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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

*Symeonidou, Antonia¹; Fiore, Mariantonietta,¹ Colantuono, Fedele¹; Audiello, Danilo¹;
Burnard, Pamela²*

¹ University of Foggia, Foggia, Italy

² University of Cambridge, Cambridge, UK

Keywords: Keywords: Creative problem solving, creative pedagogies, creative learning, creative thinking, green skills, bio-economy, problem and ideas management, Italy

Funding. CL4BIO project - "Creative learning for boosting bio-economy within HEIs' curricula" Call 2022 Round 1 KA2, Erasmus+, KA220-HED - Cooperation partnerships in higher education Open call for visiting professors, researchers and fellowships 2022/2023, Erasmus+ Mobility grants at the University of Foggia

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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