Área temática: T1. Nuevas metodologías docentes

Teaching chemical engineering principles through Flipped Classroom and Project Based Learning in an Industrial Technologies Engineering degree course

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Palabras clave: Flipped classroom, PBL, Industrial Chemistry, Chemical Engineering principles

Abstract

The project-based-learning (PBL) approach and the strategies for assessing students' learning have been applied to the Industrial Chemistry subject, a compulsory course taught in English accounting for 6 ECTS, that is part of the Industrial Technologies Engineering degree (total 240 ECTS). The subject addresses the principles of chemical processes, the fundamentals of materials and energy flow analysis, the basis of chemical reaction engineering, and a summary of process system engineering. This course is delivered in the first semester of the fourth year in the School of Industrial Engineering, a Polytechnic School at the University of Cantabria, Spain.

The learning outcomes are i) apply and execute basic calculations to solve mass and heat transfer unit operations and ideal reactors, ii) create and interpret chemical process designs at a preliminary level, iii) apply modern process simulation tools to industrial process subsystems synthesis and analysis. Students apply the above-mentioned outcomes to an industrial-scale case study working in teamwork. Additionally, specific skills and learning outcomes of an English subject are promoted.

In previous articles [1-3] the authors described the innovative practices, implemented in several subjects of the Chemical Engineering degree, that are relevant to improve the learning process in an Engineering course. From this background, the course is organized under a PBL approach applying the tactics shown in Figure 1.

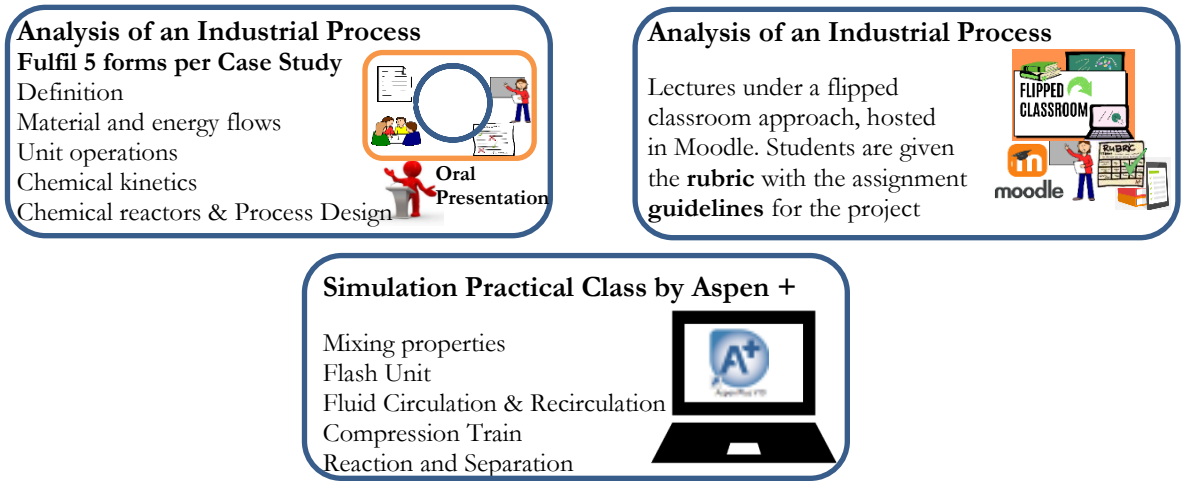

Figure 1. Learning activities applied to the Industrial Chemistry course

The course has a significant number of students (40) and four Erasmus+ students with a high proportion (70 %) of practical classroom hours. Practical classes are designed under a flipped-classroom approach, with slides and videos hosted in Moodle, serving as a suitable complement for the PBL strategy where teamwork is required to prepare short project reports and an oral presentation on an industrial case study. Simulation practical classes consist of five case studies based on mass and energy balances, unit operations, and chemical reactions.

References

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