



OPEN WORKSHOP

SHARING GOOD PRACTICES IN THE FIELD OF CREATIVE LEARNING AND BIO-ECONOMY FROM INVITED AND PARTNERS' ORGANIZATIONS

BOOK OF ABSTRACTS



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Symeonidou, Antonia; Fiore, Mariantonietta; Colantuono, Fedele; Audiello, Danilo; Burnard, Pamela

INTRODUCTION

We are delighted to present this exceptional compilation of abstracts, showcasing exemplary creative teaching and learning practices. As we delve into the pages of this book, we embark on a journey that celebrates the transformative potential of creative learning in higher education institutions (HEIs) and its paramount importance in shaping the future of the bioeconomy.

The dynamic landscape of the 21st century calls for innovative approaches that transcend traditional boundaries, and this collection demonstrates the power of creative teaching practices to address contemporary challenges. We explore the descriptions of each case, where scholars have harnessed the potential of creative learning methodologies to foster engaged and dynamic educational experiences.

1. Creative learning through collaborative online international platforms and use of case studies to address sustainability problems: this case proves how sustainability problems in curricula are skillfully tackled by the collaborative potential of international platforms, allowing students to engage in cross-cultural dialogues and develop their problem-solving abilities.
2. Fostering creative and critical learning on University Social Responsibility – the ESSA project revisited: this case offers a reflection on what universities can do to improve communities through teaching and research, and to promote equity, human rights, and conditions for their staff and students' well-being.
3. Creative learning for boosting bioeconomy within HEIs' curricula: between floating and immersing: this case explores how creative learning enhances the understanding of bioeconomy concepts and encourages students to float freely amidst a sea of possibilities.
4. From passive to active: going beyond traditional to enhance engagement and learning outcomes of finance students: this case delves into the transformation

of traditional finance education, illuminating the path towards active learning methodologies that foster greater student engagement and improved learning outcomes.

5. Case study competition as an example of the interdisciplinary and immersive teaching practice: this case allows to find out how the vibrant world of the case study competition can transcend disciplinary boundaries, providing students with immersive learning experiences that cultivate creativity and critical thinking.

6. Teaching and learning laboratories as a form of building knowledge and developing skills: this case uncovers the pivotal role of teaching and learning laboratories as fertile grounds for nurturing knowledge, skills, and innovative thinking.

7. Smart technologies in support of creative teaching-learning processes: this case refers to the era of smart technologies, where creative teaching and learning are amplified by digital innovations that enhance student learning experiences.

8. Teaching entrepreneurship for bioeconomy - enhanced curriculum for European HEIs: this case discusses an example of an enhanced curriculum for European HEIs that nurtures entrepreneurial mindsets and equips students to drive innovation in the bioeconomy domain.

9. Translation of the Ecological Behavior Scale to European Portuguese: A case study of creative learning methodology to improve the green skills of undergraduate psychology students: this case refers to a journey of skilful translation, where a creative learning methodology is applied to amplify the green skills of undergraduate psychology students.

10. Creative Problem-Solving practices amplifying threshold concepts of 'green', 'circular' and 'bio economy': emerging evidence from an instrumental case study of modules involving undergraduate Italian economics students: this instrumental case study explores how creative problem-solving practices amplify threshold concepts of 'green,' 'circular,' and 'bioeconomy' for undergraduate economics students in Italy.

These inspiring cases provide glimpses of how creative learning can profoundly impact the landscape of higher education. By nurturing critical thinking, fostering interdisciplinary collaborations, and instilling a sense of curiosity and wonder, creative learning unlocks the potential of students to become proactive contributors to the evolving bioeconomy.

In the context of the project “Creative Learning for Boosting Bio-Economy within HEIs’ Curricula”, the necessity of incorporating creative teaching and learning practices becomes even more evident. As the bioeconomy emerges as a pivotal force in addressing global challenges, it demands individuals with the capability to think imaginatively, devise innovative solutions, and embrace sustainable practices. In essence, the demands of the bioeconomy require graduates with a unique blend of expertise from various disciplines and the ability to approach challenges with a creative and integrative mindset. Creative pedagogy emerges as the key that unlocks students’ full potential, transforming them into agile, innovative, and forward-thinking professionals poised to contribute meaningfully to the dynamic landscape of the bioeconomy.

The developing field of bioeconomy presents a multifaceted landscape that demands expertise from diverse disciplines to tackle its complex challenges and harness its abundant opportunities. Bioeconomy necessitates a holistic understanding transcending traditional boundaries, encompassing biology, ecology, economics, technology, policy, and more. To effectively equip students with the skills and knowledge essential for thriving in this interdisciplinary arena, traditional pedagogical approaches alone may fall short. By embracing creative pedagogy within bioeconomy education, higher education institutions can empower students to navigate the intricacies of this burgeoning field. Creative pedagogy encourages educators to design learning experiences that transcend the silos of single disciplines, allowing students to engage with diverse perspectives and methodologies. By blending knowledge from multiple fields, students develop a well-rounded understanding of the interconnectedness of bioeconomy domains, thus becoming more adept at approaching real-world challenges from a comprehensive standpoint. Moreover, creative pedagogy cultivates a culture of curiosity and experimentation, encouraging students to explore unconventional solutions and think outside the box. In the bioeconomy, where innovative and sustainable practices are essential, fostering creative thinking is a catalyst for discovering groundbreaking pathways and driving positive change. Furthermore, creative pedagogy bridges the gap between theory and practice by integrating experiential learning opportunities and real-world case studies into the curriculum. Students actively engage in prob-

lem-solving scenarios that mirror the bioeconomy's complexities, honing their critical analysis, collaboration, and adaptability skills.

This book is evidence of the profound significance of creative learning in preparing tomorrow's leaders, researchers, and problem-solvers. We hope these examples of creative pedagogies will guide educators, inspiring them to embrace and champion creative learning within their educational settings.

Book of Abstracts

Case studies on creative learning in
bio-economy

1

Creative learning through collaborative online international platforms and use of case studies to address sustainability problems

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Keywords: Teaching. Case study methods. 21st century competencies. Bio-economy. COIL. Project based learning. CL4Bio.

Acknowledgements. The authors thank Columbus Hub Academy for their expertise and assistance throughout all aspects of the project.

Funding. The i4efficiency project is funded under EEA Grants, a multiannual financial mechanism sponsored by Iceland, Liechtenstein and Norway. Environment Programme.

In the fast-changing era when new trends at high-speed impact society and future jobs, humans continue to evolve through the learning process by developing innovative mechanisms to improve education, that holds the power to transform and enrich the quality of life in modern society (Chkoniya, Gonçalves, & Batista, 2021; Nobre, Kumar, Kastanakis, & Paul, 2023). The challenge for educators is to design programs capable of fostering a range of competencies fit for wicked sustainability problems (Davidson, Prahalad, & Harwood, 2021; Tejada-Gutiérrez, Koloszko-Chomentowska, Fiore, & Spada, 2023; Zbieć, Franc-Dąbrowska, & Drejerska, 2022). To succeed in modern-age jobs, students need to solve problems creatively, work in teams, communicate on social media, learn to use new technologies and deal with a big amount of data. Critical thinking, communication, collaboration, and creativity are the top four 21st century competencies that students should acquire for three primary reasons: (a) these skills are difficult to teach and assess, thus they are seldom included in the curriculum; (b) these skills are essential for all students in the era of globalization; and (c) these skills are essential for any career (Kousloglou, Petridou, Molohidis, & Hatzikraniotis, 2023; Okrostsvardize & Bzhalava, 2020; Touzard, Noriega, & Rugel, 2023). How research and scholarship are co-produced, co-performed, and proclaimed as particular kinds of knowledge and truths in and beyond the academy is radically changing (Burnard, Mackinlay, Rousell, & Dragovic, 2022). Project Based Learning is an essential practice that empowers students and builds these skills (Baird, 2019). And through learning experience platforms, participants in the learning process can identify specific skills or knowledge gaps by accessing an analysis of their teaching-learning activities and using suggestions for action to improve their achievement (Melnikova, Batuchina, Zascerinska, & Ahrens, 2023).

This paper presents empirical information on the benefits of online international platforms and case studies used in the education process, highlighting challenges for their effectiveness using an international collaboration project entitled "Sustainability – Best Practices from Georgia and Portugal". This project was a joint initiative of the University of Aveiro (Portugal), Ilia State University, and Ivane Javakhishvili State University (Georgia) mediated by an online environment through the Columbus Hub Academy platform with the involvement of i4efficiency (Intelligent

integration identifier and logistics efficiency project financed by EEA Grants).

This paper focuses on exploring the relationship between Collaborative Online International Learning (COIL) atmosphere with the case study hands-on methodology and Higher Education Institutions (HEIs) students' modern world sustainability problems solving capacities, aiming to provide suggestions for cultivating students' creativity, critical thinking, communication, and collaboration in an online environment. This study is based on a literature review and survey conducted with students who participated in the project. The main conclusions drawn from the study are as follows: 1) a more creative collaborative atmosphere can help to effectively develop sustainability problems solving capacities, and 2) the impact of a creative environment on students' sustainable behavior is not always immediate and may have a delayed effect, and 3) creative learning in international environment blooms students' 21st century competencies.

Research findings have pedagogical value for designing creative learning for boosting bio-economy within HEIs curricula.

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2

Fostering creative and critical learning on University Social Responsibility – the ESSA project revisited

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Keywords: University Social Responsibility, Ecological Audit, Experiential learning, Service-learning

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Despite being a trendy concept, university social responsibility (USR) is at the center of discussions about the role and the goals of the modern university (Zgaga, 2009). It involves concerns around the education of “public-minded alumni” (Chase, 1023, p. 520), as well as the need to be inclusive of diversity in terms of both disciplines and students. It incorporates a vision of what universities can do to improve communities through teaching and research. It implies respecting fair and ethical standards within its walls and interacting with other organizations and the broader community. It includes an actual commitment to social and environmental sustainability that goes beyond words and permeates its practices. It means promoting equity, advocating for human rights, and creating conditions for its staff and students' physical, mental, and psychological health and well-being (Amorim et al., 2015). As such, USR is not merely a superficial and reputational tool but is at the core of what a university (really) is (Menezes, Coelho & Amorim, 2018).

The ESSA project was an Erasmus+ project involving a partnership between the University of Edinburgh, Kaunas University of Technology, and the University of Porto together with the respective students' associations, the National Union of Students in the UK, and the European Student Union. The goal was to create open educational resources for trainers and students in Social Responsibility Audits; students from the three participating universities attended a program led by trainers and then participated in a one-week intensive, immersive, and cross-national audit of a university. The design of the process is depicted in Figure 1. The process started with the development of an ecological and situated model of USR, based on previous work developed by part of the team in a previous Erasmus+ project, EU-USR (Menezes, Coelho & Amorim, 2018). This underpinned the development of a training course for trainers, with participants from the three universities (staff and teachers) attending a one-week training at the University of Porto (Coelho et al., 2019). Then, each university recruited students who attended a one-week training delivered in a blended mode on Social Responsibility Auditing. Finally, a selected group of 6–7 students implemented a real Social Responsibility Audit in one of the participating universities – thus, turning the campus into a real living lab where the students had the opportunity (i) to conduct an audit in a real-life context, and (ii) to reflect on their experiences guided by an e-portfolio, where they collected evidence

and considered what it meant to be a participant in the project. As such, the ESSA training was implemented under the principles of service learning. As we stated elsewhere:

“Although ESSA is not a completely typical service-learning project, in particular when it comes to working “in and with communities,” it is important to keep in mind that universities are (also) communities, and ESSA student auditors worked in and with universities to improve their social responsibility, with goals of civic learning being at the core of both individual students' and organizational learning” (Coelho & Menezes, 2021, p. 3).



Figure 1. ESSA project design.

In this presentation, we will discuss the significant achievements of the project, namely: the creation of a community of people and institutions committed to USR as a broad, transversal, and central goal of HEI; the development of a learning perspective that is experiential, situated and based on real-world; the emphasis on students' empowerment and intercultural competence, based on a high-level challenge that demands high levels of engagement, from the students but also the university; and the actual change in individuals and institutions.

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3

Creative learning for boosting bioeconomy within HEIs' curricula: between floating and immersing

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Keywords: Creative learning, Bioeconomy, HEIs' curricula, Floating, Immersing.

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Bioeconomy and sustainable development became two central pillars of many countries' national policies (Issa, Delbrück, & Hamm, 2019). By facing environmental challenges, the bioeconomy is intended to have socioeconomic benefits, such as fostering economies' competitiveness, stability and meeting the rising demand (Zabulioniene & Pranskuniene, 2021). Taking into consideration the importance of bioeconomy it is crucial to prepare the actual students as they will be the "future decision makers and a key future workforce shaping and enabling it." (Masiero et al., 2020, 1925). So, attracting students to this area is fundamental, making them more interested and with more awareness.

In order to better understand the possible challenges and possibilities of the diversity of creative learning for boosting bioeconomy within HEIs' curricula learning, it is presented the theory "Submerging interactivity" developed by Pranskuniene (2015). This theory let us to rethink the boundaries of learning, even the case of analysis was chosen for museum education, but it still could be useful to creative learning for boosting bioeconomy within HEIs' curricula as well.

"Submerging interactivity" expresses the floating and immersing circle passing through four stages: boredom, seeking to avoid boredom, activation and overdosing is presented as the superficial expression of education. The concept of "the wheel of boredom" emerged in this interaction. Boredom occurs as characteristic of traditional teaching methods – its environment is monotonous and lacks stimuli. Therefore, the seeking to avoid boredom occurred not by chance. Interest is directly related to active activity, i.e., activation. Thus, activation helps escape boredom since it is interesting; it stimulates more actively. However, when students get too high doses of activation, they overdose, resulting in boredom again. Thus, the category of "overdosing" appears as a complex challenge, able to "draw" it into "the wheel of boredom".

Floating begins with boredom, educators perceive the problem, so they seek to avoid boredom and make educational efforts focusing on activation. However, if the purpose of activation is formal, this activation gives only temporary results, and efforts to increase formal activation leads to an overdosing, which leads to the return to the original state of boredom. It spins "the wheel of boredom". So, as museum visitors, students float on the surface of the education: it's boring, it's interesting, it

is boring again. So, to prepare students for the future, creative learning must go further, and contribute to immersing.

Immersing arises in the context of hooking, (self)involving, wakening of the doubt is presented as the expression of in-depth education. The category of hooking is directly connected with students, in particular, seeking their deeper interest. But education wants not only attract students, but also expecting to their get involved in knowledge. Then, wakening of the doubt appears as initial possibility of critical thinking, allowing the student not only to be hooked, (self)involved, but also to have the possibility to doubt. The further possibility to raise questions and look for answers by themselves is given by this stage, which allows not only the possibility to change/influence education but also an endless immersion possibility.

Thus, every student would have the possibility to bring their understanding, and to present their personal version, thus, developing a new view; and there would be virtually no rules, how to do it, and classes could become a free space of self-expression. Thus, the main subcategory of immersing (revealed by hooking, (self) involving and wakening of the doubt) is formed as process of in-depth education, offering an in-depth solution of problem, caused by boredom. It means that immersing seeks for in-depth experience of students and deepening education and stimulates students to reflects and act according more in the future.

The theory of submerging interactivity is important, that not only demonstrates possible constructivist principles application variety, but also reveals today's transitional situation in the context of education theories application (Pranskuniene, 2015). Activation as a superficial activity is not enough and can even be counterproductive, resulting in overdosing and more boredom. Creative learning must find a way to create real immersive activities, which hook the students, gets more (self)involvement and, as a final goal, sow doubt. Only trying to solve these doubts, students assume a central role as future stakeholders in bioeconomy.

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4

From passive to active: going beyond traditional to enhance engagement and learning outcomes of finance students

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Keywords: finance courses, engagement, active participation, real-world applications.

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This case study presents the experience of integrating a combination of innovative pedagogical approaches to enhance student engagement and learning outcomes in undergraduate Finance courses. The motivation to adapt the pedagogical methodologies is based on the evidence that the implementation of creative teaching methodologies is fundamental for the engagement of students (Anderson et al. 2022) and for more consistent and effective teaching in the classroom (Kaufman & Beghetto, 2009). Moreover, it is important to include in the evaluation process some creativity, which can include surprising ideas or solutions (Plucker, Beghetto, & Dow, 2004). Today it is clear that, after a long period of time locked up at home, when all the connections with the world were made through a screen, our students failed to develop important soft skills, like capacity to focus, time management, critical judgement, independent learning, collaborative and teamwork, and even communication skills. This is even more decisive when we need to reach out for undergraduate final year students enrolled in highly technical and demanding Finance courses.

In response to the need of enhancing student engagement and to the evolving demands of the Finance industry and education, we decided to explore new approaches to teaching finance concepts and methods, under the scope of two finance courses of the undergraduate degree in Finance of the Higher Institute of Accounting and Administration of the University of Aveiro - Analysis of Investment Projects and International Finance. These courses are functioning on the first and second semester of the third year, respectively, with the same teacher and attended by the same class, each year.

Although evaluation is usually the end of the teaching process, this is where the innovative methodologies started. For both courses, at the beginning of the semester, students are presented with an evaluation path consisting of 2 individual written tests and 2 group tasks, with different weights in final grade. During the semester students are challenged, and should they accept the challenge, they are able to follow a different evaluation path, partially or totally substituting one of the mentioned assessment elements, making the student responsible for the path to follow, which enhances their maturity and helps to outline their mindset (Hass, Katz-Buonincontro, & Reiter-Palmon, 2016). These challenges may vary from preparing a one class workshop on a matter related to the course but not deeply

explored, presenting a real-world application of a theme discussed in class, or correctly solving a problem in class within a short period of time, using all the information at hand.

Regarding the teaching process itself, due to the different characteristics of the above-mentioned courses, different approaches are also adopted. In the Analysis of Investment Projects course students are expected to apply several analysis techniques to different investment contexts. They should be able to know the method but stay alert to the details. Students are offered real examples, that get more complex as the semester evolves, incorporating storytelling techniques, which helps them relating to the material and retaining information. Indeed, several authors find evidence that storytelling techniques improve the thoughtful, performance, enthusiasm and motivation of students, such as Ilter (2016), Saindra and Mutiarani (2019), and Nabilah, Kurniawan, and Ashyar (2022). Students are also encouraged to actively participate on the resolution of some problems, using technology and online resources, like kahoot quizzes, which has a great receptivity by students. Indeed, there is evidence that this technique has been increasingly used by teachers as an interactive substitute to traditional activities (Wang & Tahir, 2015; Kohnke, 2019; Moorhouse & Kohnke, 2020; Kohnke & Moorhouse, 2022). The International Finance course is more prone to encourage quick problem-solving challenges in class, where students are engaged in collaborative tasks like searching for real time information, as exchange or interest rates to incorporate on practical examples or participate on quick polls to introduce some new subject. Methodologies that stimulate problem-solving, reasoning, and curiosity are more effective than just following measures to obtain answers (Safitri, Darmayanti, Usmiyatun, & Nurmalitasari, 2023). To improve their awareness of the world, students are asked to randomly prepare for the next class the “news of the day”. It is a 10-minute group task, where students should report current news in a creative manner – podcast, interview, breaking news radio program, WhatsApp talk or notice feed on social network, are some of the examples chosen until now.

Despite these are all time-consuming activities, it was possible to observe that, as students became more actively involved and timely and regular feedback was given, the learning process tended to become more effective, ultimately reflected on

learning outcomes and final grades.

In conclusion, this combination of methodologies creates a conducive environment for students' awareness of the real-world and applicability of the knowledge they acquire, contributing to a deeper understanding of the subjects in matter. Additionally, students are empowered to identify areas for improvement and cultivate self-motivation, becoming more independent and proactive learners. Overall, incorporating these teaching approaches not only improves the learning experience and results, but also equips students with valuable skills and a heightened sense of purpose in their academic journey.

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5

Case study competition as an example of the interdisciplinary and immersive teaching practice

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The example of the interdisciplinary and immersive teaching practice described in the paper was organised within the Euroleague for Life Sciences (ELLS), a network of leading universities cooperating in the fields of natural resource management, agricultural and forestry sciences, life sciences, animal sciences, food sciences, environmental sciences and rural development, incl. agricultural economics or rural sociology (Euroleague for Life Sciences, 2023b). Case Study Competitions (CSC) offer students a valuable platform to apply their knowledge and skills in addressing practical challenges associated with real-life problems in life sciences and related fields. With an interdisciplinary approach and an international perspective, these competitions allow students to earn academic credits while putting their theoretical knowledge into practice (Euroleague for Life Sciences, 2023a).

The ELLS CSC was organised in Poland within the project financed by ELLS Fund for Incentives – Ref. ELLS fund 2020-11 and proposed by the Bioeconomy Subject Area in 2022. It was focused on local contribution to sustainable development, stressing the role of society while answering challenges of the future. The students' task was to analyse the circumstances and dynamics a rural community faced on their way towards sustainable development. Sokoły rural commune was selected as a case study. It is located in the Western Functional Area of the Podlaskie Region (north-eastern part of Poland). The region's eastern border is also the Polish border with Lithuania and Belarus. The region's population density is 59 people/km², less than half the national average. Podlaskie region is characterised by the highest share of national parks and the second in terms of NATURA 2000 areas in the total area. Legally protected areas occupy 32% of its territory. This region is well-known in the country and Europe because of its unique natural and landscape values, making it very attractive in tourism. The entire region is located in the functional area of the Green Lungs of Poland. The Sokoły commune is situated in its central part. It consists of 48 villages and covers 156 km². The region is characterized by a low degree of industrialization. The basic branch of the region's economy is agriculture and agro-food processing, with the dominance of the dairy industry (Golebiewski, Takala, Juszczuk, & Drejerska, 2019). On the one hand, it determines high efficiency as a result of specialisation, on the other contributes to some environmental issues. The basic idea of the CSC 2022 was to attract teachers (experts) and students of

various fields (specializations). The main purpose was to cover topics of sustainable development in the selected commune. This required the participation and support from the various universities with different types of expertise involved in the ELLS. Students' field of specialization was indicated during the application process and then attendees with different background were selected to form interdisciplinary groups. Background information and activities were provided during the E-learning phase and it was expected that students would begin to work within their teams from this phase. An e-learning phase (planned for 5 working days) and 5 days of onsite activities were planned. Teachers served as moderators and facilitators of the process.

The week-long intensive program in the Sokoły commune took place on 4–10 July 2022. It included lectures by academic teachers from various fields and different universities, but above all meetings with representatives of the local community – local authorities, farmers (*e.g.* milk production). Participants were divided into international groups of members studying in various fields (economics, agriculture, spatial management, environmental engineering, *etc.*).

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The primary objective assigned to the students entailed the preparation of a project or action proposal aimed at fostering local development. The initial day was dedicated to promoting group cohesion and acquainting the students with the municipality. For the following days, a few lectures were provided, but the focal point was the meetings arranged with various representatives of the local community, including the mayor. Additionally, the students had the opportunity to engage in field visits, such as exploring a milk farm or observing the operations of a local traditional cake producer.

The students diligently worked on refining their project ideas, benefiting from valuable guidance provided by on-site teachers. This collaborative effort ensured a truly interdisciplinary approach, as students from different academic disciplines could consult and exchange ideas, enriching their perspectives. Finally, the culmination of their endeavors involved presenting their projects to the mayor, who took the initiative to organize a recording of the event by the regional television network, thereby amplifying the significance of their achievements.

In order to promote interdisciplinarity and foster an immersive learning experience,

the CSC organizers arranged a diverse array of integration activities. These activities included engaging in adventurous pursuits like canoeing, embarking on invigorating cycling excursions, and gathering around a bonfire. Moreover, the accommodation provided in close proximity to the investigated community served a dual purpose: facilitating better integration among students and teachers, while also creating an environment conducive to effective group work and collaborative problem-solving.

The final projects were presented during the ELLS conference, organized in Prague (Czech University of Life Sciences, Czech Republic), 23-24 September 2024. Team of Igor Olech (Warsaw University of Life Sciences, PhD student at the Institute of Economics and Finance, Doctoral School SGGW), Peter Muller (University of Hohenheim) and Chiara Coluccia (Wageningen University & Research) won the prize (1500 euro) for the best case study presented during the conference based on the project “Ecological practices for maize farming in Sokół: an introduction to living mulch”.

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6

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

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Keywords: Laboratories. Teaching. Learning. Sustainability. Creative Learning. Bioeconomy

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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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Smart technologies in support of creative teaching-learning processes

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Introduction

This study aims to investigate the impact of smart technologies in facilitating creative teaching and learning processes. With the advent of the digital era, a diverse array of technological resources has emerged, revolutionizing education methods (Akour & Das, 2020), (Henderson *et al.*, 2017). Smart technologies play a crucial role in this transformation, enabling highly dynamic, interactive, and personalized approaches to teaching and learning materials (Palanisamy *et al.*, 2020).

Smart Technologies

Intelligent technologies encompass systems and devices equipped with automated processing and learning capabilities, as pointed out by Palanisamy *et al.* (2020). These technological advancements empower data collection, analysis, and interpretation, facilitating intelligent interactions with users. Prominent instances of smart technologies include virtual assistants, virtual reality, artificial intelligence, and machine learning, as Akour and Das (2020) highlighted.

Benefits of smart technologies in teaching and learning

Smart technologies offer several significant benefits in the teaching-learning context. One of the main advantages is the personalization of learning. Based on data collected on learners, smart technologies can tailor content and activities according to individual needs, providing a more relevant and effective learning experience.

In addition, smart technologies promote interactivity. Learners can actively engage with the content through simulations, educational games, and immersive virtual environments. This stimulates their involvement and interest, making learning more engaging and memorable (Akour & Das, 2020).

Another benefit is accessibility. Smart technologies can overcome physical and geographical barriers, allowing learners to access content and participate in activities from anywhere and anytime. This is especially relevant in distance education contexts where learners can access educational resources equally (Henderson *et al.*, 2017).

Examples of application of smart technologies in education

Smart technologies have been applied in various ways in the educational context. Some examples are described above.

Virtual assistants: Virtual assistants like Siri, Alexa, and Google Assistant offer valuable support to learners by helping them discover information, accomplish tasks,

and respond to inquiries. They provide prompt and precise answers, enhancing research efficiency and flexibility. Additionally, these assistants offer educational resources like podcasts, as mentioned in the works of (Emerling et al., 2020; Terzopoulos & Satratzemi, 2019; Tsourakas, Terzopoulos, & Goumas, 2021; Kye et al., 2021).

Virtual and augmented reality: Virtual and augmented reality technologies offer captivating experiences that can greatly enhance the learning process. Learners can immerse themselves in virtual environments, explore distant places, interact with 3D objects, and even engage in real-world scenarios in a safe and controlled manner. The metaverse concept, particularly in virtual reality, has gained significance in education. Notably, it has been employed in STEM subjects (Science, Technology, Engineering, and Mathematics) with a considerable adoption rate of 53% (Kukulka-Hulme et al., 2023; Palanisamy et al., 2020; Zainab & Huda, 2020; McGovern, Moreira, & Luna-Nevarez, 2020).

AI tools: ChatGPT-4, ChatGPT, and Bard are the most well-known generative AI tools. They are designed to engage in conversations with their users and are tools that use large knowledge bases. For example, ChatGPT has been trained with 300 billion words (Kukulka-Hulme, 2023). The use of AI tools in education requires the adoption of better pedagogies, including adapting teaching practices, personalizing learning, supporting collaboration, training students, considering ethics, reconsidering assessment practices, and raising awareness of the benefits and challenges (Tahiru & Agbesi, 2021; Tahiru, 2021).

Final considerations

Smart technologies will be crucial in transforming the way we learn and teach. They offer opportunities for personalization, interactivity, and accessibility, making the teaching-learning process more engaging and effective. However, it is important to realize that technology alone does not guarantee educational success. It requires careful planning, teacher involvement, and the smooth integration of technologies into the curriculum. By using smart technologies appropriately, we can create enriching learning environments that stimulate creativity, collaboration, and critical thinking.

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8

Teaching entrepreneurship for bioeconomy - enhanced curriculum for European HEIs

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The bioeconomy plays a pivotal role as a strategic imperative for the European Union. Still, its efficient implementation necessitates a transformative shift in education, specifically focusing on equipping professionals with entrepreneurship skills. These skills are crucial in facilitating the emergence of the bioeconomy, as it requires developing and implementing innovative, environmentally friendly, and economically viable solutions. The current bioeconomy sector requires complex skills and knowledge which can be identified based on a structure of employment (agriculture, forestry, fisheries; food, beverage and tobacco industry; bio-based textiles; wood products and furniture; manufacture of paper and paper products; bio-based chemicals; biofuels; bio-based electricity) across Europe (Drejerska, 2017). Particular sectors require specific skills, knowledge and competencies, for example, in the wood, furniture and manufacturing sector (Gázquez *et al.*, 2021). The existing entrepreneurship training programs do not align adequately with the specific requirements of the bioeconomy sector, thereby hindering its potential for development. Moreover, despite the prominent position of bioeconomy on the policy agenda, there is a notable absence of a common European approach in addressing this issue.

Collaborative development of comprehensive content is at the centre of the FOEBE project enabling students to acquire a holistic understanding of the diverse dimensions encompassing the bioeconomy within the broader context. FOEBE aims at equipping students at Master's and PhD levels with tailor-made sustainable entrepreneurship within the consortium of seven higher education institutions (AgroParisTech FR – coordinator, University of Bologna IT, University of Eastern Finland FI, University of Hohenheim DE, University of Natural Resources and Life Sciences Vienna AT, Wageningen University and Research Centre NL and Warsaw University of Life Sciences PL) under the umbrella of the European Bioeconomy University (EBU) (European Bioeconomy University, 2023).

FOEBE adopts a comprehensive approach that integrates blended learning, combining e-learning and face-to-face sessions. This initiative provides a range of modules which can be taken as additional or elective courses, augmenting the existing curriculum and ensuring compatibility with the programs offered by European higher education institutions (HEIs). The project encompasses various activities, including developing skills portfolios and curricula for entrepreneurship in the bioeconomy. An initial survey was conducted among start-ups in the bioeconomy sector to define the desired qualification and competence profiles, which revealed that bioeconomy entrepreneurs needed transformative knowledge and competencies related to the sustainable valorisation of biomass, the

marketing of biobased products, and managing limited resources (Hinderer & Kuckertz, 2022). A dedicated digital learning platform has been established to facilitate the creation of courses and training materials. The resulting add-on module has undergone testing with two consecutive cohorts of Master's and PhD students from partner HEIs, accompanied by study weeks held in Bologna in 2022 and Warsaw in 2023.

In 2023, the Intensive Study Week was organized by EBU partners, supported with presentation of selected Italian tech startups, done by representatives of University of Foggia and University of Palermo. The program encompassed a series of lectures and group work sessions. These sessions provided students with a platform to engage in the active development and refinement of their ideas for bioeconomy start-ups. Through collaborative efforts and guided instruction, students had the opportunity to explore innovative concepts. The culmination of this intensive work was the final day, where students presented their refined start-up ideas, showcasing their depth of understanding, critical thinking abilities, and entrepreneurial acumen. This structured approach, combining lectures, group work, and final presentations, facilitated the practical application of knowledge, nurturing students' entrepreneurial mindset and preparing them for the dynamic challenges of the bioeconomy sector.

As the second one, the study week in Warsaw built on experiences of the first cohort. For example, the former FOEBE student presented her experience, which was also justified by the fact that her current thesis was linked to previous year experience as well as she worked for the company the students visited next day. The active involvement of alumni in teaching bioeconomy entrepreneurship holds significant importance and benefits for educational institutions. Alumni, as graduates who have successfully ventured into the field of bioeconomy entrepreneurship, possess valuable practical experience and industry insights. By incorporating them into the teaching process, institutions can leverage their expertise to enrich the learning experience for current students. The firsthand knowledge and real-world perspectives shared by alumni not only enhance the relevance and applicability of the curriculum but also provide students with valuable networking opportunities and mentorship. Furthermore, alumni involvement fosters a sense of community and connection between past and present students, cultivating a vibrant ecosystem that encourages knowledge exchange and continuous learning. Consequently, engaging alumni as educators in bioeconomy entrepreneurship contributes to the comprehensive and well-rounded development of aspiring professionals in this field.

Meeting with entrepreneurs working in bioeconomy as well as visiting bioeconomy start-ups were important parts of the week, as it gave a practical perspective of business processes taking place in the sector. Incorporating these activities served as crucial components of the study week, offering invaluable practical insights into the operational dynamics of businesses within the sector. These engagements provided students with firsthand exposure to real-life scenarios and a comprehensive understanding of the business processes occurring in the bioeconomy. By interacting directly with entrepreneurs, students were able to observe and analyze the challenges, opportunities, and innovative practices prevalent in the field. The experiential learning facilitated through these meetings and visits fostered a practical perspective, complementing theoretical knowledge and equipping students with a deeper understanding of the bioeconomy's entrepreneurial landscape. Such experiential activities played a pivotal role in bridging the gap between academia and industry, cultivating a holistic and application-oriented learning environment.

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Adaptation of the Ecological Behavior Scale to European Portuguese: A case study of creative learning methodology to improve the green skills of undergraduate psychology students.

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Introduction

Creative Learning Method (CLM)

The Creative Learning Method (CLM) is an innovative training methodology designed to ignite creativity and foster intentional learning. It draws inspiration from the works of various authors and researchers who have explored the domains of creativity, motivation, and educational psychology. CLM emphasizes the importance of creativity in the learning process, supporting these emphases in the concept of flow and optimal experience (Csikszentmihalyi, 1996). CLM also integrates the principles of intentional learning, where individuals actively engage with the learning material and take ownership of their educational journey, focus on experiential learning and the importance of hands-on activities (Dewey, 1997). CLM additionally recognizes the significance of motivation in sustaining learning engagement, arguing that it is crucial the intrinsic motivation and autonomy, following the self-determination theory (Deci & Ryan, 2000).

Climate change, health, and Psychology

Climate change is regarded as the most serious global health threat of the 21st century and has numerous impacts on both physical and mental health. World Health Organization states that “climate change is the single biggest health threat facing humanity” (WHO, 2021, p. 2) and stated recommendations and priority actions in the COP26 Special Report on Climate Change and Health. It argues that the health community, with the right training and support programs, is an important climate actor that can enable transformational change to protect people and the planet. Therefore, it claims to mobilize and support the health community on climate action, stating that health professionals need to be trained and empowered to recognize, anticipate, and treat the symptoms of the climate crisis – manifested through shifting disease patterns. They conclude that it is important to enable a prepared health workforce by updating health curricula and by providing additional and continued training and support programs on climate change and health while improving professional standards to include criteria on climate and health. These programs should reach the widest range of health professionals across disciplines and specialties.

As stated by Clayton (2019), as well as other authors and entities, psychology professionals can help build understanding of the behavioral and motivational factors associated with causes of climate change. They can also assist governments, communities, and individuals to prepare for and reduce the risks of climate-related events. As experts in behavior change,

sionals can help build understanding of the behavioral and motivational factors associated with causes of climate change. They can also assist governments, communities, and individuals to prepare for and reduce the risks of climate-related events. As experts in behavior change, psychology professionals can contribute to developing skills in understanding and addressing barriers to behavioral change and motivating and supporting the needed changes.

It is necessary to develop and report education and training methods and programs on climate, health, and behavior for health professionals across disciplines, namely psychologists, as experts in behavior change.

Purpose

In today's rapidly evolving climate changes, advancing education and training about green skills for undergraduate psychology students has become increasingly necessary. CLM is a possibility to foster these skills in this population.

The general aim of this work is to describe a case study which intended to improve the green skills of higher education psychology students, by CLM.

Method

Five undergraduate psychology students' group in the third year of the Graduate course Psychology were challenged to choose, define, and develop research work in the field of climate change.

The CLM methodology was used and was initiated with a challenge given to students to develop research work about climate change. The following steps were taken: 1) Definition of the learning objectives - to develop skills and knowledge about research methods and simultaneously about assessment and intervention of ecological behavior; 2) Assess of learners' needs and preferences; 3) Generation of creative ideas; 4) Plan of learning activities – Learning plan defined: performing searching in scientific databases; selecting an ecological behavior validated measure; collecting and consolidating knowledge about properties of the measure chosen; translating the measure to European Portuguese; discussing the translated measure results with peers and psychology teachers; write a report; 5) Provision of resources and materials; 6) Creation of a supportive environment; 7) Facilitation of an active participation - Students developed a focus group with peers and psychology teachers about a translation of a measure of ecological behavior; 8) Encouraging of reflection and

feedback; 9) Adaptation and iteration; 10) Evaluation of the learning outcomes – It was evaluated the achieved learning outcomes through qualitative and quantitative assessment methods to measure progress and gather insights for future iterations.

Results and Discussion

The CLM methodology was adopted, and it reveals promissory to develop skills and knowledge on research methodology and on relation to climate health and behavior. Learning outcomes evaluated allow us to conclude that learning objectives were achieved, because a research work of students was concluded, complying with the quality criteria of a research report; the Ecological Behavior Scale (Kaiser, 1998) translation to European Portuguese was obtained; and knowledge about ecological behavior was developed during learning activities that included focus group with 20 students and 7 psychology teachers.

This case study must be the object of reflection to inspire education and training methods and programs on climate, health, and behavior for health professionals, namely psychologists. CLM should be considered in education and training methods and programs in this field.

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Creative Problem-Solving practices amplifying threshold concepts of 'green', 'circular' and 'bio economy': emerging evidence from an instrumental case study of modules involving undergraduate Italian economics students

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Introduction

Although fostering creativity in higher education is promoted as vital for a sustainable future, recent UNESCO findings indicate the need for strengthening the current understanding and practices in creative pedagogies. To this end, this paper details a case study on the design and delivery of a module exploring essential concepts of 'green', 'circular' and 'bio economy' and the practice of integrating Creative Problem-Solving (CPS). An instrumental case study was conducted in the Spring of 2023 involving a group of students studying in the Department of Economics of University of Foggia, Italy. This research was born within the framework of the CL4BIO Erasmus project aimed to first train HEI trainers in the use of Creative Learning and then ask them to create innovative training materials for topics relating to bio-economy. The University of Foggia carried out the following 2 courses:

- Bioeconomy for inclusive development and green skills (n. 32 hours)
- Creative Learning for green, circular, bio economy (n. 40 hours)

These courses were delivered in English, while the comfort level of the students with respect to understanding and speaking English language ranged from limited to fluent.

Aim

The course established a framework of scientific and practice-based integration of creative skills alongside the analytical skills required for economists facing new career paths. In terms of the threshold concepts, 'Green' refers to the challenging transition process to a climate-neutral economy by addressing the skilling and reskilling of workers and anticipating changes in workplaces of the future (Nemes *et al.*, 2021). While 'circular' refers to a new model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible (Spani, 2020; MacArthur, 2013). 'Bioeconomy,' which encompasses the sustainable use of biological resources and their conversion into valuable products, presents multifaceted challenges that demand innovative problem-solving strategies (Drejerska *et al.*, 2018; Fiore, Conte, & Contò, 2015). However, traditional teaching approaches often fall short in fostering students' abilities to analyze and tackle complex bioeconomy-related issues. Therefore, this study aimed to explore the potential of creative learning methods to address this gap.

Creative pedagogies can trigger unexpected and positive engagements (Burnard, 2013; Burnard, Mackinlay, Rousell, & Dragovic 2022). New learning and understandings can do the same in the realm of multiple creativities (Burnard, 2023). This may be evidenced through authoring change in practices, originating new learning modalities and/or co-authoring new forms of authorship. This leads to meaningful work, positive collaborations and learning communities that prepared for the reality of jobs (Burnard *et al.*, 2020; Burnard & Loughrey, 2022). For the delivery of the module, we engaged the students in exploratory practices mobilised uniquely and effectively through signature creative pedagogies, designed specifically to train students to make both cross- and trans- disciplinary connections and navigate the boundaries between individual and collective creativities.

Cases

1. During the initial session, a Crisis Management exercise was conducted, presenting a rapid succession of unexpected and challenging events known as "black swans." Throughout this session, the students were tasked with developing a Business Model Canvas, aiming to create an adaptive set of solutions to address the challenges presented by the crisis events. This exercise encouraged students to think critically, innovate, and devise strategic approaches to mitigate the impacts of the disruptions on the bioeconomy.
2. Building blocks of bioeconomy were explored using real-life examples to train in transferable skills, such as handling uncertainty, predicting governing factors for the future, forecasting the potential of synthetic biology, brainstorming applications, and safeguarding the proposed solutions to navigate through challenges, and dilemmas.
3. Personal Transferable Skills through Domain-Specific Initiatives and Missions were also emphasized, recognizing the significance of the individual within the circular economy.
4. In the final session of Active Problem Management within bioeconomy, students were asked to act as stakeholders and propose specific contributions to tackle the problems. The following themes provided a framework for problem exploration and idea development: Corporate and Social Responsibility, Biodiversity, Globalization, Fragility of Value Chains and Paradigm Shift in Assessing Growth.

Learning Outcomes

At the end of the module students were able to:

- explain the conceptual framework for using renewable natural capital to transform and manage land, food, health and industrial systems, with the goal of achieving sustainable wellbeing and harmony with nature;
- analyze the governing factors that should drive the design to eliminate waste & pollution, circulate products & materials, and rejuvenate nature;
- propose and discuss the viability of sustainable economic solutions, factoring in the challenges of tomorrow's society;
- apply creative problem-solving practices and tools in their own project delivery and presentation;
- demonstrate elevated presentation skills, converse in debate challenges, collaborate as teams to resolve problems and propose ideas and confidently and present themselves.

We propose a 'mixed-methods' approach for future. Quantitative data will be gathered through pre- and post-assessments to measure the students' problem-solving. Qualitative data will be collected through observations, interviews, and reflective journals to gain insights into students' perceptions and experiences with the creative learning activities.

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