Collaborative on line international (COIL) project in the Degree in Chemical Engineering at the University of Cantabria

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Spanish universities have experienced a shift towards the virtualization of teaching, undoubtedly driven by the limitations imposed by the COVID-19 pandemic. This has had an intense effect on the internationalization of teaching programs, which have seen their activities slow down during this period. Therefore, without renouncing the benefits of face-to-face teaching, the development of on-line tools and methodologies has favored new internationalization actions and educational coordination between institutions. In the year 2021, the Project *"Virtualization of teaching as a tool for internationalization and its implementation in the European Project Semester program"* was launched within the Degree in Chemical Engineering (DCE) of the University of Cantabria (UC), financed by the *"VIII Call for Internationalization Actions"*. This initiative has allowed the participation of 11 professors and 63 students from UC and 3 universities: i) Ege University (EU) in Turkey, ii) Poznan University of Technology (PUT) in Poland and, iii) Sami Shamoon College of Engineering (SSCE) in Israel (Figure 1) in a ***Collaborative Online International Learning (COIL)*** that has brought together, virtually, students from Spain, Turkey, Israel and Poland through activities guided by the professors participating in the COIL.

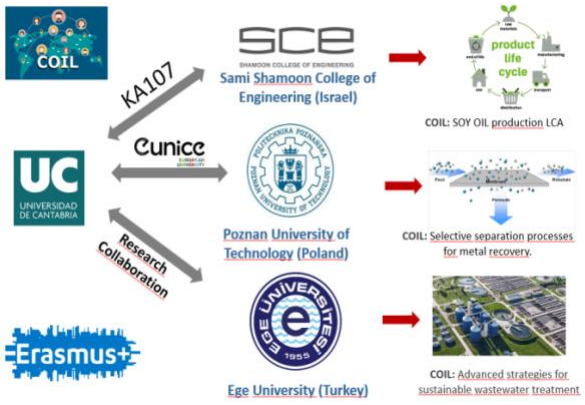

Figure 1. Structure of the UC COIL project.

The activities have been carried out in the context of 3 elective subjects (4th year of DCE) that encompass three fundamental branches of knowledge: *COIL 1 Life Cycle Analysis*, where the collaborative project dealing with soybean oil production was performed by students from UC and SSCE. COIL 2 *Advanced Separation Processes*, where UC students collaborated with PUT students in the design of selective separation processes and metal recovery and COIL 3 *Water Treatment*, where new approaches for wastewater treatment and recovery were analyzed by UC and EU.

Although the project was initially designed to maintain certain level of internationalization during pandemics, COIL methodology has proved as an useful and complementary tool that could be maintained in the future together with face to face teaching that allows the integration of students of different nationalities. As a novelty, internationalization has not only corresponded to the students, but has been extended to the faculty members. Thus, UC students have received training from international experts within the regular academic offer of the degree, with very positive results in their evaluation. However, difficulties have been encountered, mainly in the differences in the schedules of the different institutions and in problems inherent to the operation of the telecommunication systems available. As improvements within the project, it is proposed to carry out surveys to collect the experience of the participants, which would allow a self-evaluation to achieve continuous improvement. In addition, progress should be made in the design of the activities program, based on the experience gained to make it more collaborative among students and even teachers, and finally, further improvement in the provision of technical means for on-line teaching in the University of Cantabria.

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