Área temática: T1. Nuevas metodologías docentes.

Towards the Northern European teaching approach: project-based learning

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Abstract

Northern European countries (e.g. Nordic countries, the Netherlands and others) base their teaching model (at least in master programs) in project-based learning. This teaching/learning method simulates the real-world working environment, where engineers need to work in teams to complete a project. Therefore, students need to solve a case/project applying their knowledge by interacting with their colleagues [1].

Applying project-based learning in a single course implies that the teaching, and then the evaluation, of the course is planned around a case. In the case, which should be fixed by the lecturer or even suggested by the students (depending on the knowledge that the students already have on the subject), the students need to apply the core concepts of that course. Hence, the case needs to be carefully selected so it motivates the students and also allows to develop the knowledge and competences required [1]. If different cases are suggested to the different teams, they should have a similar level of complexity.

Furthermore, the lecturer must be involved in the formation of the teams. This should be carried out in such a way that it allows the formation of teams of similar level (e.g. combining students with high and medium/low grades). This situation is really close to reality, where employees need to work with colleagues imposed by their company. It is worth mentioning that the evaluation process should be designed in a way that it allows to differentiate between those students gaining the knowledge and competences versus those who did not achieve it.

In general terms, the stages to appropriately implement the project-based learning approach are:

- Introduction to core concepts of the course by the lecture.
- Selecting a case which allows to apply and develop the knowledge and competences to be gained in the course.
- Follow-up sessions between students and lecturers where students identify their problems and suggest a future actions plan.
- Continuous evaluation of students' work (e.g. preliminary reports, presentations), where also peer review within student teams can be carried out. Lecturers' feedback should be also provided in these sessions. The use of rubrics designed by the lecture will considerably enrich this process.
- Evaluation of the course through for example a team-report and individual oral examination.

In the light of the above, the project-based learning approach differs considerably to what is normally carried out at Spanish Universities, where the lecturer asks the students to work in groups to develop a topic of the course and then to write a report and present their work for its evaluation. In project-based learning, the students benefit from working in teams where they need to use/combine/develop/apply the core topics of the course (previously introduced by the lecturer) to solve a case resembling a real problem/project. The question here arises if the teaching staff at Spanish universities has the complete teaching toolbox and also the flexibility in their courses to apply this teaching methodology. Moreover, students learning process also requires to be re-shaped. These developments in teaching/learning chemical engineering in Spain requires training of both lecturers and students, as well as energy and time investments to adapt/change teaching material and evaluation processes.

References

[1] Online material at e-learning lab website from the Technical University of Denmark (http://www.elearning.dtu.dk/TEACH/). Accessed: 20th April 2022.