On September 28, 2023, a work-shop was held at the University of Zagreb Faculty of Chemical Engineering and Technology as part of the BIOTE(A)CH project (2022-1-TR01-KA220-HED-000085597). As highlighted in the invitation to the workshop, the aim of the workshop was to gather information about the challenges encountered in the transition from university to industry and how to solve the related problems:

1. To identify the innovations and challenges in the bioeconomy and biotechnology from the perspective of academics and private sector representatives
2. To understand the current knowledge and skills that university students studying in biotechnology fields should have when they begin their careers
3. To understand the difficulties that university students studying biotechnology will encounter as they begin their careers in industry
4. To contribute to the development of the curriculum for the undergraduate students in biotechnology as an initial project outcome

A total of 15 participants attended the workshop (Fig. 1), one from industry, two students and the rest were academic staff from two faculties of the University of Zagreb, the Faculty of Chemical Engineering and Technology and the Faculty of Food Technology and Biotechnology.

When asked about the knowledge and skills currently required of university graduates in the biotechnology industry, participants indicated that the biotechnology industry is rapidly evolving and that graduates entering the field are expected to have a variety of skills and a solid foundation of knowledge. All participants believe that graduates have a good educational background, but that more emphasis should be placed on new technologies in lectures. Also, students should do more lab exercises, but unfortunately this is often limited by space in faculty labs. They emphasized that understanding business principles, market analysis and intellectual property rights, and awareness of entrepreneurship and commercialization processes would be good skills. In addition, good written and oral communication skills are essential for presenting research findings, writing reports, and collaborating with interdisciplinary teams. The ability to work effectively in teams often composed of scientists from diverse backgrounds such as biology, chemistry, engineering, and computer science is desirable, as is...
continuous learning and adaptability, as biotechnology is a dy-
namic field. Graduates should be willing to learn new techniques,
keep abreast of the latest research, and adapt to new technolo-
gies and methods. They should also be able to critically analyse
problems, design experiments, and develop innovative solutions
to challenges in the biotechnology industry.

Regarding the challenges/problems of transitioning from academ-
ia to industry, participants emphasized that the transition from
academia to industry can be a difficult and crucial stage in an
individual’s career. Several important issues were highlighted.
The first is the lack of practical experience, as university education of-
ten focuses on theoretical knowledge and graduates lack practical
experience in the real world of industry. Therefore, it is important
to bridge the gap between theoretical knowledge and practical
application. Internships or research projects with industry partners
can provide valuable practical experience. The second problem
is the mismatch between skills and abilities, when graduates lack
certain skills or software knowledge needed in industry. Taking
online courses, attending workshops, or being mentored during the
first year of employment can help provide the necessary skills.
The third problem is that many graduates lack interviewing skills
and soft skills such as effective communication, teamwork, and
problem-solving in a professional environment. This problem can
be addressed by practicing interviewing skills, attending profes-
sional development workshops, and obtaining feedback from
professionals. The fourth problem is that university graduates may
have unrealistic expectations about the job, salary, or work-life
balance. However, by learning about the industry and job duties
and talking to professionals, they can get a realistic idea of what to
expect. Being open to entry-level positions can gain experience is
often a necessary step. The fifth challenge is what is known as im-
poster syndrome. University graduates sometimes feel inadequate
or unqualified, even though they have the necessary skills and
qualifications. However, finding a mentor, talking to peers, and
focusing on successes and skills can help overcome self-doubt.

When asked for examples of knowledge-based challenges and
how to overcome them, participants pointed to outdated curric-
ula that do not align with current industry needs or technologi-
cal advances. Because of this, graduates may lack the skills and
knowledge needed in the job market. The problem can obviously
be solved by modernizing the curricula in terms of both presenta-
tion and content. Limited research funding is also a major prob-
lem. Due to the lack of funding, students are unable to conduct
additional research in laboratories. As a result, graduates lack
the practical skills and experience required by industry.

One possible solution to overcome these challenges is to improve
the quality of undergraduate biotechnology education:

1. Curricula should be adapted to the latest developments in bi-
technology, including gene editing technologies, synthetic bi-
ology, and bioinformatics. Interdisciplinary courses combining
biology, chemistry, computer science, and engineering should be
introduced to provide a holistic understanding of biotechnol-
y.

2. Students should gain extensive hands-on laboratory expe-
riences that enable them to perform experiments, use ad-
vanced biotechnology equipment, and acquire practical skills.
Research-oriented projects should be offered that allow stu-
dents to work on real scientific problems under the guidance
of faculty members.

3. Collaboration with biotechnology companies, research insti-
tutions, and professionals should be encouraged to expose
students to real industry challenges.

4. Students should be offered workshops and seminars on com-
munication skills, project management, and teamwork to pre-
pare them for the professional environment. Students should
be encouraged to attend conferences and present research
papers in the field of biotechnology.

5. To have good students, faculty members should also continue
their education to keep up with the latest advances and teach-
methodologies in biotechnology.

After the discussion ended, Anita Salic thanked everyone for their
participation and fruitful discussion. Participants were also asked
to think about five different challenges and five proposed solu-
tions for bridging the gap between university and industry so that
graduates can be successful in their careers and adapt their work
easily after the workshop. Responses were collected and present-
ed in Table 1.

Table 1 – Challenges and solutions for bridging the gap between
university and industry

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of practical experience</td>
<td>Establish partnerships between universities and industries to create internship and co-op programs. Hands-on experience through internships helps students apply theoretical knowledge to real-world situations</td>
</tr>
<tr>
<td>Limited soft skills such as communication, teamwork, and problem-solving are not emphasized enough in the traditional university settings</td>
<td>Incorporate soft skills development workshops into the curriculum. Offer training in communication, teamwork, leadership, and emotional intelligence to prepare students for workplace interactions</td>
</tr>
<tr>
<td>Rapid advances in technology and industry often make university curricula outdated</td>
<td>Establish industry advisory boards that regularly review and update curriculum. Professors and industry experts can work together to ensure students are learning the most current and relevant skills</td>
</tr>
<tr>
<td>Graduates may not be familiar with the specific tools and software used in the industry</td>
<td>Organize networking events, seminars, and mentoring programs where students can connect with industry professionals. Guest lectures and alumni networks can help students expand their professional contacts</td>
</tr>
<tr>
<td>Lack of resourcefulness in finding solutions to new challenges</td>
<td>Challenge students with more project assignments that require students to find solutions on their own, using all available resources</td>
</tr>
<tr>
<td>Fear and lack of confidence toward expensive equipment</td>
<td>Encourage and teach students in class to use expensive equipment themselves whenever possible, more time to practice is desirable</td>
</tr>
</tbody>
</table>

The quality of the workshop was assessed using a quality evalu-
ation form, and excellent results were obtained in each category.

Some of the participant’s comments on organized workshop were:

• “Well organized meeting with constructive discussion”

• “The workshop was stimulating and generated good discussion among the participants. I welcome this type of workshop and wish there were more like it”

• “Great workshop, relaxing, the workshop leader did a good job of introducing the participants to the topic”

• “Excellent workshop, excellent presentation, and discussion about the gaps between faculties and industries, and excellent ideas about future improvements when it comes to connecting students and their professors with the challenges facing the industries”

• “The workshop was really interesting, and it made me think about some important things which I can say or advise to the students”

• “Short but informative, to the point and overall well-rounded”