Supporting entrepreneurial life science students at Vilnius University, Lithuania

The case in a nutshell

Since 2015, life science students from Vilnius University (VU) have participated very successfully in the iGEM innovation competition. At iGEM, an annual event in Boston, US, selected student teams from universities around the world compete with innovative solutions in synthetic biology. The main driver for participation was a renowned professor from the University's Institute of Biotechnology. VU supports the iGEM student teams and their innovative and entrepreneurial activities through finance and the opportunity to use laboratories and meeting rooms. Entrepreneurship education is not part of the students' studies – they learn how to act innovatively while preparing the targets and methods for their contribution to the competition. Taking part in the competition has had considerable impact on the mindset of students, of the research community, and of the University's executives who now appreciate such ways to tackle scientific challenges and act entrepreneurially. Moreover, taking part in the competition has also had tangible outcomes in terms of a spin-off enterprise: In 2018, students who participated in iGEM founded the company Biomatter Designs based on one of the innovative solutions.

1. Background

Profile of Vilnius University and its entrepreneurial ecosystem

Vilnius University (VU, https://www.vu.lt/en) was founded in 1579 and is one of the oldest universities in Central and Eastern Europe. In 2021, VU had close to 25,000 students and more than 3,000 academic staff members. The University has 15 faculties covering a broad array of disciplines from Economics and Business Administration, via Mathematics and Informatics to Medicine, and a Life Sciences Centre. VU is a member of the ARQUS European University Alliance, which is an alliance of long-established universities that, among other objectives, seeks strengthening the link between research and entrepreneurship. VU also organised workshops to assess the University's entrepreneurial behaviour and potential along HEInnovate's categories. However, the University's Strategic Plan for 2021-2025 does not explicitly mention entrepreneurship.

Physical and life sciences are among the most prominent fields at VU. In 2016, the University founded a Life Science Centre (https://www.gmc.vu.lt/en/) with modern research, teaching, and conferencing facilities. The Centre is home to three academic branches: the Institutes of Biochemistry, of Biotechnology and of Biosciences.

Vilnius University encourages students and staff to establish new enterprises based on research and development at the University. In order to support innovative activities, VU has established an Innovation Office. It consults on all major issues related to business venturing, from intellectual property protection and technology licensing via partner search to funding and business development. The Office's website lists more than 20 spin-offs, many in the field of life sciences.[1] Other VU facilities that support innovation include a Technological Business Incubator for innovative start-ups that focuses on life sciences and

[1] See https://www.vu.lt/en/business/innovations-and-research/entrepreneurship-university/innovative-enterprises.

related fields[2] as well as Sunrise Valley Science and Technology Park and Visoriai Information Technology Park.[3] Furthermore, VU Tech Hub (https://www.techhub.vu.lt/) is a platform for cooperation between students, researchers, business, and the public sector for innovation and entrepreneurship.

VU has offered entrepreneurship courses since 2008. Most prominent are an MBA in Entrepreneurship[4] and the DeepTech Entrepreneurship programme[5]. Outside curricula, VU has an Innovation Club. It considers itself as a science and business networking platform that encourages researchers and business representatives to meet. Previous events included, among others, "Artificial Intelligence for smart transport", "Future food and nutrition", and "Solar cells and biofuel elements for future energy".[6]

In the framework of this innovation ecosystem, students from VU have been participating successfully in an international genetic design competition named iGEM. This case study describes students' resources, activities, and experiences when participating in iGEM.

2. Objectives

The iGEM competition

iGEM is the abbreviation of International Genetically Engineered Machine. The iGEM Foundation (https://www.igem.org) is an independent non-profit organisation. Its competition (https://competition.igem.org/) takes place annually since 2003. Every year, 350 teams of pupils, students, or graduates from different disciplines engage at their education institution throughout the summer in preparing genetically designed systems. In autumn, they present their solutions at a conference in Boston, US. The majority of the projects solve pressing problems of environment protection, medicine, manufacturing, and other areas.

In 2015, VU students participated in iGEM for the first time.[7] Virginijus Šikšnys, a renowned professor from the VU Institute of Biotechnology and Rolandas Meškys, a professor from VU Institute of Biochemistry, motivated and mentored the students. The team from VU's Faculties of Natural Sciences and Chemistry jointly delivered a project on a bacteria aging mechanism. Since then, the VU team has won gold medals for outstanding achievements every year. In 2017 and 2020, they even won the grand prize of the competition.[8] In 2020, the team presented a project named FlavoFlow, dedicated to preventing fish infections in aquacultures. In 2021, the team competed with the project AmeBye, seeking to prevent the spread of infectious amoebiasis, an intestinal disease transmitted via contaminated food, water, and poor hygiene.[9] Presenting the nanoplastic detection tool NanoFind, the VU team won the gold medal for the best environment project in 2022.[10]

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[2] See https://www.vu.lt/en/business/innovations-and-research/entrepreneurship-university/technological-business-incubator.

[3] See https://www.vu.lt/en/business/innovations-and-research/entrepreneurship-university/science-technology-parks.

[4] See https://www.vu.lt/en/news/5553-vilnius-university-launches-lithuanias-s-first-mba-in-entrepreneurship?_scpsug=crawled.2369336.4fc7b40bff7f656879dada888a9758ce1105886cc2f7c80bab03e209baa8490c.

[5] Quoted from https://www.vm.vu.lt/en/admission/postgraduate/deep-tech-entrepreneurship.

[6] See https://www.vu.lt/en/business/innovations-and-research/innovation-club.

[7] See a related news item at https://www.vu.lt/en/news/3704-lithuanian-students-will-compete-in-igem-boston.

[8] See https://www.vu.lt/en/news-events/news/8359-vu-students-repeat-the-success-story-by-becoming-the-best-team-of-this-year-s-igem-competition.

[9] See https://www.vu.lt/en/news-events/news/9677-vu-team-wins-a-gold-medal-and-additional-prizes-at-an-international-competition-igem.

[10] See https://www.facebook.com/VilniusiGEM/.

3. Input

Resource students can draw from

The iGEM teams are multi-disciplinary. While the main brains are from biotechnology, the teams also include students from management, international relations, mathematics, informatics, and physics. The teams need such diversity because successful genetic design requires inputs from various disciplines, and presenting at the competition requires competences in pitching and product development.

In terms of facilities, the iGEM teams can use meetings rooms and test laboratory facilities in the Life Sciences Centre. This is indispensable in order to develop the teams' innovative ideas.

In terms of finance, the iGEM teams need funding for materials and travel expenses. The teams can draw on different sources. On the one hand, the University board approved a special allowance for the iGEM teams. Thermo Fisher Scientific, a multinational science service company with a branch in Vilnius, provides further funds. In 2022, the iGEM team also launched a crowdfunding campaign through the VU Foundation's endowment fund.[11] The crowd consists mainly of VU staff, students, and alumni.

As regards idea generation, the student teams have used different approaches. For example, in 2021, the iGEM team organised a hackathon to develop ideas for the competition. In 2022, the team launched an open call for ideas.

If the iGEM teams develop processes with commercial value, VU patent specialists can support them to protect intellectual property. The University also provides support for communicating and marketing successful outputs. For VU, successful participation in iGEM is an opportunity to demonstrate what its students have achieved.

4. Activities

Students' entrepreneurial activities around iGEM

Students participating in iGEM normally have not had formal entrepreneurship education before – except some from the Faculty of Economics and Business Administration. They learn how to act innovatively, creatively, critically, communicative, and collaborative on preparing the methods and approaches for the competition.

The initial drivers for taking part in iGEM were Virginijus Šikšnys from the VU Institute of Biotechnology, Rolandas Meškys from VU Institute of Biochemistry, and students enthusiastic about joining an international scientific competition involving a stay abroad. While the competition's main challenge is scientific, the first student teams found it difficult to receive financial support from the University. After several years of successful participation, it has become easier to convince the University that the competition is worth supporting.

Meanwhile, participating in iGEM has become so common and successful that participating in further rounds goes without saying. In 2020, the iGEM team was among the laureates of the Global Lithuanian Awards, recognised for its "solid voice in global science".[12] Global Lithuanian Awards reward the

[11] See https://vuf.lt/en/.

[12] See https://gllawards.lt/en/laureates-2020/.

achievements of Lithuanian professionals abroad and their contribution to the economy, science, and culture of Lithuania.

5. Stakeholders

How stakeholders are involved and contribute to the outcome

VU's iGEM teams frequently engage with stakeholders outside the University. This may include businesses: In the FlavoFlow project in 2020, Thermo Fisher Scientific supported the student team with reagents for experiments.

In 2021, the iGEM team figured out means to engage with the general public to raise awareness of the concept of synthetic biology . One of their activities was a Sense Lab. The team organised different events for the different senses and areas of interest and engaged with a broad spectrum of participants: for example, cheesemakers, perfume producers, contemporary artists, music lovers, and people from the general public that joined by chance. The figure provides an overview of the events for each sense.

Figure: Events VU's iGEM 2021 team organised in a Sense Lab

Event	Touch	Taste	Smell	Hearing	Vision
Participants	15	30	67	134	757
Artistic element	Workshop	Food degustation based on relational aesthetics	Lecture on creative perfume making	Concert	Installation
Scientific topics	Genome editing, human & microorganism relation	GMO creation and its regulations	Synthetic biology and its applications in perfumery	Insulin synthesis, bioethical dilemmas, in vitro organs	Microorganisms, their use in synthetic biology
Sensory stimulation	Bread forming	Foods made with microorganisms	Sniffing test, vanillin in different forms	Musical compositions	Ever-changing visual illusion

Source: https://2021.igem.org/Team:Vilnius-Lithuania/Education

6. Outputs, impacts, and lessons learned

Impacts

Kristina Babelytė-Labanauskė, Head of VU's Innovation Office, reports that participating in the competition has changed the mindset of the University's community. This applies first of all to the students who learn that they can and must act independently. It has also changed the attitude of the research community and the University's executives who now appreciate such new ways of tackling scientific challenges and acting entrepreneurially. They also see that students who participated in the competition find it easier to find a job after graduation. Employers appreciate their ability to work in teams, to present and to speak in public.

Kristina Babelytė-Labanauskė finds that this case illustrates that students' participation in competitions like iGEM changes the connotation of entrepreneurship. Entrepreneurship obtains a wider meaning – it is not only about delivering courses on entrepreneurship or establishing start-up businesses.

Participating in iGEM brings applicability to the University's education. It enhances students' competences in project management, teamwork, science communication, finance management and similar skills necessary for the journey from an idea to a real-life success story. iGEM develops such competences especially strongly as it is an interdisciplinary initiative and as it combines formal and non-formal activities. At the same time, iGEM impacts on the agenda of the whole university. Pace by pace, it paves the way to greater impact that the University delivers to society, putting more attention to its "third mission" of knowledge transfer, beyond research and teaching.

Venturing achievements

iGEM has also led to spin-off companies. Former participants of VU's iGEM team launched the start-up company Biomatter Designs (https://www.biomatterdesigns.com/) in 2018. Its business activity is protein design at the intersection of synthetic biology and artificial intelligence. In 2021, the company raised 500,000 Euro of seed funding.[13] Biomatter Designs made it onto the list "Forbes 30 Under 30 – Europe – Science & Healthcare".[14] Today, the company has 20 employees, and in financial year 2020/21 it achieved a sales revenues of 300,000 Euro.

Lessons learned

While the iGEM competition may lead to spin-off enterprises, above all it fosters students' innovative thinking and acting in "enterprising" rather than "venturing". The conclusions from the 2021 iGEM team show what students can learn from such activities. These learnings may also be relevant for other higher education institutions.

VU's iGEM team 2021: Conclusions from innovative activities

"To conclude, this year we invited different audiences to engage in dialogue about synthetic biology. In our activities, we aimed to teach others and learn new things ourselves by diving deeper into different contexts and understanding problems from various perspectives. We sought to implement every activity thoughtfully and gained many insights from external sources - stakeholders, literature, etc. As a result, we created lasting tools and influential activities. We hope that our experiences will be inspiring and applicable to other teams. We have several key takeaways for anyone aiming to make an impact through education in iGEM:

- meet people from various institutions and organisations as often as possible - half of the meetings might be irrelevant, but there will be essential and enriching ones among them
- keep in touch with partners from previous years - you might establish new and lasting activities that other teams did not
- think outside the box - impressive activities can happen by merging seemingly unrelated fields
- know your audience - when organising an event or giving a presentation, consider your target audience preferences. Find ways to reach the audience through various channels."

Source: https://2021.igem.org/Team:Vilnius-Lithuania/Education

Sources

[13] See https://www.vu.lt/en/news-events/news/8447-vu-start-up-biomatter-designs-attracts-half-a-million-euros-of-investment.

[14] See https://www.vu.lt/en/news-events/news/10711-vu-startup-biomatter-designs-featured-in-forbes-30-under-30.

This case study was prepared by Dr. Stefan Lilischkis from empirica Gesellschaft für Kommunikations- und Technologieforschung mbH, Bonn, Germany, through collection and analysis of documentation about VU's iGEM teams and interviews with key representatives from the University.

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Links

Vilnius University Life Sciences Centre: https://www.gmc.vu.lt/en

Vilnius-Lithuania iGEM team: https://2020.igem.org/Team:Vilnius-Lithuania/Education