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Teaching and learning laboratories as form of building knowledge and developing skills

Batista, Manuela[1]; Gonçalves, Fernando[1]; Chkoniya, Valentina[2]

[1] Escola Superior Naútica Infante D. Henrique, ENIDH, Lisbon, Portugal
[2] University of Aveiro, Aveiro, Portugal

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We are currently witnessing complex and systematic transformations of difficult reading, and the integration of this reality in higher education institutions requires, as Morin (2000) mentions, a reform of thought, inseparable from the reform of education in the 21st century. Learning should encompass knowledge, techniques, productive modes, and being interested in the relationships between things and ourselves (Morin, 2000).

Consistent with this conception, the final report of the study "Promoting education, training and skills across the bio-economy" by the European Commission, from 2022, states that there will be specific skills for which there will be a great demand in the future bio-economy (2030–2050): transversal skills, digital and technological and a good understanding of the fundamental principles of the bio-economy allied to systemic thinking.

Given the above, "the evolution of the educational system – the system itself, knowledge, time, space and culture – will be one of the main challenges of the 21st century" (Delacôte, 2000).

Due to all the changes that are taking place, academic institutions face some challenges:

1. identify, understand, and follow the changes that are taking place;
2. integrate and work on real and global problems;
3. have resources that combine sectoral knowledge with technological solutions;
4. develop the four types of skills of the 4th revolution: problem-solving, self-management; working with people, technology use, and development (World Economic Forum).

Industry 4.0, is disrupting and will continue to disrupt the way we live, learn, and work (Kaka, 2022). This revolution is forcing us to rethink how we teach in our academic institutions, rethink skills, syllabus, methodologies, techniques, and research.

"Therefore, today, teaching and learning methods include emerging information and communication technologies (ICTs), advanced tools, and innovative facilities. Also, teaching and learning methods are focused on developing desirable competencies in today's students to motivate them to propose solutions to today's and future problems" (Chkoniya, Gonçalves, & Batista, 2021).

Rethink the educational system and involve in a more interactive Academy, linked to Industry, capable of leading and designing and Lead R&D&I processes.

The relationship between academia, industry, and society, carried out in the form of "Teaching and Learning Laboratories" can be materialized through projects with different configurations. In this paper, authors present two examples developed in a

Higher Education Institution - Escola Superior Náutica Infante D. Henrique, ENIDH in Portugal.

One of the examples is the MSC-ENIDH Academy. This is an innovative project of a business nature, between ENIDH and an International Shipping Agency, materialized in a project dedicated to maritime transport, especially containerized cargo, its agency, and the business organization of MSC in Portugal. The syllabus was designed with the employer a trainee who completes this training offer immediately add value when they enter the job market.

The other is an international project called eShip, as an example of collaboration between companies and academic institutions. The project involved three business partners and two academic partners, with teachers and students to create and validate business scenarios. In the maritime-port sector ports and logistics chains tend to become more and more technological hubs, with automation and digitalization of traditional processes and interconnected with all stakeholders. This accelerated transformation must be integrated into the ENIDH, to prepare the future workforce.

One of the ways of integrating this complex and constantly changing reality can be through these "teaching and learning laboratories" that improve the process of building knowledge and developing skills. In terms of research, development, and innovation, it has been possible to involve teachers and students, in interactive academies capable of leading and design and Lead R&D&I processes.

It has been possible to build knowledge and develop skills in some curricular units (Maritime and Port Economics, Port Management, Environmental Management, Logistics, and Port Information Systems) with the introduction of current and real problems in the maritime-port sector by using creative learning techniques including Hypothetical scenarios, Improvisation, Analogies, Brainstorming sessions. For example, through the implementation and the execution of pilots and "teaching and learning laboratories", as a learning model focused on building knowledge about the shipping market, green shipping and digital transition, and new products or services. This type of laboratory promotes cooperation business, research, and education and allows students - testing the solutions proposed in a logic of "on job training"- to apply their knowledge and skills in a real experimental context, improving many of the academic skills, in a contextualized interdisciplinary learning (O'Neil et al., 2020).

Data for the elaboration of freight index ratios and key performance indicators, data

analytics, and maritime trends, among others, such as the promotion of lectures, seminars, conferences, and the publication of indexed scientific articles add value to the maritime-port sector. The academy and companies creating knowledge, tools, services, and development of new skills that mitigate social problems, can be a very beneficial triangle for the sustainability of the planet. This vision can be implemented through teaching and learning laboratories, centered on real sectoral problems, in a new conception educational system.

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