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Teaching entrepreneurship for bioeconomy - enhanced curriculum for European HEIs

Marcin Zbieć¹, Drejerska, Nina¹, Sobczak-Malitka, Wioleta¹

¹ Warsaw University of Life Sciences, Warsaw, Poland

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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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