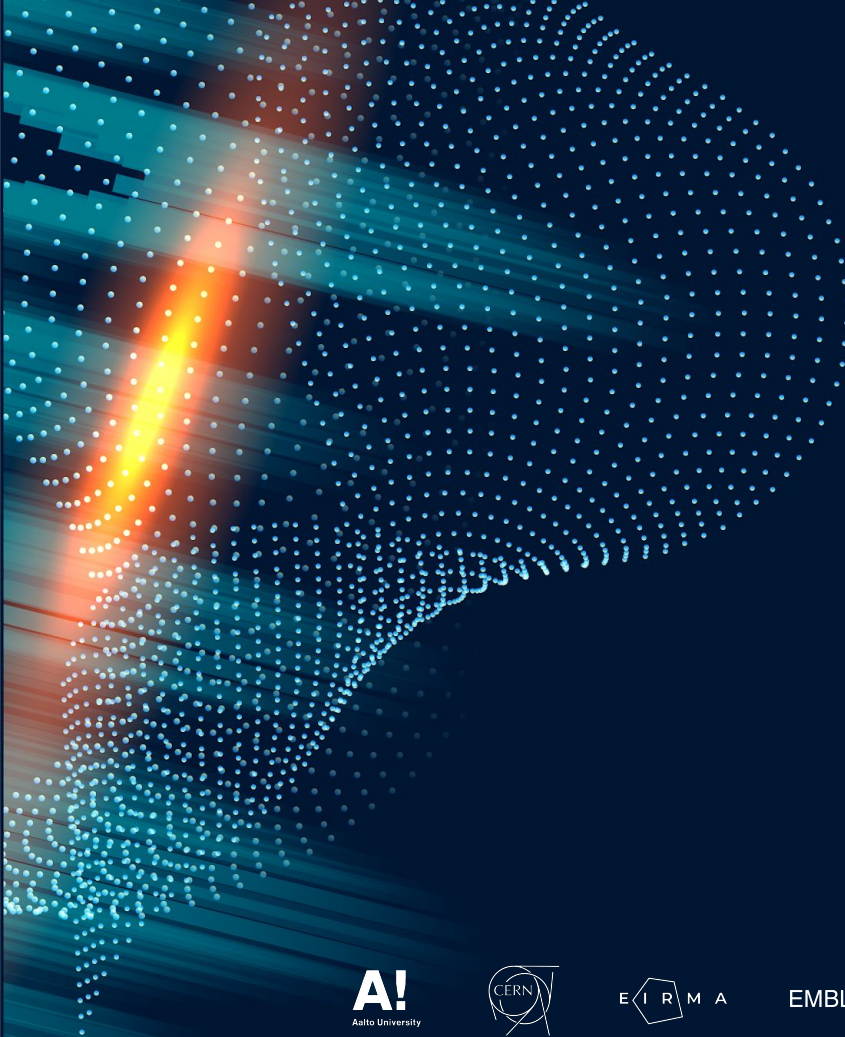


# LEARNING IMPACT ATTRACT ACADEMY

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REFLECTIONS ON EDUCATING WITH  
BREAKTHROUGH TECHNOLOGIES  
FOR SCIENCE AND SOCIETY



The insights shared in this report were gathered during the Pre ATTRACT Final Conference, hosted at the European Synchrotron Radiation Facility, in Grenoble, France. June 12-13, 2024.

Project team: Vikki Eriksson, Rohan Sachdeva, Klaus Castrén, Shreyasi Kar

Student feedback analysis and visualisations: Xiaoqi Feng  
Photography: Adela Navratilova

Contributors: Aaro Packalén, Aaron Down, Anna Cain, Arkar Nan Htike, Byri Manoj Srinivasa Perumal, Catarina Soares Batista, Dina Zimmermann, Eloisa Mazzocco, Evdokia Charalambous, Gabriel Vayá, Giuseppe Mincolelli, Hio Liang, Ho Fung Ma, Jali Närhi, Jenni Ikonen, Joao Vinicius Hamalainen Gama, Juan Ramos Castro, Jukka Ojasalo, Katharina Salewski, Kirstin Kohler, Lauren Demaio, Marina Paola Oian, Markku Koskela, Markku Mikkonen, Matteo Vignoli, Mireia Gargallo, Mireia Sierra Andrés, Nassim Beladel, Ole Anton Werner, Petra Garajova, Sem Carree, Senni Kirjavainen, Sine Celik, Susana Zarco Soriano, Virpi Kaartti, Yousra Gottih.

Aalto Design Factory, 2025



# FOREWORD

The landscape of education is undergoing a profound transformation, driven by rapid advancements in technology and the changing demands of our global society. This report stands as a testament to the pivotal role that education plays in shaping not only the individual but also the collective future of humanity.

At the heart of this transformation lies the intersection of learning and technology. Students today are not merely recipients of knowledge but active participants in its creation, dissemination, and application. The ability to collaborate with cutting-edge and emerging technologies is no longer an optional skill—it is a necessity. Empowering students to engage with these technologies fosters critical thinking, creativity, and adaptability. It prepares them to navigate a world where innovation is the currency of progress. Moreover, collaborative learning—enabled and amplified by technology—breaks down silos, connecting students across disciplines, geographies, and cultures. This interconnected approach equips them to address complex, multifaceted problems with a diversity of perspectives and a shared commitment to solutions.

This report captures the essence of this educational paradigm shift, presenting insights from educators who highlight that collaboration and technology can redefine learning experiences. As we explore the themes and findings presented in these pages, let us remain steadfast in our belief that education is the most powerful investment in the future. By harnessing the power of emerging technologies and fostering collaboration, we can ensure that today's students are not just prepared for the future—they are empowered to shape it.

**ATTRACT Academy team, 2022-2025**



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01

# THE PROJECT

An overview of the project as well as contributing institutions.



# INTRODUCING ATTRACT PHASE II

Building on the achievements of phase 1, ATTRACT phase 2 emphasizes supporting and funding the most impactful and promising technological breakthroughs identified in the initial phase, particularly those demonstrating significant potential for applications in science, industry, and society. Many technologies driving breakthrough innovations with transformative impacts on people's lives originate from fundamental research.

Funded by the European Union's Horizon 2020 programme, ATTRACT is a trailblazing initiative that unites Europe's fundamental research and industrial communities to spearhead advancements in next-generation detection and imaging technologies, aiming to revamp Europe's economy and improve people's lives by fostering the creation of new products, services, companies, and jobs.

This phase also expands opportunities for young entrepreneurs, while introducing a pioneering Socioeconomic Study that examines an emerging innovation ecosystem.

# ATTRACT ACADEMY

One of the activities in ATTRACT phase 2 is the upscaling of the 'Young Innovator and Entrepreneurs' pilot from phase 1, under the ATTRACT Academy umbrella. During phase 2 the ATTRACT Academy initiative increased the number of universities and students, providing young innovators with the opportunity, methodologies and mentoring for developing novel concepts and prototypes of technological solutions addressing societal challenges inspired and in collaboration by the detection and imaging technologies developed within the funded projects.

The inclusion of student projects in ATTRACT phase 2 is designed to create a new generation of researchers who perceive co-innovation between academia, research infrastructures, and commercial organisations as a natural way of working. The student projects are intended to foster a stronger entrepreneurial culture across Europe that uses the concepts and resulting technologies created for research purposes as the starting point for developing products and services for our citizens.

Student projects were funded in two different modalities



## MODALITY A

Student Programs in this modality focus on design thinking and involve courses worth 5–9 ECTS credits. Interdisciplinary student teams create prototypes, experiments, or demonstrations using ATTRACT technologies to address societal challenges. Students work in a non-linear process, starting with identifying societal needs and then exploring innovations inspired by ATTRACT-funded technology. Deliverables include a brief project report, a description of the solution, and a team poster.



## MODALITY B

Student programs use Passion-Based Learning (PBL) and design thinking, with courses totaling at least 10 ECTS credits. Smaller courses can be included if paired with larger ones. Students work in interdisciplinary teams to design prototypes using ATTRACT-funded technologies, collaborating with research groups and scientists. Deliverables include a project poster, team flyer, final solution video, and a detailed report.



# 17

Institutions represented within  
ATTRACT Academy consortia

# 149

Completed student projects

# 1307

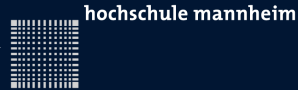
Students active in projects



# CONSORTIA & PARTICIPATING INSTITUTIONS

Organizations partnered and collaborated on *student projects* (SPs). There were 10 SPs included in ATTRACT Phase II.

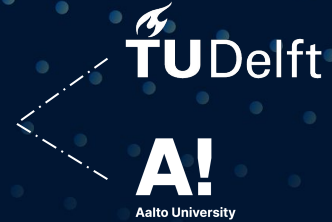
**SP-1 BASE:**  
From Smart  
Facilities to Smart  
Regions



**SP-2 SGI:**  
SUGAR Global  
Innovation



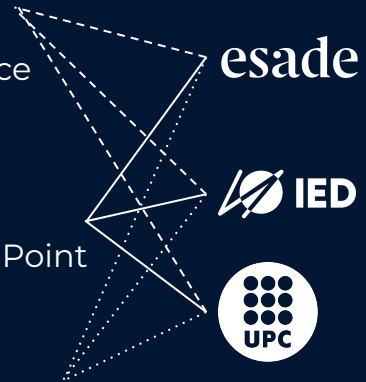
**SP-3 SPOT:**  
Societal Perspectives  
to innovation  
Opportunities in  
Technology



**SP-4 CBI4AI:**  
Challenge Based  
Innovation for  
Artificial Intelligence

**SP-5 CBIFP:**  
Challenge Based  
Innovation-Fusion Point

**SP-6 TeSI:**  
Technology for Social  
Innovation



# CONSORTIA & PARTICIPATING INSTITUTIONS

**SP-7 ACISS:**  
**ATTRACT CERN**  
Ideasquare  
Summer School



esade



hochschule mannheim

**SP-8 CBI.A3:**  
Challenge Based  
Innovation A3



**PACE**  
UNIVERSITY

**SP-9 CBI.ATTRACT:**  
Challenge Based  
Innovation Attract



**UNIMORE**  
UNIVERSITÀ DEGLI STUDI DI  
MODENA E REGGIO EMILIA



**ALMACUBE**



**Università  
degli Studi  
di Ferrara**

**SP-11 FTSF:** Future  
Technologies for  
Sustainable Fashion

**Iaac** | Institute for  
advanced  
architecture  
of Catalonia



# ATTRACT ACADEMY TIMELINE

**Round 0** kicks off with **32** projects, across **6** consortia.

**January  
2022**

**Round 1** kicks off with **56** projects, across **10** consortia.

**September  
2022**

**Round 2** kicks off with **61** projects, across **10** consortia.

**September  
2023**

Educators and students present their experiences at the pre-AFC

**June  
2024**



02

# THE PROCESS

Data collection and analysis.





# CAPTURING EDUCATORS' EXPERIENCES

The qualitative data for this report was collected during an interactive workshop designed to facilitate collaborative exploration of educational experiences and practices. The 3 hour session was structured around a series of reflective and future focussed questions. Participants worked in trios, engaging in focused discussions and sharing insights drawn from their diverse contexts. Each group collectively documented their thoughts, either through handwritten notes on paper or digitally on collaborative platforms. For groups using paper, photographs of their clustered notes were captured to preserve the richness of their input.

Participants discussed and captured individual insights in response to:

- How ATTRACT projects support the development of multidisciplinary student teamwork and learning?
- How did ATTRACT projects impact the overall quality of student work?
- Did ATTRACT projects help develop any students' individual or intrapersonal skills?
- Beyond funding, did the ATTRACT projects help empower you, your students or your organisations?
- If you could go back in time and redesign the ATTRACT experience - what would you keep and what would you change?
- What were the methods you developed to navigate the complex quagmire of deep imaging and detection technologies? How did you make them digestible for your students?

The session ended with an open exploration of participants thoughts, concerns and hopes for future education.



# CAPTURING STUDENTS' EXPERIENCES

In order to share student experiences, which relate to the themes emerging from the educators' workshop, feedback included in the ATTRACT Student Surveys is included.

The surveys focused on students' overall learning satisfaction, perceptions of learning outcomes, received support, and collaboration experiences. 430 students shared their feedback through the surveys (survey 1 n=270; survey 2 n=160). Questions were adjusted for Modality A and B courses, as they have different lengths and may have different impact on students' learning experiences and outcomes.

The surveys incorporated both Likert scale questions and open-ended questions to dive deeper into students' learning experiences related to interdisciplinary collaboration and technological innovation. Not all survey questions are reported here.



# MAKING SENSE OF FINDINGS

## *Educator's Insights*

The notes collected during the workshop with educators served as in-vivo codes, representing participants' authentic language and concepts. The data underwent a rigorous thematic analysis, identifying patterns and underlying themes that emerged across the groups. This approach ensured that the analysis was grounded in the participants' lived experiences and perspectives, providing a nuanced understanding of the shared challenges, opportunities, and innovations in education. The resulting themes discussed in this report, include:

- ➔ **LEVERAGING NON-TRADITIONAL PRODUCT DEVELOPMENT PROCESSES**
- ➔ **TEACHING HIGH TECH**
- ➔ **NAVIGATING MULTIDISCIPLINARITY, SERENDIPITY & PEER ENGAGEMENT**
- ➔ **SOCIETAL IMPACT & STUDENT MOTIVATION**

## *Students' Insights*

Quantitative analysis of student feedback survey data was completed through descriptive statistics in R software.







03

## THE THEMES

Emerging themes from educators' insights and student feedback.



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# LEVERAGING NON-TRADITIONAL PRODUCT DEVELOPMENT PROCESSES

A decorative graphic consisting of a series of white dots forming a wavy, ribbon-like shape that flows from the left side of the page towards the center.

ATTRACT provided a transformative framework for student learning, breaking away from the constraints of traditional product development (PD) processes. By adopting a non-traditional approach, ATTRACT enabled students to move beyond being slotted into conventional roles, fostering a deeper exploration of their potential and introducing them to new skills and competencies. This approach not only enhanced their understanding of product development but also exposed them to unexpected ways of working, thereby broadening their perspectives on innovation and collaboration.

In a number of cases ATTRACT introduced students to an entirely new framework and methodology, creating a fertile ground for experimentation and discovery. Unlike conventional PD cycles, which often prioritize linear role assignments, ATTRACT encouraged iterative exploration and cross-functional collaboration. For example, students participated in exercises such as building a Rube Goldberg machine—a playful yet complex task that emphasized creativity, teamwork, and problem-solving in unconventional ways. These activities underscored the value of stepping outside predefined roles to tackle challenges from multiple angles.

ATTRACT was instrumental in helping students discover and adopt new roles and skills. Through methodological exchanges, knowledge-sharing sessions, and masterclasses, participants gained access to a diverse toolbox of methods and approaches. Tools like stakeholder mapping equipped students to holistically navigate and engage with complex ecosystems, enhancing their ability to approach scientific concepts and actors strategically. This multidimensional skill set prepared students to engage more effectively with real-world challenges, bridging the gap between academic learning and practical application.

One of the ATTRACTs standout contributions was its emphasis on improving how scientific concepts are communicated to students. By integrating tools like the *Design Sprint* methodology and facilitating exchanges of knowledge and tools, the program promoted a culture of collaboration and innovation. These activities were not only engaging but also pivotal in fostering a deeper understanding of the complexities involved in deep-tech development and its integration into student courses.



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# TEACHING HIGH TECH

**Bringing cutting-edge technology projects into academic settings represents an ambitious yet rewarding endeavor. Such initiatives expose students to real-world innovation challenges, foster interdisciplinary collaboration, and enable the development of critical skills. However, they also present unique challenges, requiring careful planning, adaptive teaching strategies, and ongoing refinement. This section explores both the benefits and the obstacles encountered when integrating advanced technologies into academic projects.**

Incorporating cutting-edge technology projects into academia is essential for preparing students to thrive in an increasingly complex and technology-driven world. These projects push students beyond theoretical learning, immersing them in the application of advanced tools and ideas. A significant pedagogical challenge is ensuring that students engage with technology critically and creatively, rather than being guided too closely toward pre-specified directions. Summarizing and presenting the technology in an open-ended way encourages exploration and innovation, allowing students to generate diverse and unexpected solutions.

The use of tools like *Tech Cards* proved to be a valuable starting point for bridging disciplinary gaps, but there is significant potential to refine and develop such tools further. Encouraging methodological exchanges among educators and providing targeted support for younger or less-experienced students can help mitigate disparities in project outcomes.

Moreover, integrating structured frameworks for interdisciplinary collaboration and research can help students more effectively crystallize their ideas and move from exploration to actionable innovation. By continuously adapting teaching strategies and enhancing resource support, institutions can ensure that cutting-edge technology projects become a cornerstone of academic excellence.

# TEACHING HIGH TECH

## 3 CORE BENEFITS

ATTRACT facilitated **increased knowledge sharing** among teachers and trainers, enriching the overall teaching ecosystem. Collaborative discussions about teaching strategies and activities enhanced the faculty's ability to support students effectively.

Students had to focus intensely on research to ensure their ideas were novel and viable. This emphasis on critical evaluation helped them develop essential **skills for assessing data and challenging assumptions**, pushing them to think "out of the box" rather than following clients, partners or sponsors' predefined paths.

Over time, the quality of **student projects improved** as teaching teams refined their methods of support. Understanding how to guide students in exploring the diverse applications of technology significantly enhanced project outcomes.

## 3 MAIN CHALLENGES

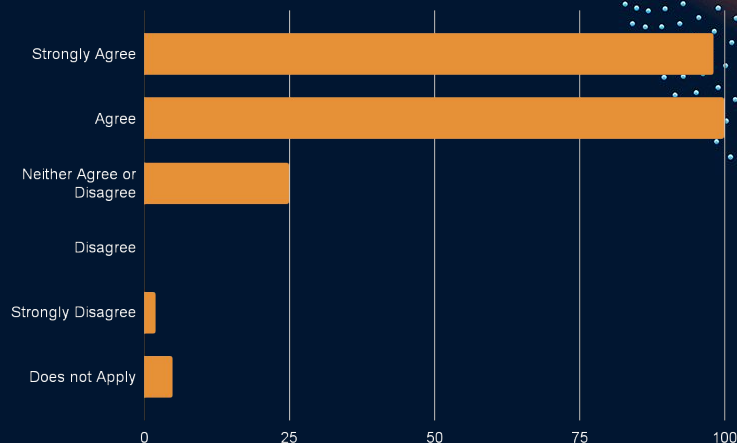
Not all student teams adapted to the technologies equally. While some excelled, generating innovative solutions, others **struggled to understand the technology**, leading to fluctuations in project quality. Younger students, in particular, found it more challenging, as they often lacked the work experience and confidence to navigate the complexities of the projects compared to older peers.

Advanced technologies often required coaches to invest **substantial effort in helping students explore** different applications and possibilities. The need to balance guidance with encouraging independent thinking was a recurring challenge.

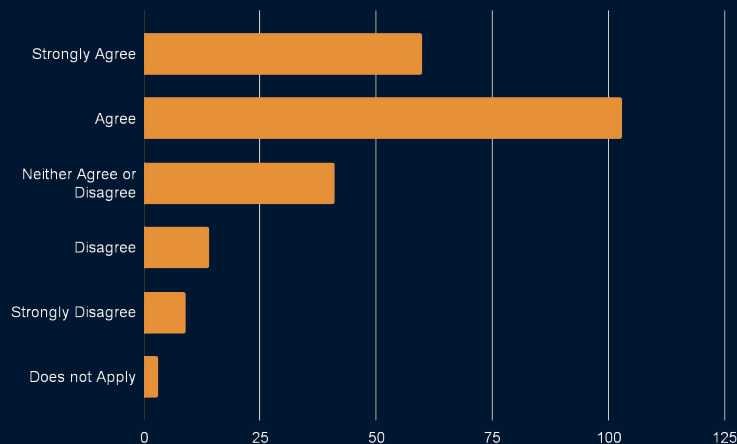
In the early phases, **some technologies did not function as intended**, disrupting the learning process. Length differences between academic programs also influenced how quickly students could engage deeply with their projects, with longer programs offering more time for exploration and adaptation.



*Question from student survey 2:*  
Based on my experience in the ATTRACT course, a collaboration between higher education students and emerging technologies is a progressive way to create innovative societal applications.



*Question from student survey 2:*  
My team was adequately supported to collaborate with the ATTRACT technologies.

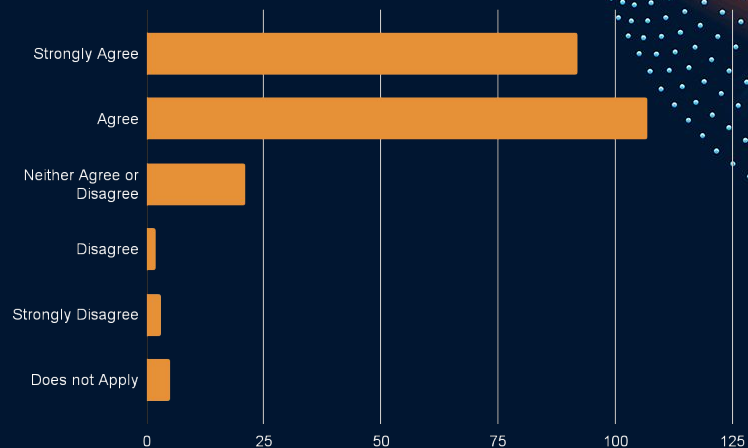


**TEACHING  
HIGH TECH**  
*A student  
perspective*

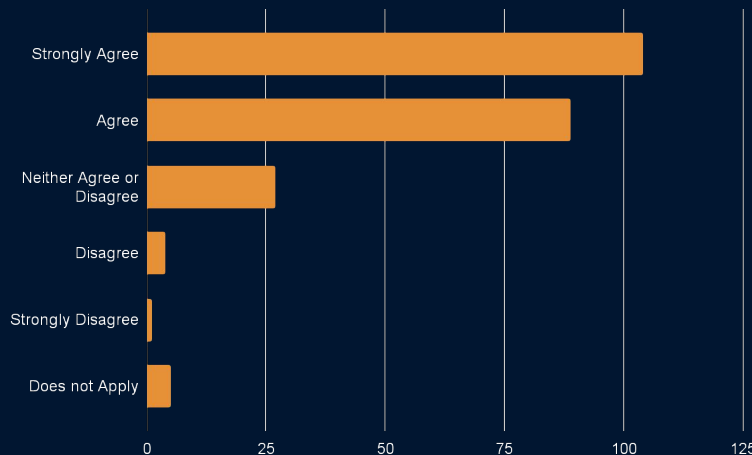
**“I learned a lot working with ATTRACT technologies’ representatives! At first, I felt confused and unsure, as I wasn't familiar with many of them. However, through this collaboration, I've gained valuable insights and developed the confidence to work with technologies and not to be afraid of exploring.”**

— Student from IED

*Question from student survey 2:*  
The ATTRACT course improved my ability to create societal applications, that is, the ability to utilise technology to benefit society.



*Question from student survey 2:*  
The ATTRACT course helped me gain the confidence to be more creative with technology applications.



**TEACHING  
HIGH TECH**  
*A student  
perspective*

**“It was rewarding having  
the experience of being in  
an impressive tech-friendly  
environment!”**

— Student from Swinburne University of Technology



# TEACHING HIGH TECH

What should RDIs and technology partners consider and prepare when collaborating with students and educators?

**01**

**Simplification  
of  
Technologies**

Adapt and simplify complex technologies to make them more accessible and understandable for students. Focus on technologies that can act as substitutes for tomorrow's innovations to encourage creative exploration.

**02**

**Effective  
Pre-Project  
Briefing**

Conduct comprehensive briefings for R&D&I teams to align on language and concepts that make their technologies accessible to non-experts, particularly students.

**03**

**Positive and  
Encouraging  
Feedback**

Provide constructive and positive feedback to students, as it significantly boosts their confidence and enhances motivation.

**04**

**Active and  
Genuine  
Collaboration**

These parameters aim to ensure that technology partners contribute effectively to innovation-driven education, fostering a collaborative and inspiring environment for university students.

**05**

**Enhanced  
Communication  
Skills**

Train R&D&I scientists to communicate their research in accessible, clear, and inspiring ways to bridge knowledge gaps and enhance collaboration

# TEACHING HIGH TECH

What should RDIs and technology partners consider and prepare when collaborating with students and educators?

**06**

**Fostering  
Mutual  
Respect**

Emphasize mutual respect between R&D&I scientists and students, recognizing students as emerging experts and valuable contributors to the project.

Recognize that the quality of collaboration with R&D&I scientists is a key determinant of project success. Strong partnerships lead to better outcomes and higher student motivation.

**07**

**Impactful  
Collaboration**

**08**

**Accessibility  
of Knowledge  
and Research**

Consider making knowledge and research outcomes more open-source to allow broader access to tools and findings, benefiting students and supporting partners alike.

**09**

**Researcher  
Training and  
Motivation**

Offer targeted training and motivation programs for R&D&I scientists to prepare them for engaging with students and maximizing the educational value of their involvement.

**10**

**Proactive  
Support**

Provide timely and reactive support to student teams, avoiding delays or lapses in engagement that could lead to demotivation.

In modern education, particularly in fields intersecting with advanced technology and design, multidisciplinary is not merely a bonus but a necessity. ATTRACT, by supporting travel budgets and fostering collaborative teamwork, provided an avenue for students from varied backgrounds to come together and work on shared challenges. These opportunities emphasized the importance of meeting peers from different disciplines and fostering cooperation, laying the groundwork for interdisciplinary innovation.

Team dynamics play a pivotal role in fostering multidisciplinary. In many cases, engineers acted as translators or explainers of technology, helping designers and other non-technical peers understand complex concepts. This reciprocal relationship enabled team members to leverage their respective expertise effectively. Even in weaker teams, students reported learning from their peers' diverse approaches, highlighting the value of simply being exposed to other disciplines.

Promoting multidisciplinary through serendipitous peer interaction is a vital component of modern education, equipping students to tackle complex problems with a diversity of approaches and skills. While challenges such as siloed working and uneven knowledge sharing persist, intentional design and support can significantly enhance the depth of interdisciplinary collaboration. By fostering trust, cooperation, and mutual learning, educators can create environments where students not only leverage their expertise but also grow from the strengths and perspectives of their peers

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## MULTIDISCIPLINARITY, SERENDIPITY & PEER ENGAGEMENT

Despite the opportunities for interdisciplinary learning, students often defaulted to dividing tasks based on their areas of expertise, limiting cross-pollination. This tendency to work “in silos” reduced the potential for creative blending of skills and ideas across disciplines.

In many teams, only one member fully understood the technical aspects of a project, leading to a reliance on that individual to explain or translate the technology for the rest of the group. While this dynamic highlighted the importance of engineers as communicators, it also underscored the difficulty of achieving balanced knowledge sharing across disciplines.

Facing the challenges of working across disciplines pushed students to develop resilience and adaptability. By confronting their teammates’ weaknesses and compensating for gaps in expertise, students honed their ability to collaborate effectively in multidisciplinary settings.

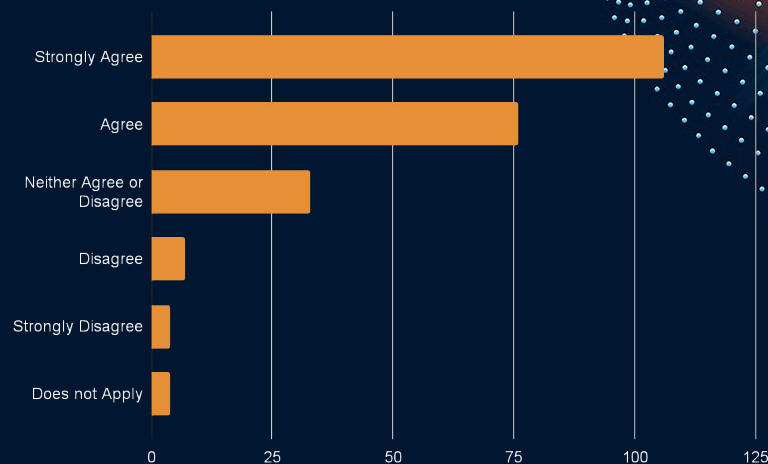
Trust-building exercises and the process of forming teams with designated leadership fostered cooperation and mutual understanding. These activities encouraged students to step outside their comfort zones, facilitating learning from peers and building confidence in interacting with unfamiliar disciplines.

Encouraging students to actively learn skills outside their own disciplines remained a challenge. While some students showed enthusiasm for developing a broader skill set, others were more comfortable staying within their expertise, which limited the depth of interdisciplinary collaboration. Grounded in this a number of opportunities shared by educators.

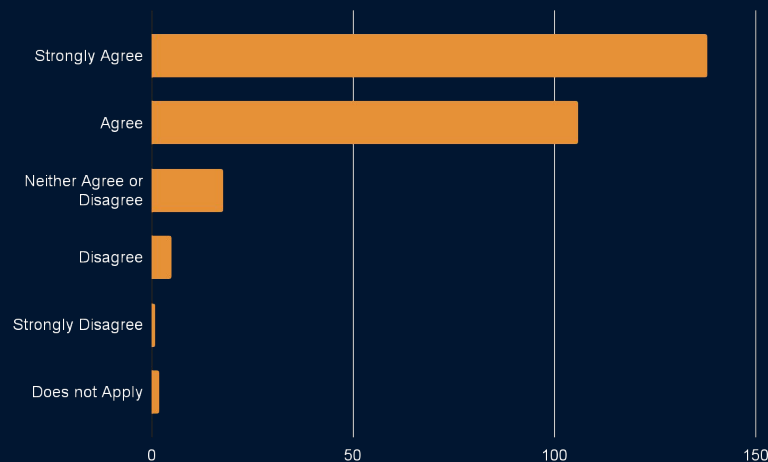
- 01** Design activities that explicitly encourage cross-pollination of skills, such as role-switching exercises or collaborative design challenges.
- 02** Provide structured guidance on how to integrate diverse expertise effectively, reducing the tendency to default to silos.
- 03** Offer tools and frameworks for better interdisciplinary communication, such as shared glossaries or visual aids to bridge technical and non-technical perspectives.
- 04** Facilitate workshops or masterclasses aimed at equipping students with foundational skills from other disciplines, fostering mutual understanding and appreciation.



*Question from student survey 2:*  
Collaborating in an interdisciplinary team improved our student project.



*Question from student survey 1:*  
Interdisciplinary teamwork helped me grow professionally.



**DISCIPLINARITY,  
SERENDIPITY &  
PEER  
ENGAGEMENT**  
*A student  
perspective*

**“Collaboration with my teammates and people from other groups is an amazing experience. We all have different points of view so I learned how to be more open to unexpected ways of thinking.”**

— Student from ESADE

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# SOCIETAL IMPACT, STUDENT MOTIVATION

Incorporating real-world challenges with societal relevance into academic projects offers an effective way to inspire and engage students. When paired with emerging technologies, these projects create opportunities for students to address tangible issues, fostering motivation and a sense of purpose. However, ensuring the success of such initiatives requires careful planning, including providing access to expertise, refining technology interactions, and promoting collaboration.

Working on projects that are beyond their initial expertise challenges students to step outside their comfort zones. These experiences help students develop resilience, adaptability, and problem-solving skills as they turn seemingly insurmountable briefs into successful outcomes. For many, grappling with advanced technologies and unfamiliar societal problems was a transformative learning experience, teaching them to navigate uncertainty and complexity while maintaining focus on their goals.

A key component of these projects was the increased access to experts facilitated by ATTRACT. Through enhanced touchpoints with R&D&I professionals, particularly in the second round of the initiative, students gained deeper insights into cutting-edge technologies and their potential applications. This exposure improved students' technological literacy, enabling them to explore more sophisticated and innovative solutions to the problems they addressed.

The inclusion of real-life application scenarios further amplified the impact of these projects. By working with actual cases that had clear societal implications, students found a direct connection between their academic efforts and real-world outcomes. This connection not only motivated them but also gave their work greater relevance and significance.



# SOCIETAL IMPACT, STUDENT MOTIVATION

## ATTRACT ACADEMY PRACTICES

ATTRACT also provided practical support, such as travel budgets, which helped maintain student teamwork and motivation. Collaborative efforts were central to project success, and opportunities for exchange, such as the student presentations in Bologna, were invaluable for sharing ideas and elevating the overall quality of the projects. However, further fostering exchanges between teams could enhance outcomes even more, as cross-pollination of ideas has the potential to raise the standard of every project.

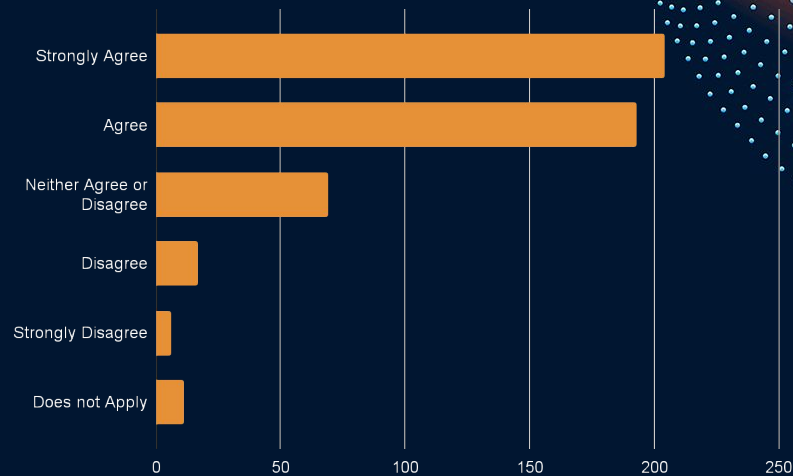
### *The benefit of multiple ATTRACT Academy rounds*

The evolution of the program from its first round to the second demonstrated the value of iterative refinement. Early challenges, such as limitations in technology developers' ability to effectively engage with students, were addressed in subsequent rounds by fostering more structured and focused interactions. Narrowing the scope of applications and strengthening these relationships allowed students to dive deeper into their projects, resulting in higher-quality outcomes.



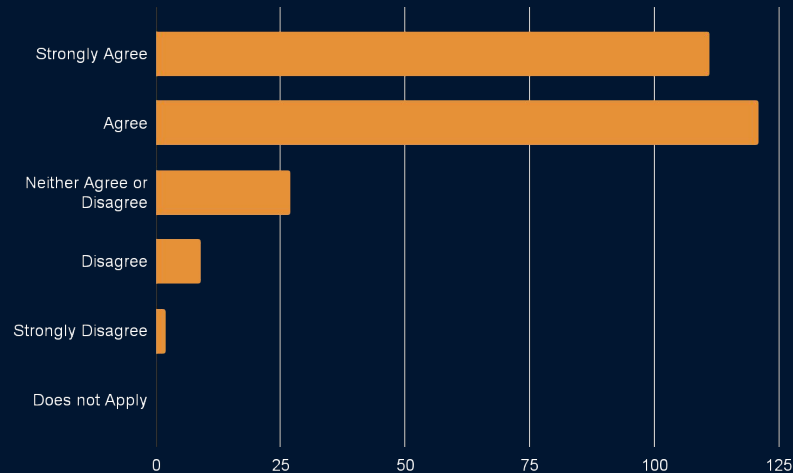
*Question from student survey 1 and 2:*

It was motivating to work on a challenge that could have a real impact on the world.



*Question from student survey 1:*

It was inspiring to investigate the use of technology to solve societal challenges.



**STUDENT  
MOTIVATION**  
*A student  
perspective*

**“It was amazing to collaborate with other friends in the class throughout the ATTRACT project. I have learned to broaden my perspective, learning the social impact of being an mechanical engineer and sharing my ideas through brainstorming sessions. In general, I believe it is a good course to develop myself as an engineer and create meaningful experience in my whole studies at Aalto.”**

— Student from Aalto University



04

# THE FUTURE

What do we take forward?

# Final thoughts

The ATTRACT Academy programme has provided educators with a wealth of insights into the transformative potential of connecting students with technology partners to address real-world challenges. This innovative teaching model has underscored the importance of creating interdisciplinary, hands-on learning experiences that bridge academia and industry. As educators, we have seen firsthand how such an approach prepares students for future challenges, equipping them with skills that go beyond the traditional classroom and fostering a mindset of innovation and collaboration.

ATTRACT has already demonstrated tangible benefits for educators, students, and institutions alike. For at least one institution, it has inspired the development of new programs and even a forthcoming project utilising their own technology portfolio to inspire projects in a similar way. ATTRACT has also influenced how some educators interact with technology partners, shaping the way they approach research and development in their courses. Increased access to prototyping and the new instruments and investments sparked by ATTRACT collaborations have benefited institutions and opened new possibilities for experiential learning.

For students, the opportunity to see their projects evolve in the hands of technology companies and researchers has been particularly motivating. This continuity of development not only validates their efforts but also inspires them to aim higher, work harder, and dream bigger. The ATTRACT ecosystem has also enhanced the quality of students that educators can present to future stakeholders, whether for employment or additional collaborative projects, further demonstrating the lasting value of this initiative.

Looking ahead, this way of teaching will be critical for shaping the future of education. It emphasises adaptability, fosters connections between disciplines, and integrates emerging technologies in meaningful ways. By learning from initiatives like ATTRACT, we are not only enriching the academic experience but also potentially influencing the evolution of research and technology development itself. This collaborative model represents the kind of forward-thinking, impact-driven education that will prepare students to tackle the complex challenges of tomorrow while empowering educators to continually innovate in their teaching practices.





**FOSTERING  
EXPLORATION  
TOGETHER.**



2025

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Visual credit: Images from Adela Navratilova and Unsplash.  
Icons created by Freepik, Visual elements by Slidesgo.



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