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Teaching Symbolic Language to non-native Speakers

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In this paper, we describe how an on-line resource, primarily intended to improve the proficiency in a foreign language, can also facilitate the understanding of the symbolic language in an engineering degree course. We think that thanks to the use of this resource, a course in an engineering degree can tackle both the challenge of teaching symbolic language to non-native speakers and the challenge of doing this without losing insight into the concepts that appear in the course.

In autumn 2009, five four-year degree offered by the Universitat Politècnica de Catalunya (UPC) were launched at the School of Engineering of Manresa (EPSEM). In autumn 2010, another one was launched. One of the differences between the old and the new degrees is that the new ones must give a sufficient proficiency in a foreign language in the way determined by the university to converge to the EHEA. This can be done in different ways, among them the development of a minimum of courses taught in English. The so called Content and Language Integrated Learning (CLIL) methodology aims to improve the proficiency of a foreign language in non-linguistic subjects. It's an approach based on language immersion for learning content through a foreign language, thus teaching both the concepts of the subject and the foreign language. Although the European Commission suggests the presence of trained teachers who are native speakers of the vehicular language to facilitate the introduction of CLIL approaches, this is not the situation in our university. So, the EPSEM decided to collect information about the teaching staff and about the students in order to plan the best way to introduce CLIL approaches in the new degrees and concluded that scaffolding material was really necessary to support teaching content through English.

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In this communication we focus on how to teach symbolic language in English to non-native speakers. *Multilingual formulae* is an open access on-line collaborative resource available at http://mformulae.epsem.upc.edu. It contains tables of symbols and a set of formulas classified in different subjects. More concretely it contains tables to support English speaking of symbolic language as binary relations, symbols, scientific notation, etc. Tables and formulas include examples and audio files. More than 600 formulas of different engineering areas have also been introduced. Each formula, see Fig. 1, is described in symbolic language, text and audio with the speech in several languages: all in Catalan, Spanish and English, and some in French. The project has been developed using the Content Management System Plone, and the Javascript library MathJax to render mathematics in LaTeX. It is the result of the research group *Linguatech-Rima*, who is basically in charge for the design of the application and to suggest, review and classify formulas in different subjects. It can not be considered complete because new formulas are being added after technical and linguistic review.

The resource is addressed to lecturers and students as a support for the lack of fluency, to ensure the effective communication when symbolic language is used. It also highlights the mathematical part of the formulas, improving content learning. Furthermore, it can also be helpful to increase the self-confidence when oral presentations in a foreign language at professional or research level are involved. ∎

Fig. 1. *Reflection coefficient equation: symbolic language, text and audio.*

ACKNOWLEDGMENTS