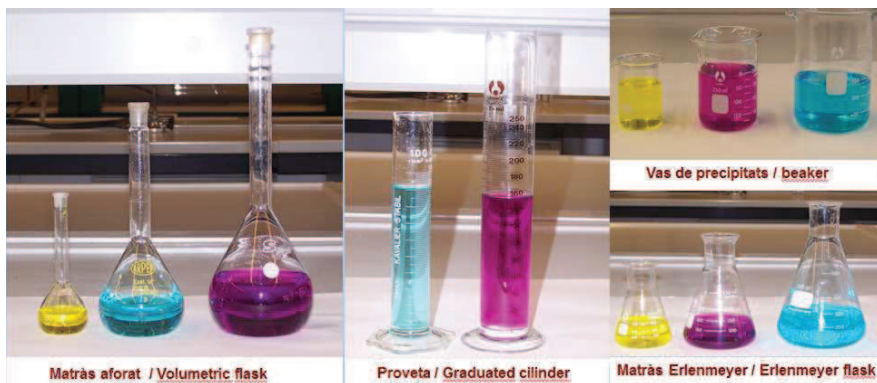


Figure 8. Sample of the Visual Dictionary

5. References

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