Co-funded by the European Union

Novel Biotechnological Solutions in Climate Change Mitigation

2024-1-EL01-KA220-HED-000251373

PILOT TRAINING REPORT

BIOSHIELD PILOT COURSES

1. General Information

Partner Institution	*Democritus University of Thrace*
Department/Faculty	*Molecular Biology & Genetics*
Country	*Greece*
Work Package	*WP4 — Pilot Course*
Date of Report Submission	*30/09/2026*
Pilot Training Dates	*09/03/2026-09/05/2026*
Responsible Person(s)	*Professor Yiannis Kourkoutas*
Associated Partner(s) Involved	*Brewery: Macedonian Thrace Brewery S.A. - Vergina*
Target Number of Participants	*20*
Actual Number of Participants	*16*

2. Overview of the Pilot Training

2.1 Organisation and Preparation

The BIOSHIELD pilot training at Democritus University of Thrace (DUTH) was organised through the Training and Lifelong Learning Centre (T.L.L.C. - DUTH) and implemented with the participation of academic and research staff from the Department of Molecular Biology and Genetics (DMBG) of DUTH. The training was coordinated by Yiannis Kourkoutas, Professor of Applied Biotechnology, with the contribution of faculty members, postdoctoral researchers, and PhD candidates from the DMBG of DUTH. The academic staff involved included Professor Maria Grigoriou, Professor Katerina Kedraka, Associate Professor Georgios Skavdis, Associate Professor Petros Kolovos, and Assistant Professor Katerina Palaiologou. The educational and scientific team was further supported by the Postdoctoral Researchers Grigoria Mitropoulou and Ilektra Stylianopoulou, as well as the PhD Candidates Paraskevi Somalou, Konstantinos Tegopoulos, Chrysoula Pavlatou, and Elisavet Dimoula. Collectively, the team contributed to the delivery of the program, the preparation of educational material, and the provision of scientific guidance and mentoring to the participating students.

The pilot course was designed for the undergraduate students of the DMBG, and participant recruitment and selection took into consideration their academic background and performance, english language proficiency, as well as their knowledge and understanding of biotechnology-related topics. Communication and collaboration skills, initiative, and organisational abilities were also considered during the selection process. The delivery of the pilot training was based on the BIOSHIELD Curriculum and incorporated the educational resources developed within the project. At the beginning of the pilot training, all thematic modules of the BIOSHIELD Curriculum were presented to the students, providing them with an overview of the different biotechnology-related approaches to climate change mitigation addressed by the programme. Following this introductory phase, the students selected the thematic module on which they wished to focus and subsequently worked on the corresponding learning activities and group projects. The training was further

supported by educational video tutorials, the BIOSHIELD Student Handbook, and relevant scientific literature. These resources were used to strengthen the students' theoretical preparation, facilitate independent study, and support their active participation in the development of their projects.

2.2 Methodology and Learning Activities

The pilot training followed a Blended and Flipped-Learning approach, combined with the Design Thinking methodology, with the aim of promoting active student participation and linking theoretical knowledge with practical application. Face-to-face teaching included lectures, presentations, discussions, and interactive learning activities, while asynchronous learning was supported through independent study of the educational material and the BIOSHIELD video tutorials.

The Flipped Learning and Design Thinking methodology provided the framework for the development of the students' projects. The students were guided through the main stages of the process (Empathize, Define, Ideate, Prototype, and Test), encouraging them to explore biotechnology-related challenges from different perspectives, define specific problems, generate potential solutions, and progressively develop and refine their research ideas. Particular emphasis was placed on creative problem-solving, critical thinking, and the development of realistic and sustainable biotechnology-based approaches to climate change mitigation.

Following the presentation of the thematic modules, the students selected the area in which they wished to work and collaborated in groups on the corresponding research challenges. Learning activities combined theoretical instruction with group work, literature research, discussions, project-based learning, and practical activities, including laboratory-based work, where relevant to the selected topic. The students were encouraged to use the BIOSHIELD digital educational resources and relevant scientific literature to support the development and scientific justification of their proposed solutions. Throughout the process, the academic staff and the researchers from the DMBG provided scientific guidance, feedback, and mentoring to support the students in developing and refining their projects, presentations, and posters, ensuring their scientific quality and relevance to the thematic areas of the BIOSHIELD project.

2.3 Participant Profile

The pilot training involved undergraduate students in their 3rd or 4th year of study, with an academic background in the life sciences and particularly in areas related to molecular biology, genetics, and biotechnology. At this stage of their studies, the participants had already acquired fundamental knowledge and laboratory experience in relevant life science disciplines, providing them with an appropriate scientific background to engage with the biotechnology-related challenges addressed during the BIOSHIELD training.

The students were organised into 4 working groups, consisting of 3 or 4 participants each. Some of the students had already worked together during the BIOSHIELD Learning, Teaching, and Training Activity (LTTA), which facilitated communication and collaboration within the groups. Following the introductory presentation of the BIOSHIELD thematic modules, the students selected the thematic area that best matched their interests and worked collaboratively on the corresponding research challenges. The 4 working groups focused on different thematic areas and research challenges of the BIOSHIELD Curriculum.

1) Group 1 selected Module 1 "*Resilience Through Food and Microbiome Innovations*" addressing Problem 1 "*Advancing Cultured Meat: A Sustainable Solution for Climate Change*", with their work focusing on fiber-based scaffolds made from food-grade plant biopolymers as a scalable and cost-effective approach to structured cultured meat.

2) Group 2 selected Module 2 "*Sustainable Food Systems: Biotechnology and Renewable Resources for Clean Label Products*" addressing Problem 2 "*Waste to Treasure: Biorefinery and Upcycling Strategies*

in the Bioeconomy Era", with their work focusing on the biorefinery-based valorisation of food waste into biopolymers and biofuels, and on practical recommendations for restaurants, food industries, and municipalities.

3) Group 3 also worked within Module 1 "*Resilience Through Food and Microbiome Innovations*", addressing Problem 2 "*Microbiome-based Strategies for Sustainable Manufacturing Challenges in the Starter Culture Industry: A Circular Approach to Climate Resilience*", and developed the "EcoWhey" concept. EcoWhey proposed a circular bioprocess that valorises organic by-products, including cheese whey, residual yeast and eggshells, to create a low-cost, zero-waste growth medium for lactic acid bacteria (LAB) and the production of starter cultures.

4) Group 4 selected Module 5 "*Plant-based Solutions in Climate Change Mitigation*", addressing Problem 2 "*Plant in-vitro Cultures: Biotechnological Approaches for Sustainability*", with their work focusing on the *in vitro* propagation of *Allium sativum.*

Within each group, the students combined literature research, discussions, and the knowledge and skills acquired during the training to develop their research ideas and proposed biotechnology-based solutions. The group-based approach also supported the development of transversal skills, particularly teamwork, communication, critical thinking, and collaborative problem-solving.

2.4 Additional Organisational Information

The pilot training was delivered at the DMBG of DUTH, using the Department's teaching and laboratory facilities. The available infrastructure, including teaching rooms, audiovisual equipment, laboratory facilities, and digital learning resources, supported both the face-to-face and asynchronous components of the training and contributed to the implementation of the planned educational activities. Throughout the pilot training, the students received continuous scientific guidance and support from the academic and research staff involved in the program. The instructors supported the students in understanding the thematic content, identifying and developing their research ideas, consulting relevant scientific literature, and progressing with their group projects. Feedback and mentoring were provided throughout the different stages of the learning and project-development process, allowing students to discuss challenges, refine their proposed solutions, and further develop their scientific and transversal skills. Brewery Vergina was visited as the associated partner.

3. Pilot Training Indicators

Indicator	Reported Value
Number of students participating in the pilot training	14 (+2 students who only attended but did not actively participate)
Number of students completing the satisfaction survey	16
Number of working groups formed	4
Number of research ideas and/or prototypes developed by the groups	4
Number of students successfully completing the pilot training	14
Number of students receiving certificates	14
Overall attendance rate	100%
Completion rate	100%
Number of academicians confirming effectiveness of course delivery methodology	2
Number of industry representatives confirming effectiveness of course delivery methodology	1
Number of student video testimonials collected	2

4. Satisfaction Survey Results

No	Survey Statement (5-point Likert Scale: 1 = Strongly Disagree, 5 = Strongly Agree)	1	2	3	4	5	4+5
1	I am highly satisfied with the overall quality and delivery of the BIOSHIELD training program.				25%	75%	100%
2	The program effectively improved my transversal skills, such as teamwork, communication, and creative problem-solving.				25%	75%	100%
3	I feel that my research skills in biotechnology (particularly related to climate change mitigation) have significantly improved.			6.2%	18.8%	75%	93.8%
4	I feel better prepared to enter the labour market as a result of this training.				25%	75%	100%
5	The animated video tutorials effectively helped me understand the key concepts and prepare for hands-on activities.				18.8%	81.2 %	100%
6	The Design Thinking process enhanced my ability to generate innovative solutions to industrial challenges.			6.3%	12.5%	81.3 %	93.8%
7	The “Biotech Student’s Guide to Future Projections” handbook provided valuable guidance on biotechnology applications and entrepreneurship.				18.8%	81.2 %	100%
8	The use of digital tools and interactive technologies enhanced my learning experience.			6.2%	18.8%	75%	93.8%
9	Hands-on laboratory activities were essential for testing and refining our biotechnology research ideas.				25%	75%	100%
10	My team successfully developed a functional prototype or research project concept during the pilot training.			6.2%	18.8%	75%	93.8%
11	Interactions with industry representatives and academic experts helped me better understand real-world industrial challenges.			6.2%	12.5%	81.3 %	93.8%
12	I intend to pursue a career in the biotechnology industry.			6.2%	18.8%	75%	93.8%
13	I have a strong intention to establish or join a biotechnology startup in the future.				25%	75%	100%

5. Analysis of Survey Results

5.1 Overall Participant Satisfaction

The results of the post-training satisfaction survey indicated a very high level of overall participant satisfaction with the BIOSHIELD pilot training implemented at the DMBG of DUTH. All students, [16 respondents (100%)] expressed satisfaction with the overall quality and delivery of the training program, with 75% strongly agreeing and 25% agreeing with the corresponding survey statement. The participants also expressed highly positive views regarding the educational resources and teaching methodologies employed during the pilot training. In particular, 100% of the respondents agreed or strongly agreed that the animated video tutorials helped them understand key concepts and prepare for hands-on activities. Similarly, all respondents positively evaluated the "*Biotech Student's Guide to Future Projections*" handbook in refining their biotechnology research ideas. Furthermore, 93.8% of the participants positively evaluated the contribution of the Flipped Learning and Design Thinking methodology to their ability to generate innovative solutions, as well as the use of digital tools and interactive technologies to enhance their learning experience. Overall, the survey findings demonstrated a high level of participant satisfaction and a positive reception of the blended-learning approach, educational resources, and practical activities incorporated into the BIOSHIELD pilot training. These results provided encouraging evidence of the suitability of the training program for its target group and support the effectiveness of its educational approach.

5.2 Strengths and Weakneses

The survey results highlighted several strengths of the BIOSHIELD pilot training. One of the main strengths was the combination of theoretical knowledge with practical and collaborative learning activities. All participants positively evaluated the development of transversal skills, including teamwork, communication, and creative problem-solving. The animated video tutorials and the "*Biotech Student's Guide to Future Projections*" handbook were also positively evaluated by all participants, indicating that these educational resources effectively supported the learning process.

Another important strength was the use of the Flipped Learning and Design Thinking methodology and project-based group work. The training encouraged the students to identify biotechnology-related challenges, develop innovative solutions, and progressively advance their research ideas with guidance from the academic and research staff. The formation of 4 working groups resulted in 4 research ideas and/or prototypes, demonstrating the practical application of the knowledge and skills acquired during the pilot training.

No major weaknesses were identified through the satisfaction survey, as positive responses ("Agree" or "Strongly Agree") ranged from 93.8% to 100% across all survey statements. Nevertheless, some areas showed slightly lower levels of agreement compared with others. In particular, 93.8% of the participants positively evaluated the improvement of their biotechnology research skills, the Flipped Learning and the Design Thinking process, the use of digital tools and interactive technologies, the development of a functional prototype or research project concept, and interactions with industry representatives and academic experts. These findings suggested that future implementations could further strengthen these aspects, for example by providing additional opportunities for practical application, interaction with external experts, and support for the development and testing of research ideas.

5.3 Learning Outcomes

The survey results indicated positive learning outcomes in terms of both research and transversal skills. All participants (100%) agreed or strongly agreed that the training improved their transversal skills, particularly teamwork, communication, and creative problem-solving. In addition, 93.8% of the respondents reported that their research skills in biotechnology, particularly in relation to climate change mitigation, had significantly improved. These results are consistent with the collaborative and project-based nature of the training, which involved group work, literature research, discussions, and the development of biotechnology-based research ideas. The training also had a positive impact on the participants' perceptions of their employability. All respondents (100%) agreed or strongly agreed that they felt better prepared to enter the

labour market as a result of the training. This suggested that the combination of scientific knowledge, practical activities, teamwork, and problem-solving contributed to students' perception of their readiness for future professional environments. Regarding future career and entrepreneurship intentions, 93.8% of the participants indicated an intention to pursue a career in the biotechnology industry. Furthermore, 100% of the respondents agreed or strongly agreed that they had a strong intention to establish or join a biotechnology startup in the future. These findings indicated a strong interest among participants in pursuing biotechnology-related professional and entrepreneurial pathways following the pilot training.

5.4 Achievement of Project Objectives

The results of the pilot training indicated that its implementation at the DMBG of DUTH contributed positively to the achievement of the project objectives and expected results. The course delivery methodology proved effective in supporting student participation and the development of both scientific and transversal skills. This is reflected in the satisfaction survey, where 100% of the participants positively evaluated the overall quality and delivery of the training program and the improvement of their transversal skills, while 93.8% of the respondents reported an improvement in their biotechnology research skills. In addition, the student presentations were evaluated and scored by two academics and one industry representative, providing external feedback on the students' project work and presentations. An important outcome of the pilot training was the development of research ideas through collaborative project work. Four working groups were formed, resulting in 4 research ideas and/or prototypes. The students applied the knowledge and skills acquired during the training to biotechnology-related challenges and further developed their ideas through literature research, discussions, practical activities, and scientific guidance from the academic and research staff. The implementation also achieved the expected results, with participants successfully completing the course and obtaining certification. Fourteen students successfully completed the pilot training and received the appropriate certificates. The reported completion rate was 100% among the students who actively participated in the program. The survey results also provided positive evidence regarding the effectiveness of the BIOSHIELD educational materials. All respondents agreed or strongly agreed that the animated video tutorials helped them understand key concepts and prepare them for hands-on activities. Likewise, 100% of the respondents positively evaluated the "*Biotech Student's Guide to Future Projections*" handbook as a valuable source of guidance on biotechnology applications and entrepreneurship. These findings, together with the positive evaluation of the overall training program, provided evidence of the effectiveness of the BIOSHIELD Curriculum and its accompanying educational resources of the DUTH pilot training implementation.

5.5 Recommendations for Improvement

The overall evaluation of the BIOSHIELD pilot training was highly positive. Nevertheless, further opportunities for interaction with industry representatives and external experts could be incorporated into future implementations. Such involvement could strengthen the connection between the students' research ideas and real-world biotechnology challenges, while providing additional insights into the practical and industrial application of the proposed solutions. This recommendation is supported by the survey results, with 93.8% of the participants positively evaluating their interactions with industry representatives and academic experts. Overall, the recommendations focus on further enhancing an already positively evaluated training approach rather than addressing major weaknesses. The combination of theoretical instruction, Flipped Learning and Design Thinking, group-based project work, practical activities, and BIOSHIELD digital educational resources should therefore be maintained in future implementations, while opportunities for interaction with industry and external experts could be further expanded.

6. Annexes

Please list and attach any supporting documentation referenced in this report.

Annex	Description	Uploaded (Y/N)
Annex 1	List of participating students	Y
Annex 2	Certificates issued (sample)	Y
Annex 3	Raw satisfaction survey data (Google Forms / Excel Sheet)	Y
Annex 4	Photographic documentation / activity evidence	Y
Annex 5	Student video testimonials (mp4 or video file reference)	Y
Annex 6	Description(s) of research ideas / prototypes developed (Student Presentations)	Y
Annex 7	Other supporting documents (if applicable)	Not applicable

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BIOSHIELD

Pilot Course Attendance List
Institution: DEMOCRITUS UNIVERSITY OF THRACE

ΙΔΡΥΜΑ ΚΡΑΤΙΚΩΝ ΥΠΟΤΡΟΦΙΩΝ ΙΚΥ

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Name and Surname	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
1. Frantzeskou Eugenia														
2. Gkotzamanis Georgios														
3. Ioannidou Antonia														
4. Karvouni Anastasia														
5. Kourtis Dimitris														
6. Larentzou Aikaterini														
7. Lazarou Dimitra														
8. Mpechtsoudis Aggelos														
9. Mpoultadaki Vasiliki														
10. Pappas Georgios														
11. Psarra Glykeria														
12. Sdiros Georgios														
13. Sentementes Ioannis														
14. Symsiris Diomidis														
15. Tounta Aikaterini – Paraskevi														
16. Tzintziou Maria – Evaggelia														

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17. Kourkoutas Ioannis														
18. Dimoula Elisavet														
19. Παυλίδου Χρυσούλα														
20. Ηλέκτρα Σταθοπούλου														
21. Σιμάλου Παρασκευή														
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Co-funded by the European Union

BIOSHIELD

Certificate of Attendance

This is to certify that

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Participated in the Pilot Training Activity of the Erasmus+ KA220 HED project:
"BIOSHIELD"
Novel Biotechnological Solutions in Climate Change Mitigation
2024-1-EL01-KA220-HED-000251373
09/03/2026– Alexandroupolis, Greece

Yiannis Kourkoutas- Project Coordinator

Democritus University of Thrace

Yiannis Kourkoutas

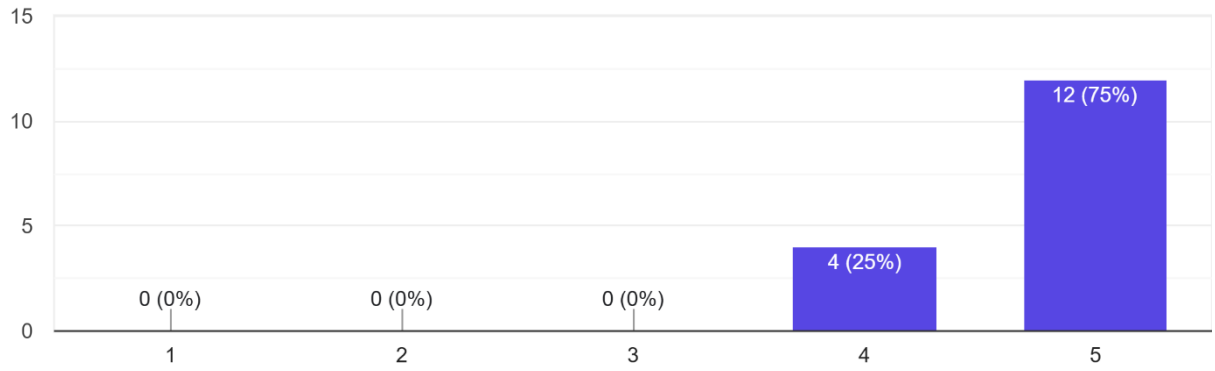
Sveučilište Sjever

University of Maribor

MELLIS KNOWLEDGE TO PRACTICE

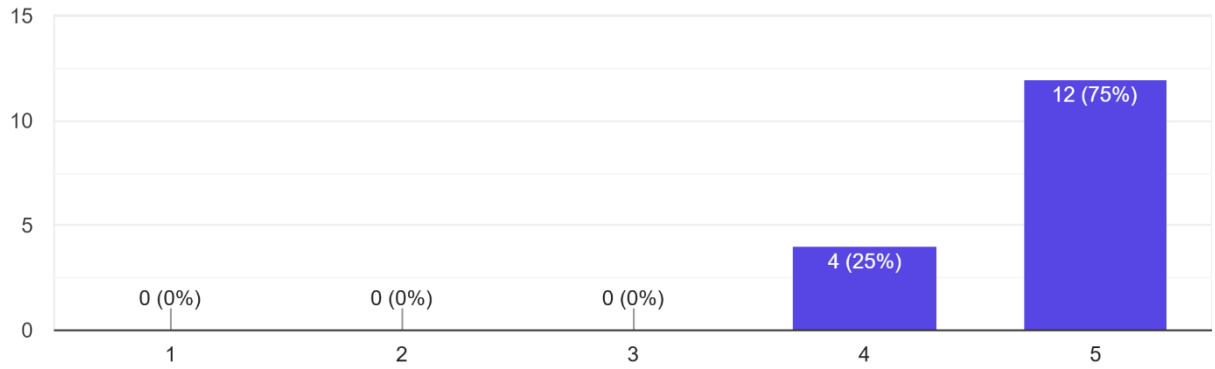
1- I am highly satisfied with the overall quality and delivery of the BIOSHIELD training program.

16 απαντήσεις



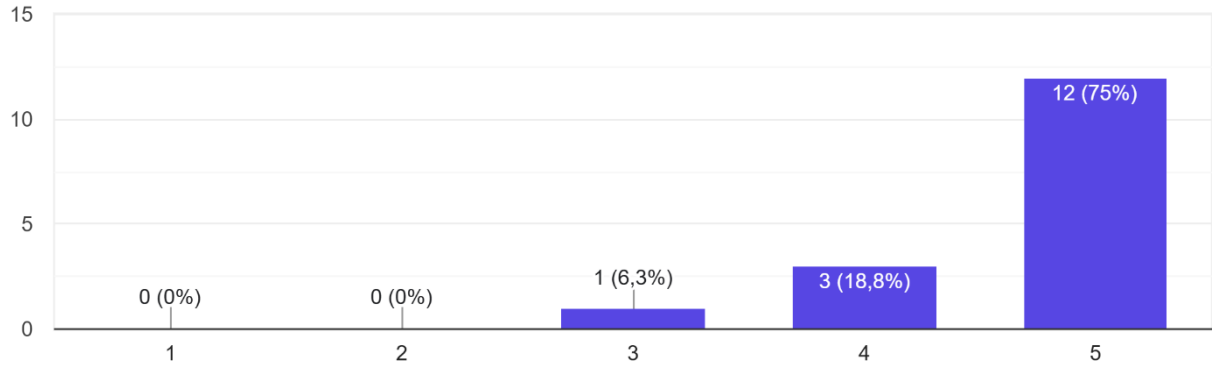
2- The program effectively improved my transversal skills, such as teamwork, communication, and creative problem-solving.

16 απαντήσεις



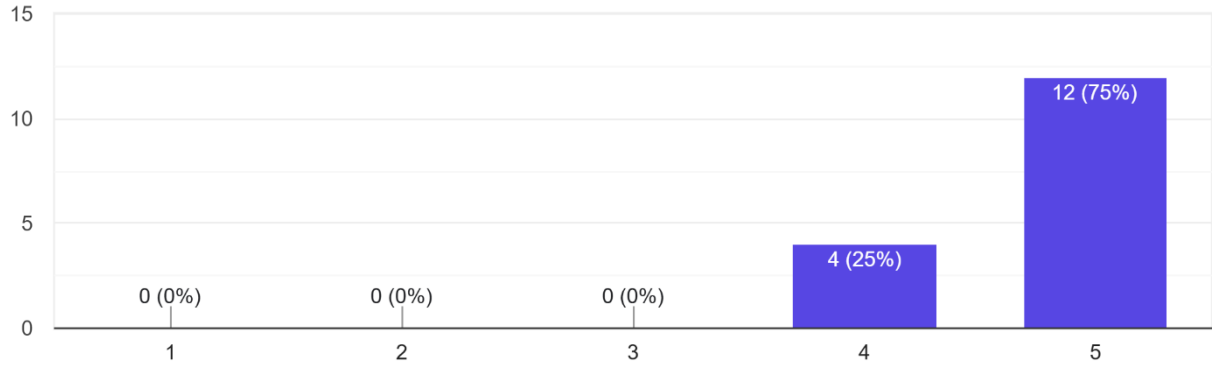
3- I feel that my insights into my research skills in the field of biotechnology (specifically for climate change mitigation) have significantly increased.

16 απαντήσεις



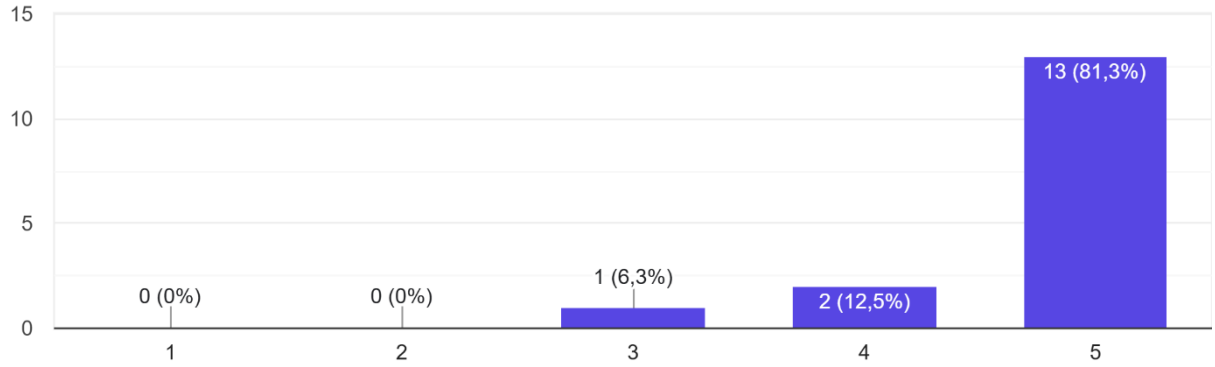
4- I feel better prepared to enter the labour market as a result of this training.

16 απαντήσεις



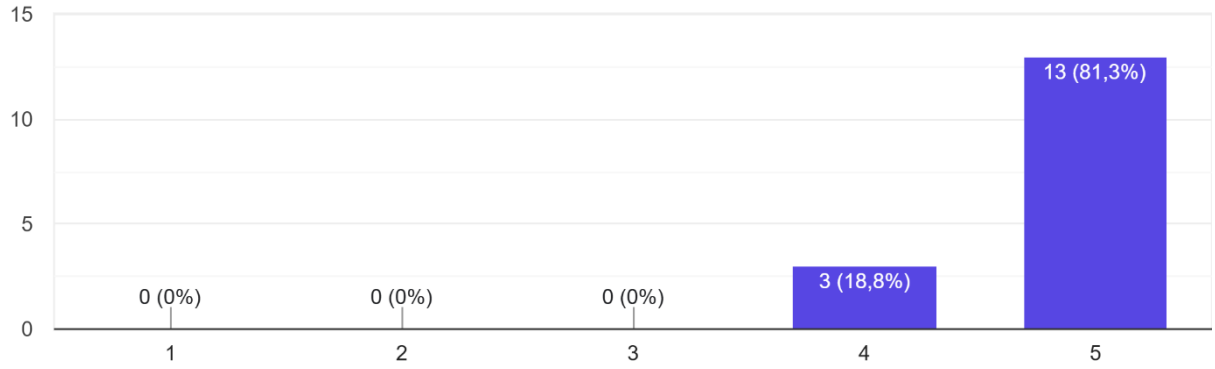
6- The Design Thinking process (Empathize, Define, Ideate, Prototype, Test) enhanced my ability to generate innovative solutions for industrial problems.

16 απαντήσεις



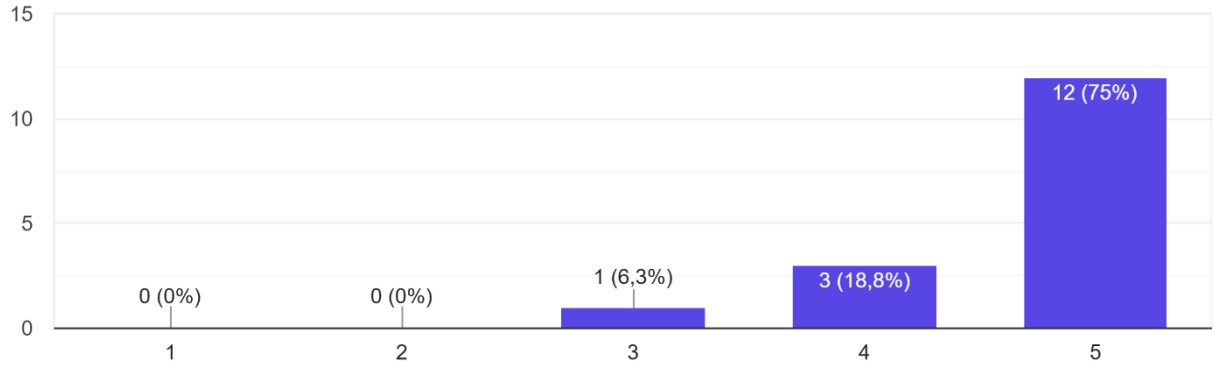
7- The "Biotech Student's Guide to Future Projections" handbook provided valuable guidance on biotechnological applications and entrepreneurship.

16 απαντήσεις



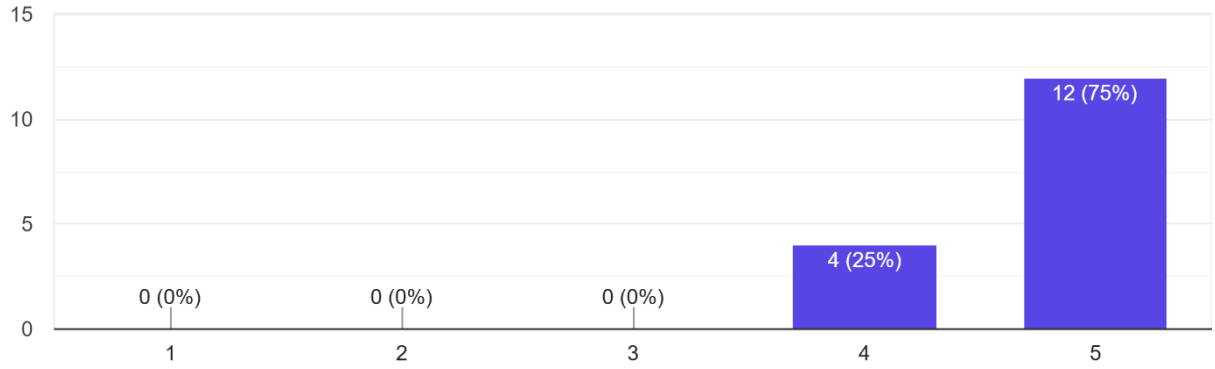
8- The use of digital tools and technologies facilitating interaction and engaging learning during the course enriched my active learning experience.

16 απαντήσεις



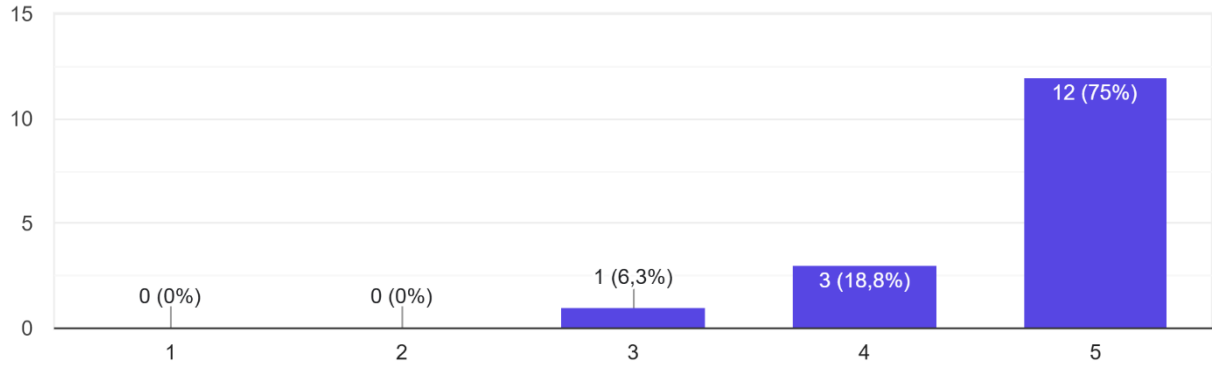
9- The hands-on laboratory work is essential for testing and refining our biotechnological research ideas.

16 απαντήσεις



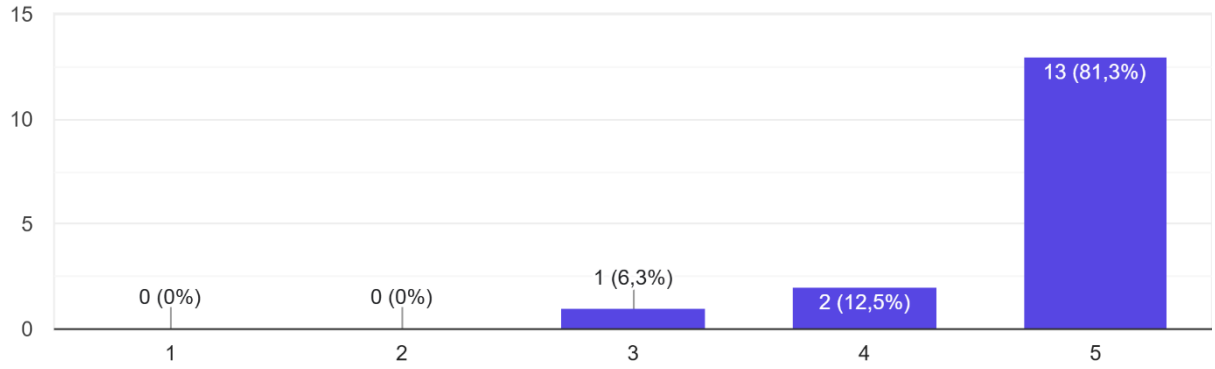
10- My team and I successfully developed a functional prototype or a research project idea with an outline during the piloting process.

16 απαντήσεις



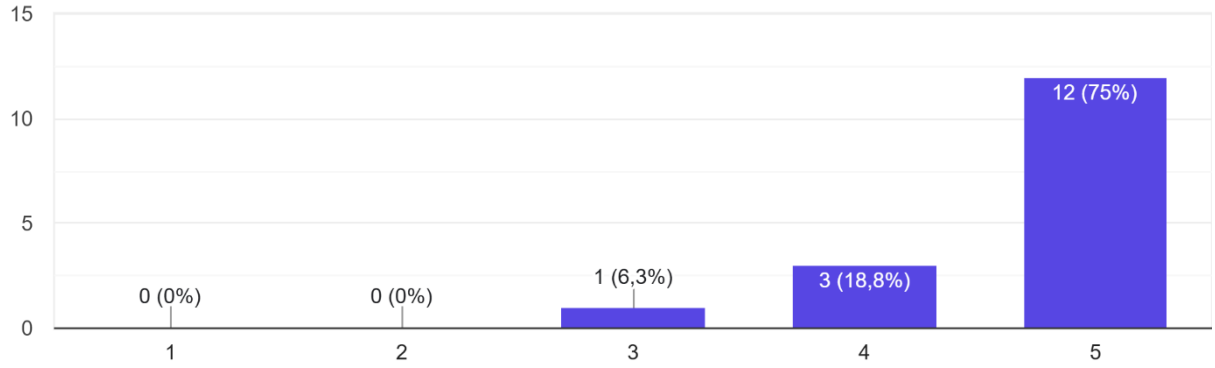
11- Interacting with industry representatives and academic experts provided me with a clear understanding of real-world industrial challenges.

16 απαντήσεις



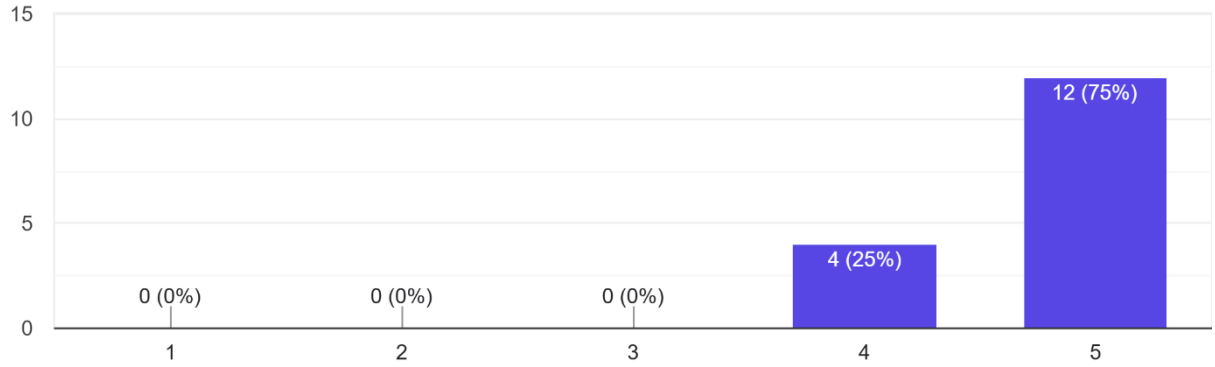
12- I intend to pursue a career in the biotechnology industry rather than other employment sectors.

16 απαντήσεις



13- I have a strong intention to launch a startup or be a part of it as a partner in the biotechnology field in the future.

16 απαντήσεις



Testimonial video: https://drive.google.com/drive/folders/11fdBFhiEhS4mFgdZ-cFf0WHAWI5WT98s

Students presentations: https://drive.google.com/drive/folders/1R9WKxfDj0hiGCm8SHgu_7BGcrMaKM7J3