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Entrepreneurship education at the Biotechnical Faculty

The University of Ljubljana, Slovenia

Abstract

The Biotechnical Faculty at the University of Ljubljana (UL) promotes entrepreneurial thinking among students and staff through both curricular and extra-curricular activities. Key courses include Entrepreneurship for master's students and Bioeconomy, which covers commercialization and business modelling. Extra-curricular activities include a Challenge Lab with EIT Food, hackathons, and European student competitions. These initiatives respond to growing demand from students and industry for entrepreneurial skills. While student-led start-ups remain rare, interest in entrepreneurship has increased. Successful alumni companies include Juicy Marbles and Future Foods, the latter awarded by the University in 2024. A key challenge was integrating a compulsory entrepreneurship course into the curriculum, which required removing another course. Faculty aim to inspire students to explore future opportunities, recognizing that entrepreneurial training may spark action later in their careers.

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HEInnovate dimensions affected:

European Commission | OECD

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Institutional Profile

The **University of Ljubljana** (UL) is the largest higher education institution in Slovenia. In 2023, it had more than 37,000 students and close to 7,000 employees.[1] It is also the largest research institution in Slovenia, with more than 4,600 registered researchers and 30 % of researchers in Slovenia[2]. The UL has 26 Faculties and Academies, spanning from the Academy of Fine Arts and Design to the Veterinary Faculty. The University's strategy includes the objectives of "developing education for creativity, innovation, criticality and social responsibility, embedded in the domestic and international environment" as well as "support for the transfer of knowledge",[3] which indicates entrepreneurial ambitions.

As regards **innovation and entrepreneurship**, UL has dedicated programmes to educate and support entrepreneurial students and staff. Important offers include a master's programme in Entrepreneurship by the School of Business and Economics[4] as well as training and support measures by the Office of Technology Transfer[5].

The **Biotechnical Faculty** provides education and research in "the sciences of living nature (…) as well as agriculture, forestry and fisheries (…) and the related production technologies", that is in a broad spectrum of biotechnical subjects. The faculty, established in 1974, "facilitates and encourages interdisciplinary and multidisciplinary cooperation in education".[6] In 2023/24, the Biotechnical Faculty had approximately 3,000 students. It runs entrepreneurship courses and activities to support entrepreneurial students and staff. The School of Business and Economics and the Biotechnical Faculty are preparing a joint master's programme in Bioeconomics for winter semester 2025/26. This programme will also address innovation and entrepreneurship.

This case study focuses on how the University of Ljubljana's Biotechnical Faculty fosters entrepreneurial thinking and acting of students and staff through education and innovative activities.

Initiative Description

Problem Definition / Context

The Biotechnical Faculty introduced curricular entrepreneurship courses and extra-curricular events in order to enable students to obtain basic entrepreneurial and management skills. Prof. Luka Juvančič from the Faculty observed that in the past 20 years,

[1] See https://www.uni-lj.si/en/university/about-us/university-in-numbers.

[2] See https://www.uni-lj.si/en/university/about-us.

[3] See https://www.uni-lj.si/en/university/about-us/strategies.

[4] See http://www.ef.uni-lj.si/graduate/ent.

[5] See https://www.uni-lj.si/en/research/innovation-and-knowledge-transfer.

[6] See https://www.bf.uni-lj.si/en/about-the-faculty/about-us/.

students' interest moved more and more towards leading an own company, towards creating individual impact, away from working in the government.

Actions Taken

The Biotechnical Faculty offers several curricular and extra-curricular courses and events to arouse entrepreneurial thinking and acting in students. Major offers include curricular courses "Entrepreneurship" and "Bioeconomy" as well as a Challenge Lab in cooperation with EIT Food.

- Introduction of compulsory course "Entrepreneurship" (3 ECTS) for master's students in Biotechnology and Food Technology

Curricular course "Entrepreneurship"

The course Entrepreneurship[7] is a three ECTS compulsory course for two Master of Science study programmes at the Biotechnical Faculty: Biotechnology and Food Technology. It is for first year students, which indicates that the Biotechnical Faculty considers entrepreneurship as being of basic importance. The faculty introduced the course in the most recent iteration of the study programme accreditation, approximately in 2014. The faculty introduced it because the job market is seeking for entrepreneurial capabilities, and the students want it. In the process of evaluation of the master's degree programmes, two study programmes (Food Technology, Biotechnology) have identified this need and have supplemented the degree programme with the subject Entrepreneurship. Approximately 80 students participate in the course per semester: between 40 and 50 students of Biotechnology as well as 30 and 40 students of Food Technology.

Entrepreneurship
Course number: BT209
Study programme: Biotechnology
Lecturer: Aleš Kuhar
Course of Study: Systems Biotechnology, 1st semester
Lectures 20 hours - Seminars 10 - Seminar exercises 10 - Credits 3 kt
Course content:
Entrepreneurship in modern economies. The importance and role of entrepreneurship. Stages and components of the entrepreneurial process. Specific features of biotechnology companies.
Concept of enterprise. The entrepreneurial environment. The process of setting up a company. Company structure. Systematics of companies and legal forms of companies in Slovenia. Systematics by organisational structure of the company.
Accounting. Principles of double-entry bookkeeping. Balance sheet (principles and structure). Profit and loss account (principles and structure). Financial statements and business information databases.

[7] See https://www.bf.uni-lj.si/sl/studij/studijski-programi/predmetnik/20210414101145/20210414101145/podjetnistvo, in Slovenian.

Business performance analysis and investment economics. Productivity, economy, added value. Performance indicators and performance indicators.
Elements of business planning. Business plan formulation. Designing the competitive advantages of an enterprise.
Marketing management of enterprises - basic concepts. Consumer buying/consumption behaviour - Elements of the marketing web. Product strategy. Cost and value pricing. Distribution strategy. Marketing communication and promotion.
Source: https://www.bf.uni-lj.si/sl/studij/studijski-programi/predmetnik/20210414101145/20210414101145/podjetnistvo

- Introduction of elective course "Bioeconomy" (3 ECTS) including entrepreneurial sessions and a biobased challenge

Curricular course "Bioeconomy"

"Bioeconomy" is a three ECTS elective course for master's students in Biotechnology. It consists of seven lectures and seven seminars, focusing a challenge that students solve in group work. The course includes dedicated entrepreneurial sessions: lectures on commercialisation and business models, financing models, biobased start-ups, organisational and legal aspects as well as seminars on value chain organisation and business model design. The faculty introduced the course in 2017. Between eight and 16 students have taken part per semester. As the course is open for Erasmus students in applied life sciences from other countries, it is taught in English.

Course: Bioeconomy
* = hybrid option available by agreement
Lectures:
1 (Circular) bioeconomy: context, principles, performance – 3 hours
2 Exploitation of (technological and economic) potential of biomass, role and importance of biorefineries. Byproduct utilisation, renewables in food industry. Shell biorefinery; extraction of high VA compounds from microalgae – 4 hours
3 Innovation process 1: from basic research to pilot demonstrations
Lignocellulosic biomass: composition, biorefining techniques, applications (nanocellulose) – 4 hours
4* Innovation process 2: from pilot demonstration to commercialization; business models in the bioeconomy – 3 hours
5* Assets and transition pathways related to bioeconomy development; financing models and enabling environment in bioeconomy. Unveiled potentials of biopolymers; insider's view on biobased startups - 4 hours
6 Organizational and legal aspects of innovation in the bioeconomy; socio-economic aspects of the transition to the bioeconomy. Introduction to SRIP Circular Economy, national BISC-E competition – 3 hours
7 Course closure; evaluation of acquired competencies and exchange on future steps - 1 hour
Seminars:
1 Introduction to the study challenge: formation of groups, selection of sources of biomass, work design, agreement on the work phases and milestones - 1 hour

2 Workshop 1: Location of biomass source; quantification; characterisation and technological properties - 2 hours
3 Workshop 2: Identification and evaluation of relevant biorefining concepts - 1 hour
4* Milestone 1: Quantification, characterization, description of the biorefining process (group presentations)
5* Workshop 3: Identification of actors potentially interested in participation in the projected value chain - 1 hour
6 Workshop 4: Value chain organization, business model design, implementation steps - 2 hours
7 Study challenge: final presentation - 4 hours
Source: University of Ljubljana, Biotechnical Faculty

The Bioeconomy course includes a students' challenge on the conceptual design of a value-added chain of biobased products. Acting in this challenge may trigger entrepreneurial thinking and acting, while it is not explicitly about entrepreneurship. The aim of the seminar is to strengthen students' understanding of the organisation of a new biobased product development, considering both technological and entrepreneurial aspects, in line with circular economy principles. It simulates four key phases:

- Describe the environmental and social challenge of your project.
- Define the biomass source: location, quantitative evaluation; characterisation of physical and chemical properties of biomass; outline the most promising material streams; where applicable, describe the proposed organisation of logistic flows.
- Define the technological processes: cultivation, preparation of biomass, biorefining; schematic representation of stocks / processes / flows / intermediate outputs (that is raw materials for final biobased products/materials/solutions).
- Define the business process, possibly leading to closed material and energy loops, leading to final biobased products. Alternative options: company-level, industrial symbiosis, bioeconomy clusters. Define the value streams, final products and potential business partners.

The seminar combines individual and group work. It spans over eight weeks with five sessions. The seminar ends with the presentation of a proposed circular business model and a written final report.

- Extra-curricular events: Challenge Labs, hackathons, BISC-E and Ecotrophelia competitions

The Biotechnical Faculty organises short and intensive extra-curricular entrepreneurial events such as Hackathons and challenges. These events usually address a geographical or thematical challenge in the agri-food domain. For such events, typically, companies or local governance bodies provide challenges. Students' interest in these events is high.

An example is the "Challenge Lab 2023 – Slovenia". Prof. Ales Kuhar from the Biotechnical Faculty, who was national coordinator of the EIT Food Hub of the European Institute of

Technology (EIT) at that time, organised the event. See the box text for more information. Approximately 25 students from all over the University took part in the Challenge Lab. The subject was insect bioconversion. Due to the heavy workload, the Faculty handed over the organisation of the Challenge Lab 2024 to the Slovenian Chamber of Commerce.[8]

CHALLANGE LAB 2023 – Slovenia
EIT Food HUB Slovenia is organising Challenge Lab 2023 again after one year. This year we are focusing on the challenge of insect bioconversion in agri-food industry.
Venue: Biotechnical Faculty, University of Ljubljana, in the Janez Hribar Hall and faculty foyer
"In three workshops, applicants will have the opportunity to gain expert knowledge on insect bioconversion and work in groups monitored by the working expert mentors. The workshops will highlight a broader picture of the concept of circularity, bioconversion, circular system, proteins in the food chain and in animal feed, interchangeability and alternative decarbonization of frass. The content will be presented by Slovenian experts from various organisations, institutions and NGOs. Insects will also be presented from an entomologist's point of view. The first workshop of Challenge Lab will be held on May 25. The second and third workshops will be held as a two-day camp event on June 2 and 3. Participants will work in groups to find solutions to insect bioconversion challenges using the extended "Design Thinking" method. This is a process of redefining the problem by understanding the user and creating and testing innovative solutions. The method is often used in large organisations and is particularly useful for solving challenging and ill-defined problems, which is welcome in the food supply challenge. Anyone who likes challenges can apply - students from different faculties, PhD students, young researchers and anyone interested in innovation and solving complex socio-economic challenges. No prior experience and knowledge is required."
Source: https://www.eitfood.eu/events/challange-lab-2023-slovenia?_gl=1*ek7s7o*_up*MQ..&gclid=Cj0KCQjwqdqvBhCPARIsANrmZhNlauD8ThHVEC0CLYGjAwlbEaivlkM4SoGPwnY4UGkvmiDj-Ajs6Z4aAo45EALw_wcB

Other examples of entrepreneurial extra-curricular activities include supporting students' participation in European student competitions: the Bio-based Innovation Student Challenge Europe (**BISC-E**)[9] and the European food innovation competition **Ecotrophelia**[10]. The BISC-E is a "Europe-wide student competition to stimulate entrepreneurship and award excellence. BISC-E seeks to raise awareness and involve students in the transition towards a bio-based economy"[11]. Ecotrophelia is a "student food innovation competition with the ambition of promoting competitiveness and entrepreneurship within the food industry". In this competition, students work "on the development of their food product" to "learn all

[8] See https://www.eitfood.eu/events/challenge-lab-2024-food-for-life-healthier-lives-through-food.

[9] See https://biconsortium.eu/about-bisc-e.

[10] See https://eu.ecotrophelia.org/.

[11] Quoted from https://biconsortium.eu/about-bisc-e#whatbisc.

aspects of the company: R&D, marketing, packaging, quality, finance, etc, skills sought and valued by companies and helpful to help them build their start-up".[12]

Stakeholders Involved

- Students, lecturers (e.g., Prof. Aleš Kuhar),
- EIT Food, Slovenian Chamber of Commerce,
- companies and governance bodies

Resources Used

The Biotechnical Faculty runs the entrepreneurial courses and other activities within its general budget with one and a half staff members. The Faculty acquired licenses for software that helps in entrepreneurial processes.

Infrastructure or Tools

Software for assessing credit ratings and bookkeeping reports of firms.

Knowledge transfer ambassadors

UL has dedicated knowledge transfer ambassadors, which may serve as a good practice example for other HEIs. "Knowledge transfer ambassadors are UL researchers who have successfully collaborated with the industry or have entrepreneurial experiences. They can provide you with first-hand information/experiences on knowledge transfer (whether it is collaboration with the industry, the benefits of intellectual property protection or establishing a spin-off company)." In December 2024, two of them were from the Biotechnical Faculty[13], and one of them has successfully started new companies.

Impact and Success Factors

Internal Impact (on students, faculty, curriculum)

While the share of students who are interested in launching their own company has increased, start-ups by students or graduates are exceptional.

External Impact (start-ups, partnerships, ecosystem)

A prominent company that emerged from the Biotechnical Faculty is Juicy Marbles. Another is Future Foods, a company that gained an award from the University in 2024.

Challenges and Mitigation

As mentioned earlier, the main driver to establish the entrepreneurial courses was demand by students and employers. Luka Juvančič reported no significant barriers, as the

[12] Quoted from https://eu.ecotrophelia.org/ecotrophelia-about-us.

[13] See https://www.uni-lj.si/en/research/innovation-and-knowledge-transfer/from-idea-to-market/ul-knowledge-transfer-ambassadors.

Departments are in charge of organising the study programmes. Generally, it is more difficult to establish a compulsory course because another course must be removed at the same time.

Conclusion and Outlook

Key Learnings

The professors consider it their job to show the students what future opportunities they have. Maybe, entrepreneurial training sparks their minds later.

Transferability to Other Institutions

As the courses and extra-curricular activities at the UL Biotechnical Faculty are relatively small-scale, biotechnical faculties from other higher education institutions may relatively easily be able to introduce similar courses and activities.

Next Steps

The School of Business and Economics and the Biotechnical Faculty are preparing a joint master's programme in Bioeconomics for winter semester 2025/26. This programme will also address innovation and entrepreneurship.

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