

EDITORIAL: TRAINING IN TEACHING INNOVATION. ENGINEERING 2030**Elena Cano García¹, Beatriz Amante García², María Martínez Martínez³**¹Universitat de Barcelona (Spain)²Projectes d'Enginyeria, Universitat Politècnica de Catalunya (Spain)³Enginyeria Química, Universitat Politècnica de Catalunya (Spain)ecano@ub.edu, beatriz.amante@upc.edu, rosario.martinez@upc.edu*April 2022**May 2022*

Since the Sorbonne declaration in 1998, much has been published about the implementation of the European Higher Education Area, which, among other things, proposes the creation of a system of European credits that measure the student's workload. This places the core of the process in the student's learning rather than in the teacher's teaching. Numerous changes have been taking place, but the culture of teaching innovation does not seem to have penetrated sufficiently (Paricio et al., 2019). On the other hand, the COVID-19 pandemic has accelerated the digital transformation of the university (Martín-Barbero, 2020). However, the use of technologies does not necessarily entail a pedagogical change (Bhagat & Spector, 2017), for which it seems necessary to deepen teaching innovation processes supported by technology.

On the other hand, teaching innovation and research on teaching innovation constitute axes that outline the characteristics of the best valued higher education institutions. Contributing to the training of citizens and professionals through different teaching-learning methods is one of the basic functions of universities, so the commitment to teaching innovation allows strengthening this function (Iqbal et al., 2018).

For all these reasons, this issue includes the best works, the result of the teaching innovation conferences that were held for the closing of the training program "Training in Teaching Innovation. Engineering 2030" taught by the University of Barcelona for professors of engineering degrees from the Catholic University of Northern Chile and the University of <mailto:mailto:ecano@ub.edu> Antofagasta (sponsored by HEUMA CORFO and the team of trainers included professors from the Universitat Politècnica de Catalunya, professors at the Open University of Catalonia, and faculty of the University of Barcelona, which is the program's coordinating institution) and which were held at the end of March 2021. The results presented at the conference were mostly innovations, which had to be adapted to the confinement situation derived from the COVID-19 pandemic generated by COVID-19 (García-Peña et al., 2020).

In the first place, there is an article by Professor Valero, who is an international reference in the matter, which indicates the benefits of active methodologies and their need in the current context. Under the title "Challenges, difficulties and barriers for Engineering Higher Education" the possibilities and limitations of active methodological strategies in hybrid teaching contexts are outlined. Gamification (Lluch et al., 2022) or the creation of communities of practice that learn by developing cooperative learning strategies (Turnbull et al., 2021) are some of his proposals.

Next, there is a work that describes and analyzes the evaluation practices carried out during the pandemic in engineering and mathematics studies at the University of Barcelona. The reality that Professor Puertas shows can

possibly be extrapolated to other institutions or realities, as he draws a panorama of the use of tools both linked to the LMS (Moodle, in this case) and external ones. The link between the evaluation proposals and the development of certain transversal skills is stated, which represents a relevant contribution to the literature on this topic (Ibarra et al., 2020a).

Finally, there are 5 articles related to the experiences developed.

Cano and Rojas, under the title "Increase in academic performance due to the application of cooperative learning strategies: a case in civil engineering", show the effects that the implementation of active methodologies has on performance, learning pace and motivation. Although the proposal is made on a module of a subject, combining the lecture session with the online cooperative learning workshop session implies improvements in participation, motivation, the pass rate, previous performance, and the pace of learning, which suggests its extension to other modules or subjects.

The authors Peceño, Lluch, Bonilla, Cortes and Bakit, with their contribution "Students' perception of the digital tools used in methodological strategies associated with online teaching in the context of pandemics: a case of analysis in the North of Chile", help a greater understanding of students' perception of the access, use and usefulness of digital tools used in online teaching during the pandemic. This analysis is very useful for adjusting online teaching according to the needs of students.

The following contribution, which is a choral work by Lluch, Balbotín and Sullivan about the increase in cooperative learning and student motivation with gamification strategies, explains a case in Industrial Civil Engineering in which gamification is implemented to solve its own problems. of science-based engineering, from the integration of two key subjects of the Industrial Civil Engineering career. As a result, motivation, teamwork, good performance in learning and evaluation activities, and student satisfaction are achieved.

Professors Willans and Galván emphasize the importance of designing activities in which interactivity with the teacher, with the resources and among the students favors greater academic retention and an improvement in learning achievement. Their contribution offers clues for future designs online or in hybrid mode.

Finally, Fernández and Espinoza address cooperative work in their contribution "An inverted classroom experience in the context of a pandemic: cooperative work as a strategy for meaningful student learning." The article demonstrates the need to implement significant learning experiences that mix virtuality and presence based on practice and with the provision of feedback as a key element for the continuous improvement of student learning. Specifically, within the framework of these active methodologies, the importance of collaborative work or cooperative teaching is reflected for the acquisition of new learning, the increase of new positive attitudes during the teaching and learning process, the improvement of academic performance, the development of teamwork competence and increased student satisfaction and motivation.

All these experiences illustrate contributions that have been designed following several characteristics related to good teaching practices: (a) seek constructive alignment between all elements of the curricular design (Biggs, 2003); (b) design quality learning tasks (Ibarra et al., 2020b); (c) place the student at the center of the learning and evaluation process (Carless & Boud, 2018); (d) use technology to favor learning processes (Pinto & Leite, 2020), and (e) guide the teaching-learning process, in a competency-based approach, towards the graduate profile to train professionals and citizens who society demands (European Commission, 2019; Villa, 2020). On the other hand, not only are the designs and curricular developments narrated, but the contexts of action for each case are located, facilitating the analysis of the readers to consider their possible transfer and the results that these implementations have yielded are collected. taking another step towards evidence-based education.

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