SciCultureD

D3 - Embedding of a SciCultureD approach within partner institutions— CPD courses for teachers and other academics, executing undergraduate courses, policy change within HEI institutions

- Result Leading Organization: city2science
- Result Type: Policy Recommendations

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Executive Summary 2

Description: 3

1.1 Task 1: Literature Review 3

1.2 Task 2: Continuous Professional Development (CPD) Course 5

1.3 Task 3: Executing Transdisciplinary ECTS Undergraduate Courses 13

1.4 Task 4: Policy Change within HEI Institutions 18

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SciCultureD is an Erasmus+ project, led by the University of Malta together with Western Norway University of Applied Sciences, Norway, city2science, Germany, and Science View, Greece. It aims to nurture transdisciplinarity and innovative problem solving through the blending of arts, science and entrepreneurship. Funded by the Erasmus+ programme of the European Union. This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Executive Summary

This report outlines key tasks and findings from the SciCultureD project, aimed at advancing transdisciplinary (TD) education in higher education institutions (HEIs) and continuous professional development (CPD) programmes. By integrating TD practices into curricula and institutional policies, SciCultureD seeks to address global challenges such as sustainability, inequality, and public health through collaborative, innovative, and inclusive approaches.

Task 1: Literature Review

To assess the current landscape of TD education in HEIs, a comprehensive review of 32 selected studies was conducted, exploring definitions, boundaries crossed, motivations, methodologies, and challenges. The findings highlight that TD education integrates diverse disciplines and stakeholder perspectives, fostering skills like critical thinking and creativity while addressing societal challenges. However, systemic barriers, cultural resistance, and resource limitations hinder widespread adoption.

Task 2: CPD Course Gap Analyses

city2science and Science View analyzed their CPD courses to identify gaps in implementing TD principles. While the training programs incorporate interdisciplinary elements and hands-on activities, limited engagement with external stakeholders constrains their transdisciplinary potential. Recommendations include involving diverse actors and expanding the scope of training to enhance societal impact.

Task 3: ECTS Undergraduate Course Gap Analyses

The University of Malta and Western Norway University of Applied Sciences evaluated ECTS undergraduate courses. While these programs include innovative elements like project-based learning, sustainability-focused projects, and creative ideation techniques, they face challenges in fully embedding TD approaches, particularly in fostering cross-disciplinary teamwork and stakeholder collaboration.

Task 4: Policy Change Workshop

An interactive workshop with project partners was conducted to develop actionable policy recommendations for embedding TD education into institutions. The workshop emphasized aligning higher education policies with European values such as inclusivity, sustainability, and active citizenship, ensuring long-term institutional and societal benefits.

Key Policy Recommendations

The report concludes with the following set of policy recommendations for advancing transdisciplinary (TD) education in HEIs

1. Embed transdisciplinary approaches in HEIs' educational curricula
2. Incentivize faculty and teaching staff to Adopt TD Approaches
3. Foster partnerships between academia and non-academic stakeholders
4. Align policy and funding priorities with TD objectives
5. Increase accessibility and promote inclusivity in TD education
6. Establish evaluation and follow-up mechanisms

Description:

This report describes the activities of D3 - Embedding of a SciCultureD approach within partner institutions— CPD courses for teachers and other academics, executing undergraduate courses, policy change within HEI institutions. In particular, the report summarizes the literature review on TD education in HEIs (Task 1), the gap analyses of CPD courses within the partner institutions (Task 2), the gap analyses of ECTS courses (Task 3), and the policy change within HEI institutions (Task4). It finally summarizes a set of policy recommendations for advancing transdisciplinary (TD) education in HEIs.

1.1 Task 1: Literature Review

To better understand and assess the current landscape of transdisciplinary (TD) education in higher education institutions (HEIs), the consortium led by city2science reviewed relevant literature. This review focused on the involved disciplines, the rationale behind their design, and the strategies and approaches used for implementation, as well as the challenges faced. Additionally, we examined the contributions of SciCultureD and its predecessor, SciCulture, in this context. While the full literature review is in Appendix SciCultureD Literature Review on Transdisciplinary Education in HEI.docx, a summary of the main findings is presented here.

For this literature review, we searched relevant literature in *Scopus*, an established database of peer-reviewed literature. The search string used was: “transdisciplinary education + HEI/Higher Education Institutions,” and produced 126 results. In addition, we added relevant literature suggested by the SciCultureD experienced team. After a thorough double-step screening process, we selected a total of 34 titles to be reviewed. The literature review answered the following set of questions.

I. How is “Transdisciplinary (TD) Education” typically defined in the literature concerning education in Higher Education Institutions (HEIs)?

   The reviewed literature defines TD Education in HEIs as a process that differs from traditional learning by going beyond disciplinary learning to integrate various knowledge systems and living experiences through collaboration with relevant stakeholders. This process contributes to the development of a shared understanding and leads to innovative and socially relevant solutions. In this way, TD Education redefines learning by disrupting traditional ways of thinking and learning.

II. What boundaries are commonly crossed in TD Education within HEIs?

The literature reveals that TD Education breaks siloed academic disciplines, and integrates social sciences, humanities and the arts in areas of learning usually limited to science, technology, engineering, and mathematics (STEM). More importantly, it reveals that the top-down boundaries between science and society are demolished and redefined. TD Education also integrates global perspectives by enabling cross-border collaboration. By crossing these boundaries, transdisciplinary education transforms how knowledge is created and applied

III. What are the underlying reasons for developing TD Education programmes in HEIs?

Many reasons underlie the development of TD Education programmes considered within the reviewed literature. One of these is the ability of TD Education to enhance essential student skills such as critical thinking, creativity and adaptation. These skills are vital to addressing complex societal problems that cannot be solved within the traditional disciplinary ways of thinking. TD Education enhances also the societal relevance of education and research within HEIs by engaging external stakeholders. Moreover, TD Education supports holistic learning that integrates knowledge, skills, and values for transformative learning, which empowers students to address ecological, social, and economic justice. In sum, TD Education is seen to be a response to the increasing complexity of our world. Emerging societal challenges demand not only sophisticated skills but also collaborative frameworks that engage diverse stakeholders and empower students to drive systemic change.

IV. What approaches and strategies are frequently employed in TD Education in HEIs?

Embedding transdisciplinary (TD) education within higher education institutions requires innovative pedagogical approaches that foster collaboration, problem-solving, and engagement with real-world challenges. One widely recognised method for fostering transdisciplinary (TD) education is Problem- and Project-Based Learning (PBL/PjBL). Another approach is collaborative, experiential learning where real-world engagement and problem-solving are fostered. Integrating order, disorder, interaction and organisation around “macro-concepts” which then form a constellation called a “polyhedral system” is another innovative way that brings brainstorming and group work into TD Education. Many TD Education programmes were developed around challenge-based and action-oriented learning, which empowered students to bring their solutions to society. This intersects with another approach frequently cited

which is community-based learning. Some approaches are built around the so-called "transformative pedagogies," which aim at fostering values and attitudes that translate into behavior, such as cultivating a sense of community. In a similar vein, the literature stresses leadership as a tool to empower students and enhance social relevance. Transforming through the arts is yet another way to produce new transdisciplinary knowledge. This demonstrates the breadth of strategies for embedding transdisciplinary (TD) education as outlined in the literature.

V. How does the SciCulture(D) approach differ from other TD Education approaches?

There is a considerable overlap between the SciCulture(-D) project and broader perspectives on transdisciplinary education—particularly in the emphasis on interdisciplinarity and societal impact. However, SciCultureD makes a unique contribution by framing transdisciplinary education through a posthuman and materialist lens. This approach seeks not only to address complex problems but also to transform the epistemological and methodological foundations of higher education, advocating a shift from traditional Western paradigms toward more inclusive, ethical, and future-focused practices. SciCultureD achieves that by employing the so-called "creative pedagogies" in a learning process based on design thinking principles.

VI. What are the main challenges in embedding TD Education in HEIs?

Embedding transdisciplinary education (TD) in higher education institutions (HEIs) presents a wide array of opportunities but is accompanied by substantial challenges. Some highlighted challenges are systemic such as limited time, resources, and siloed policies within HEIs, which hinder collaboration across departments and with external partners. Cultural and institutional resistance further complicates the integration of transdisciplinary education. Challenges also manifest at the student level. The time-demanding nature of TD Education programmes, the group dynamics, and the communication barriers are but a few examples of difficulties students have to face in such programmes. Unbalanced, project-based and preferential funding presents another hurdle that can restrict the establishment and the expansion of TD Education in HEIs.

1.2 Task 2: Continuous Professional Development (CPD) Course

Both city2science and ScienceView, as providers of CPD courses, performed gap analyses on their typical courses. The gap analyses are coupled then in Task 4 to produce a set of policy recommendations for partners to implement SciCultureD values and principles in their CPD offerings. Here are the two gap Analyses.

I. city2science CPD Training Gap Analysis

city2science GmbH is a German SME dedicated to advancing science communication and public engagement through specialized training programs. The team offers tailored workshops and training sessions for universities, research institutions, and city administrations, equipping participants with the skills needed for effective science outreach and community engagement. Their programs cover topics like storytelling, interactive science communication formats, open innovation and participatory science engagement strategies, empowering researchers and science communicators to connect with diverse audiences. By fostering these competencies, city2science strengthens the link between scientific communities and society, enhancing public understanding and involvement in science.

a) General Description of the Training

A popular workshop frequently offered by city2science is titled “Introduction to Science Communication and Public Engagement.” This training provides an overview of recent developments and trends in science communication, covering both national and international funding strategies. Participants gain practical tips, techniques, and best practices for effectively engaging with stakeholders outside the scientific community. The workshop combines informative sessions with hands-on activities and is designed specifically for early-career scientists with little or no experience in science communication or public engagement. The session typically lasts four to six hours.

b) Transdisciplinarity of the Training

Here we look at the extent of transdisciplinarity of the training by analyzing several aspects.

b.1.) What are the intended outcomes of the selected training (course)?

The intended outcomes of this training course are to enable participants to:

- Gain an understanding of current developments in science communication and public engagement.
- Identify potential target groups relevant to their research.
- Explore best practices in science communication and examine options for communicating their own research.

- Develop skills and discover practical tools for effectively engaging diverse audiences and stakeholders with their research.
- Plan strategic communication and engagement activities tailored to their specific research topics.

  Through these outcomes, participants are equipped to make their research more accessible and impactful beyond the academic community.

b.2.) What practices or disciplines does the selected training (course) encompass?
The training encompasses a blend of theoretical insights, reflective discussions, and practical sessions. The theoretical components draw from media studies, sociology, and science communication, supplemented by real-world case studies in science communication and public engagement. This interdisciplinary approach provides participants with both a conceptual framework and hands-on skills for effective science communication.

b.3.) What approaches does this selected training (course) employ?
The training employs a range of approaches to engage participants and build practical skills:

- **Alternation of Theoretical and Practical Sessions:** The course combines theoretical input with hands-on activities. This approach equips participants with foundational knowledge and enables them to apply it directly to their work.
- **Reflective Exercises:** Reflection sessions help participants identify parallels between their own research and established best practices in science communication. These sessions encourage participants to extract valuable lessons and insights from other fields.
- **Skill-Building Practical Activities:** Practical exercises, like stakeholder mapping and science festival planning, are used to help participants apply theoretical concepts while focusing on their own research topics.
- **Creative Techniques:** The course incorporates interactive and creative tools, such as LEGO bricks, moderation cards, and group activities, to stimulate engagement and idea generation.
- **Interactive Online Tools:** In the online format, tools like Mural, Mentimeter, and Slido facilitate dialogue and creativity, creating a dynamic and collaborative learning environment.

b.4.) Is the selected training (course) transdisciplinary? If not, what are the expected challenges when trying to make it transdisciplinary?
The training includes some transdisciplinary elements by incorporating diverse methods, a mix of theoretical and practical activities, and occasionally drawing participants from various academic backgrounds. However, it primarily engages early-career researchers and PhD candidates from the natural sciences, with limited involvement from external stakeholders like citizens or policymakers, which constrains its transdisciplinarity.

To enhance its transdisciplinary character, the training could involve additional stakeholders, such as professors, government officials, or NGO representatives working in relevant fields (e.g., environmental protection). However, several challenges may arise:

- Administrative Constraints: Universities, which usually manage registration, promotion, and participant coordination, may limit the training to academic participants.
- Economic Limitations: Involving external experts often incurs additional costs, which may be challenging given typical budgetary restrictions and market pricing policies.
  These factors make broadening the target group challenging, although engaging a wider range of participants would likely enhance the transdisciplinary nature of the training.

II. Science View CPD Training Gap Analysis

Founded in 2008, Science View is an organization that promotes science communication and science education activities to help bridge the gap between the scientific community and the wider public in Greece and in Europe. The staff, members and co-operators (science communicators and science journalists) of Science View, are constantly working on making scientific knowledge useful and clearly understood by the general public. In this period there are 5 full time staff and part time as well as can involve a network of almost 250 members from several fields (e.g. scientists, teachers, communicators). In doing so,it focuses on the following activities:

- the organization of events for the distribution and communication of science in public (such as conferences, info days, science cafes, scientific workshops) and their video coverage released on media or uploaded on websites
- the organisation of training courses about new techniques on science communication; the team specializes on designing and developing e-learning courses for organizations, companies, universities, schools and public and private bodies; it further designs and conducts online seminars, synchronous or asynchronous, via the training web platform of Science View printed and electronic publications, e.g. books concerning science popularization, newsletters, online magazines, websites, information portals and brochures.
- the development and implementation of educational activities in science and technology in order to inform teachers and pupils to obtain relevant skills.
- the development and operation of self-assessment tools for school units in order to measure their capacity in open schooling, innovation and STEAM activities.
- the mobilization of young people, especially students, to participate in actions of scientific interest

- the development and implementation of research activities in various scientific fields.
- the production of videos and documentaries (including interactive documentaries) of research and scientific projects for dissemination and awareness purposes Science View is further involved in the organization of science festivals, world conferences and science debates.

a) General Description of the Training

Science View is offering a training course called **Challenge-Based Learning (CBL)**. CBL is an educational approach that actively involves students in real-world challenges, encouraging them to develop practical solutions through collaboration, critical thinking, problem solving and creativity. This method bridges the gap between theoretical knowledge and practical application, fostering deeper understanding and retention of concepts.
The training aims to introduce the participants to the CBL. Challenge-Based Learning allows students to experience the relevance of the teaching content and enables them to relate to it. It unites research and teaching and promotes a scientific mindset and critical reflection in academia, economy and society. It makes disciplinary boundaries visible, encourages reflection, opens up new perspectives and fosters the ability to deal with complex environments and a rapidly changing reality. Finally, it promotes collaboration of students, teachers, and with external partners, links subjects and methods to cross-disciplinary key competencies and prepares students for professional life.
The core principles of CBL include: Real-World Focus, Multidisciplinary Integration, Collaboration and Communication, Technology Integration, and Action-Oriented practices. The CBL framework typically involves three interconnected phases: engage, investigate, and act. To be able to employ the CBL approach the following components need to be taken into consideration: The Big Idea, Essential Question, The Challenge, Guiding Questions, Guiding Activities, Guiding Resources, Solution Development, Reflection and Assessment, Publishing/Sharing.
When CBL is implemented as an educational approach in the teaching and learning process, it aims to achieve the following: Increased student engagement and motivation, improved problem-solving, critical thinking, communication and collaboration skills, Enhanced ability to apply theoretical knowledge to real-world situations and connect academic learning with real-world applications, Greater preparedness for future professional challenges and opportunities
Implementing Challenge-Based Learning represents a significant step towards modernizing higher education and better preparing our students for the future. By connecting learning to real-world challenges, we can create a dynamic and engaging educational experience that fosters both academic and personal growth. Overall, Challenge-Based Learning offers a dynamic and

effective approach to equip students with the knowledge, skills, and confidence to thrive in a complex and ever-changing world.
The training is structured in 3 Units following the CBL's phases:
Unit 1: Engage. During this Unit the learners personally connect to the subject matter through the identification, development and ownership of a compelling Challenge. During the Engage Phase, the learners move from an abstract Big Idea to a concrete and actionable Challenge using the Essential Questioning process.
Unit 2: Investigate. During this phase of the training, learners should develop and own contextualized learning experiences and conduct content- and concept-based research to create a foundation for actionable and sustainable Solutions. Within the Investigation phase learners should be able to pursue a systemic inquiry to identify all the needed information about the Challenge and be able to brainstorm about possible solutions.
Unit 3: Act. Learners develop grounded Solutions and implement them in authentic settings, receive feedback, and learn from their successes and failures. Moving beyond the term paper, test and presentation as the culminating event for a learning experience, Challenge Based Learning requires the Learners to act on the cumulative knowledge and skills gained through the Challenge.

b) Transdisciplinarity of the Training

Here we look at the extent of transdisciplinarity of the training by analysing several aspects.

b.1.) What are the intended outcomes of the selected training (course)?
With the completion of the training, trainees will be able to:

- understand and articulate the CBL principles and framework;
- analyse the position of CBL within the broader context of active learning pedagogies by comparing it with other practices, namely problem based, project organised learning, design thinking;
- explain and describe the role of the tutor, the student and the other actors in the implementation of CBL practices;
- develop and describe different type of challenges, namely nano-, standard- and strategic challenges;
- develop a strategy to integrate CBL in their educational practices.

b.2.) What practices or disciplines does the selected training (course) encompass?
The training aims to introduce the participants to the Challenged based learning approach. Challenge-Based Learning allows students to experience the relevance of the teaching content and enables them to relate to it. It unites research and teaching and promotes a scientific mindset and critical reflection in academia, economy and society. It makes disciplinary boundaries visible,

encourages reflection, opens up new perspectives and fosters the ability to deal with complex environments and a rapidly changing reality.

b.3.) What approaches does this selected training (course) employ?
The Challenge-Based Learning (CBL) training course that Science View is providing, typically employs a variety of approaches to support participants in engaging with real-world challenges and developing actionable solutions. These approaches are designed to be learner-centered, collaborative, and experiential. Here are the main approaches used in CBL training courses:

1. Problem-Framing and Inquiry-Based Learning
- **What It Is**: Participants are guided to define and refine a real-world problem or challenge through questioning, research, and exploration.
- **How It Works**:
    - Use guiding questions to explore the root causes of a challenge.
    - Encourage critical thinking and curiosity.
    - Incorporate research and data analysis to support evidence-based understanding.
- **Purpose**: Helps learners fully understand the context and scope of the challenge.

2. Collaborative Learning
- **What It Is**: Learners work in teams to brainstorm, discuss, and develop innovative solutions.
- **How It Works**:
    - Emphasize teamwork and diverse perspectives.
    - Use tools like collaborative platforms, brainstorming sessions, and peer feedback.
    - Assign clear roles within teams to enhance productivity.
- **Purpose**: Fosters communication, leadership, and teamwork skills.

3. Experiential Learning
- **What It Is**: Hands-on, project-based activities allow learners to apply theoretical knowledge in real-world scenarios.
- **How It Works**:
    - Engage learners in designing prototypes, conducting experiments, or implementing small-scale interventions.
    - Provide opportunities to test and iterate solutions based on real-world feedback.
- **Purpose**: Bridges the gap between theory and practice, reinforcing active learning.

4. Interdisciplinary Approach
- **What It Is**: Challenges are explored through multiple lenses, integrating knowledge from different fields.

- **How It Works**:
  - Encourage participants to draw from diverse disciplines (e.g., technology, social sciences, arts).
  - Facilitate workshops or guest lectures from experts in various fields.
- **Purpose**: Promotes holistic thinking and innovative problem-solving.

5. Technology Integration

- **What It Is**: Digital tools and platforms support collaboration, research, and solution development.
- **How It Works**:
  - Use online platforms for communication and project management.
  - Leverage data visualization, simulation tools, or coding for prototyping.
  - Incorporate multimedia presentations for sharing findings.
- **Purpose**: Enhances engagement and equips learners with digital literacy skills.

6. Mentorship and Expert Guidance

- **What It Is**: Instructors and industry experts act as facilitators or mentors rather than traditional lecturers.
- **How It Works**:
  - Provide feedback and guidance during key stages of the project.
  - Offer real-world insights and connections to external networks.
- **Purpose**: Supports learners in navigating challenges and aligning solutions with practical realities.

7. Reflective Practice

- **What It Is**: Learners are encouraged to reflect on their experiences, decision-making processes, and outcomes.
- **How It Works**:
  - Use reflective journals, group discussions, or storytelling.
  - Encourage critical evaluation of successes and failures.
- **Purpose**: Deepens understanding and helps learners identify areas for personal and professional growth.

8. Showcase and Feedback Sessions

- **What It Is**: Participants present their solutions to peers, instructors, or external stakeholders.
- **How It Works**:
  - Organize events like pitch presentations or exhibitions.
  - Incorporate constructive feedback from diverse audiences.
- **Purpose**: Builds communication skills and prepares learners to translate ideas into actionable plans.

9. Action-Oriented Approach

- **What It Is**: Emphasis on developing implementable and sustainable solutions.
- **How It Works**:
    - Guide learners to create step-by-step action plans for deploying solutions.
    - Include scalability and impact assessment in solution design.

Purpose: Ensures learning outcomes are meaningful and translate into real-world impact.

1.3 Task 3: Executing Transdisciplinary ECTS Undergraduate Courses

Both the University of Malta (UM) and Western Norway University of Applied Sciences (HVL) performed gap analyses on one of their ECTS undergraduate courses. The gap analyses are coupled then in Task 4 to produce a set of policy recommendations for partners to implement SciCultureD values and principles in their ECTS courses. Here are the two gap Analyses.

a) UM ECTS Course Gap Analysis

The University of Malta (UM) – Università ta' Malta – has been, over its 400-year history, the hub for international academic exchange on the island. UM is the leading higher education institution in Malta and its structures are in line with the Bologna Process and the European Higher Education area. UM carries out academic research and provides a vibrant higher education setting in the arts, sciences and the humanities as required for Malta's economic, social and cultural development. The courses are designed to produce highly-qualified professionals in multiple disciplines. The alumni community is growing exponentially: well over 3,500 students graduate in various disciplines annually. Today UM is composed of fourteen faculties, a number of interdisciplinary institutes and centres, three schools and a junior college. Besides the main campus, situated at Msida, there are three other campuses: Valletta, Marsaxlokk, Gozo. The language of instruction is English.

a) General Description of the Training

"Science Communication" is a 6-ECTS credit course for Undergraduates (Year 2 and 3) offered at the Department of Physiology and Biochemistry, which is responsible for teaching medical, dental and pharmacy students. This course provides students with the necessary skills to understand the importance of science communication for research; to create your own science communication event; to assess if the event is successful; to write about scientific topics for the media, and to orally present scientific research to a broad audience. Students will

be able to discuss the theory behind general public speaking and science communication, helping them develop key competencies throughout their career; they will be able to identify the principles of dialogue and two-way communication; they will be able to describe the principles of science communication to different audiences, and explain what makes an effective science communication event; In terms of media communication skills, students will discuss the features of what makes a good media interview.

2. Skills
- Public speaking skills;
- Writing skills for for citizens and other groups of people, such articles for various media; self-editing;
- Interviewing skills;
- Ability to organize a creative science communication event;
- Self evaluation and event strategy skills (evaluation plan for a science communication event);

b) Transdisciplinarity of the Training

Here we look at the extent of transdisciplinarity of the training by analyzing several aspects.

b.1.) What are the intended outcomes of the selected training (course)?

The objectives of this study-unit are to teach students:
- The importance of science communication for research;
- How to create your own science communication event;
- How to assess if the event is successful;
- Science (media) writing skills; and
- Oral communication skills.

b.2.) What practices or disciplines does the selected training (course) encompass?

This course provides a blend of theoretical lectures, independent study time and workshop sessions.
The theoretical lectures focus on general public speaking and science communication theories. Besides, the lectures provide students with theoretical insights on communication science, a branch of social science that uses various methods of empirical investigation and critical analysis to understand the principles of dialogue and two-way communication. The lectures have direct input coupled with dialogues with the students through question-based approaches and online murals to aid collaborative sessions. The creative pedagogies that are used in the SciCultureD course are

introduced to the students, as are various STEAM approaches with several case studies including SciCulture/D, Science in the City, Creations, NUCLEUS and a number of other EU projects. The ethics of science, why to communicate science and related topics are discussed.
The individual study time allows students to reflect, study and to work on assigned tasks. The course invites students to apply their creative skills to craft effective science communication events with the support of artistic approaches. The students have to create their own STEAM activity including how to promote it, how it would be run, and how to evaluate it to assess if they have met their objectives. The individual study time is supported by field trips related to the coursework.
The workshops give spaces to hands-on and practicals integrating the students' learning experience with real-world examples and applications. They also prepare presentations and give them to the class. They also make their own videos, participate in a radio show (this involves script development and interviewing guests), and have handson sessions on how to make large props for public speaking.

b.3.) What approaches does this selected training (course) employ?

The training employs a range of approaches to engage participants and build practical skills:

- **Alternation of Theoretical and Practical Sessions:** The course combines theoretical input with hands-on activities. This approach equips participants with foundational knowledge and enables them to apply it directly to their work.
- **Reflective Exercises:** Reflection sessions help participants identify parallels between their own research and established best practices in science communication. These sessions encourage participants to extract valuable lessons and insights from other fields.
- **Skill-Building Practical Activities:** Practical exercises, like stakeholder mapping and science festival planning, are used to help participants apply theoretical concepts while focusing on their own research topics.
- **Creative Techniques:** The course incorporates interactive and creative tools, such as LEGO bricks, moderation cards, and group activities, to stimulate engagement and idea generation.
- **Interactive Online Tools:** In the online format, tools like Mural, Mentimeter, and Slido facilitate dialogue and creativity, creating a dynamic and collaborative learning environment.

b.4.) Is the selected training (course) transdisciplinary? If not, what are the expected challenges when trying to make it transdisciplinary?

The training employs a range of approaches to engage participants and build practical skills:

- **Alternation of Theoretical and Practical Sessions:** The course combines theoretical input with hands-on activities. This approach equips participants with foundational knowledge and enables them to apply it directly to their work.
- **Reflective Exercises:** Reflection sessions help participants identify parallels between their own research and established best practices in science communication. These sessions encourage participants to extract valuable lessons and insights from other fields. The lecturers link theory and practice through reflection in dialogue sessions with the students.
- **Skill-Building Practical Activities:** Practical exercises, like stakeholder mapping and science festival planning, are used to help participants apply theoretical concepts while focusing on their own research topics. They also have sessions on making large props, and use these in class to develop public speaking skills. There are specific video making, script writing, and interview skills sessions as well.
- **Creative Techniques:** The course incorporates interactive and creative tools, such as group activities, to stimulate engagement and idea generation. The students participate in a radio show and make videos, they also need to use design skills for presentations, narratives to make those presentations engaging, and receive guidance and constructive feedback to improve.
- **Interactive Online Tools:** In the online format, tools like Mural, Keynote and Mentimeter facilitate dialogue and creativity, creating a dynamic and collaborative learning environment.

II. HVL ECTS Course Gap Analysis

Western Norway University of Applied Science (Høgskulen på Vestlandet, acronym HVL) is spread on five different locations in Western Norway. With approximately 1400 staff and 16,000 students it is one of the largest higher education institutions in the country, offering Bachelor and Master studies primarily within education, engineering, health and social sciences. PhD studies are offered in five scientific fields. HVL has three focus areas in its mission to provide research-based knowledge and expertise to understand and solve society's challenges: Sustainable social development, welfare and innovation.

c) General Description of the Training

Product Development for Sustainability is a 10 ECT course that is a part of the Norwegian West Coast SDG educational initiative, which seeks to give students new knowledge on ethics and sustainable development relevant to the delivery of the UN's SDGs. It can be combined with other courses into a 30 ECT semester program. It is also a mandatory course in the Bachelor program Engineering, sustainable production and circular economy.

In the training, students will learn how to develop new products considering the environmental impacts of their products through the life cycle of a product. The course uses active learning in the lectures, and the class will be arranged in a "restaurant/island layout" and be mentored in a team-based project. The course will start with an introduction to product types, creativity, invention, innovation, and IP protection. It applies creative ideation techniques, such as TRIZ, Lateral thinking, the stage-gate model, SCAMPER and Six hats. The sustainability concerns, recommendations, and techniques are lectured and practiced via case studies and practice examples. A feasible number of the selected products will be prototyped and tested. Students will be introduced to effective communication methods and mind fallacies in a product development process.

d) Transdisciplinarity of the Training

Here we look at the extent of transdisciplinarity of the training by analyzing several aspects.

b.1.) What are the intended outcomes of the selected training (course)?

The intended outcomes of this training course are that the students

- know the product development process, from problem statement to prototyping
- know how to consider sustainability in a product
- can develop a desired product concerning sustainability aspects
- can use different ideation techniques
- can apply basic engineering knowledge on a product
- can effectively communicate ideas with others
- can work with others in a team and have respect for other perspectives

b.2.) What practices or disciplines does the selected training (course) encompass?
The course encompasses a mix of theory, teamwork in practical sessions, and reflective discussions. Students meet theoretical components from fields such as science, engineering, science communication, innovation, and entrepreneurship, with case studies and practice examples. These fields come together in a creative process where ethical and sustainability aspects are central.

b.3.) What approaches does this selected training (course) employ?
The course employs a range of approaches:

- Project-based learning
- Teamwork

- Creative ideation techniques, such as TRIZ, Lateral thinking, the stage-gate model, SCAMPER and Six hats
- Learning from case studies and practice
- Prototyping and testing product ideas from the course
- Focus on sustainability and ethics
- Introduction to certain fields, such as creativity, invention, innovation, and communication

b.4.) Is the selected training (course) transdisciplinary? If not, what are the expected challenges when trying to make it transdisciplinary?

The teamwork that is at the core of the course is to a large degree transdisciplinary, but requires inputs from a number of separate disciplines. Again, since it's a course on a bachelor level, it might have some limitations to how confident the students are when it comes to transdisciplinary work. Some of the students take this as a part of an engineering degree, and knowledge and interests in that respect might promote or obstruct their possibilities for transdisciplinarity.

1.4 Task 4: Policy Change within HEI Institutions

After the thorough literature review and gap analyses of some ECTS/CPD courses and training, city2science designed and facilitated an interactive online workshop for all partners, which served as a cornerstone event for drawing lessons from the SciCultureD project and building on them in embedding not only TD Education but also principles such as inclusivity, diversity, active citizenship, and participatory research—into the fabric of their organizations.

I. Aim of the Workshop

The primary goal was to enable partners to reflect on the successes and challenges of SciCultureD, while developing a set of actionable policy recommendations. These recommendations aim to support partners in embedding SciCultureD principles within their institutions, presenting them to senior management, and sharing them with similar organizations interested in enhancing the quality and relevance of higher education.
Moreover, the workshop was strategically positioned to generate concrete insights on how to align higher education policies and practices with core European values especially concerning sustainability issues. We think that the insights will foster systemic change and deliver long-term institutional benefits for the involved partners and beyond.

II. Structure and Focus

The workshop included various sessions as follows:

a) Session 1: This session focused on identifying the intended outcomes and the main stakeholders of the training and courses we offer in our institutions.

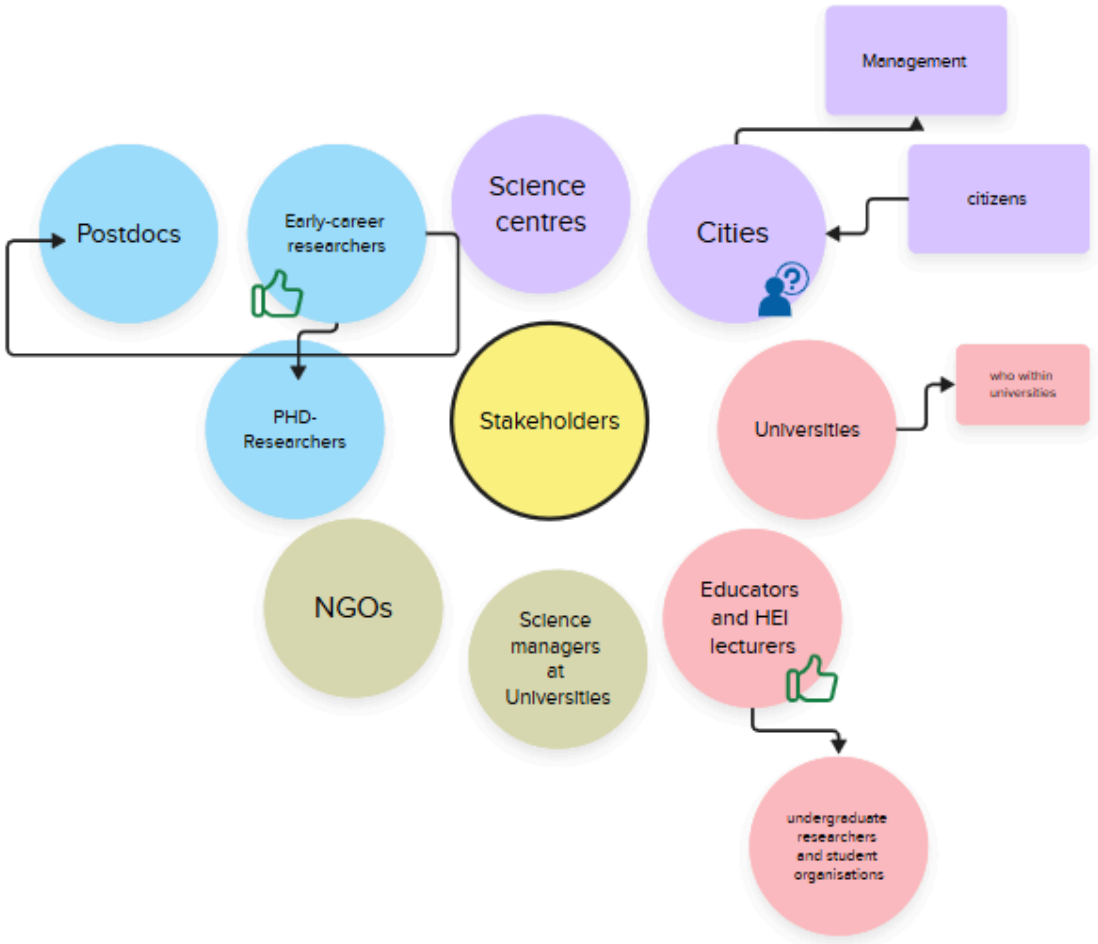


Figure 1 - Screenshot of session 1 with identified stakeholders of SciculturedD by the participating partners. Arrows indicate relationships.

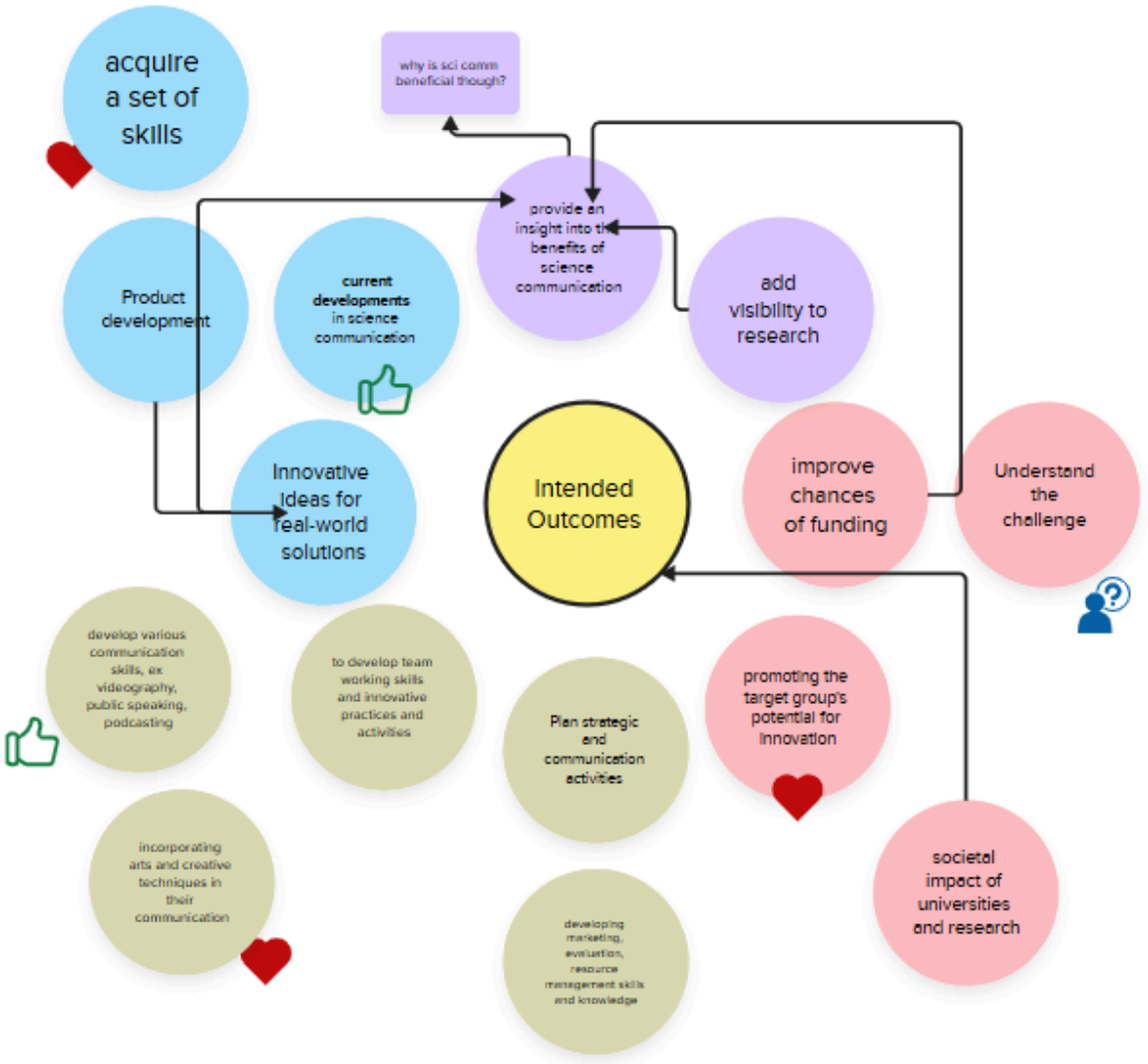
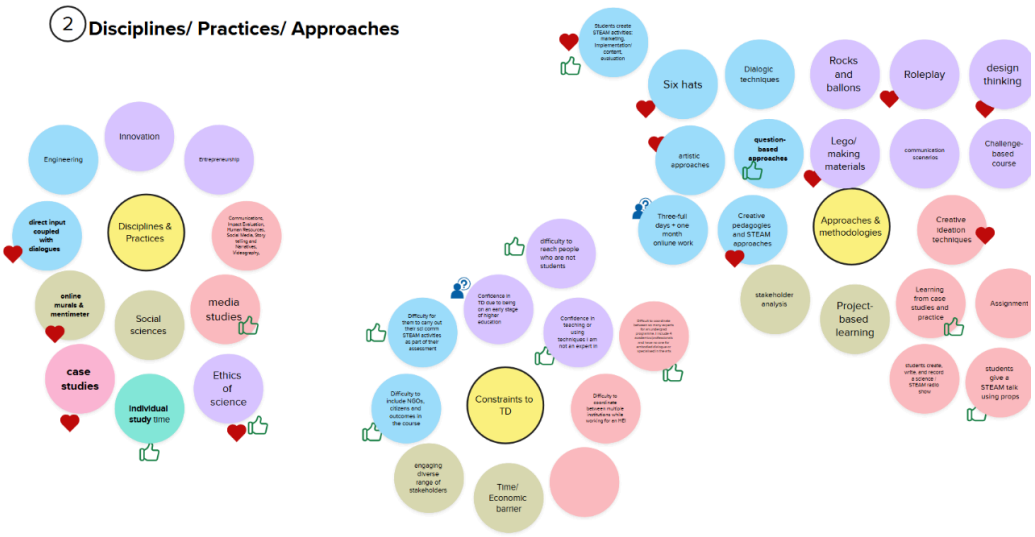
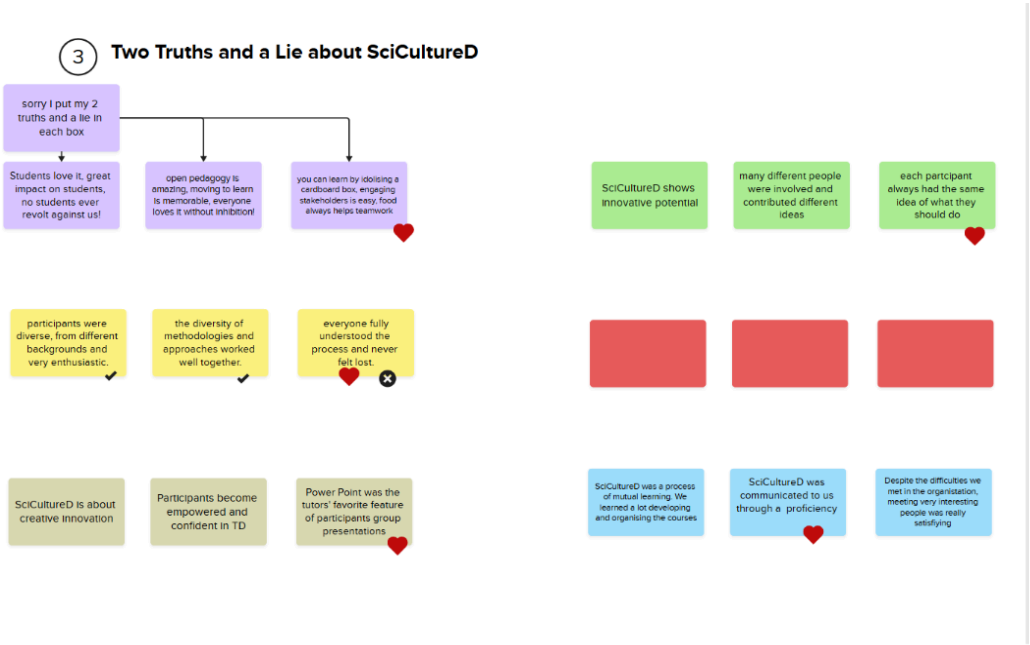


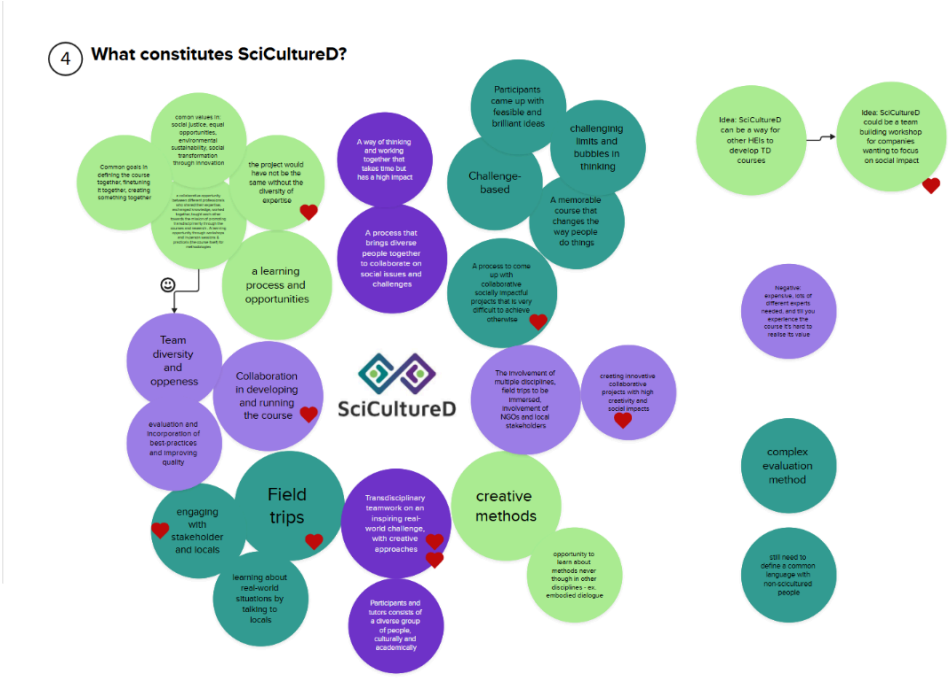
Figure 2 – Screenshot of session 1 with identified outcomes of SciCultureD by the participating partners. Arrows indicate relationships.

b) Session 2: This session explored the diverse disciplines and practices, approaches and methodologies, and constraints to transdisciplinarity in the training and courses we offer in our institutions.

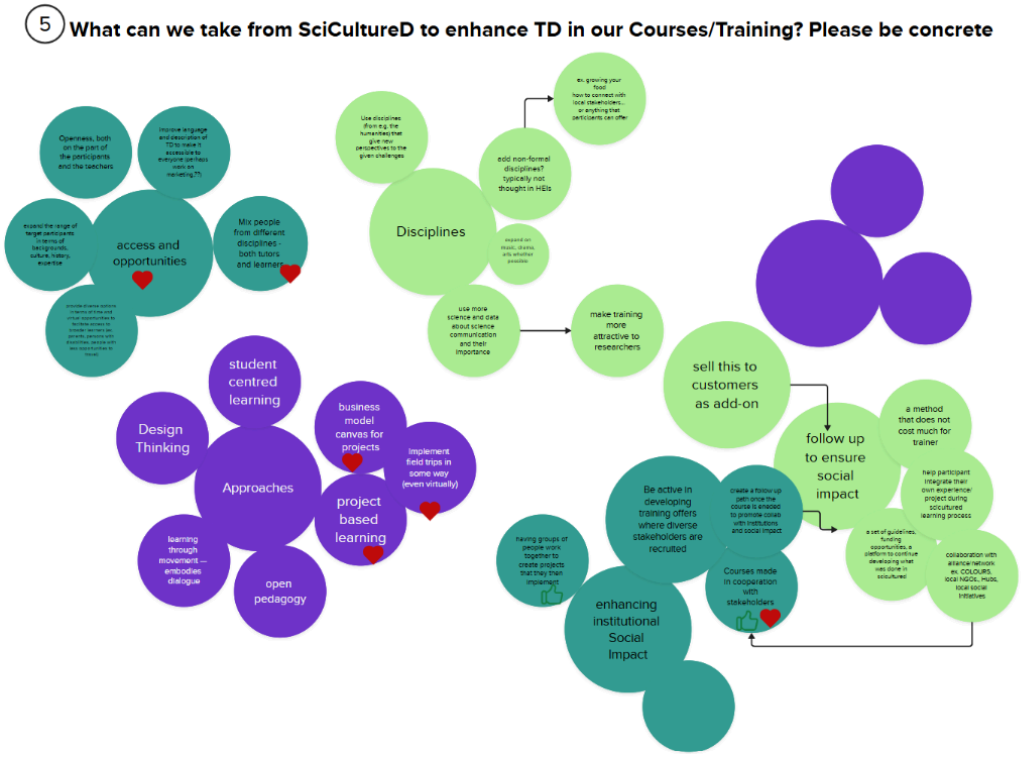


c) Session 3 & Session 4: These sessions examined the key elements that make up SciCultureD and its potential for fostering change through transdisciplinary approaches.



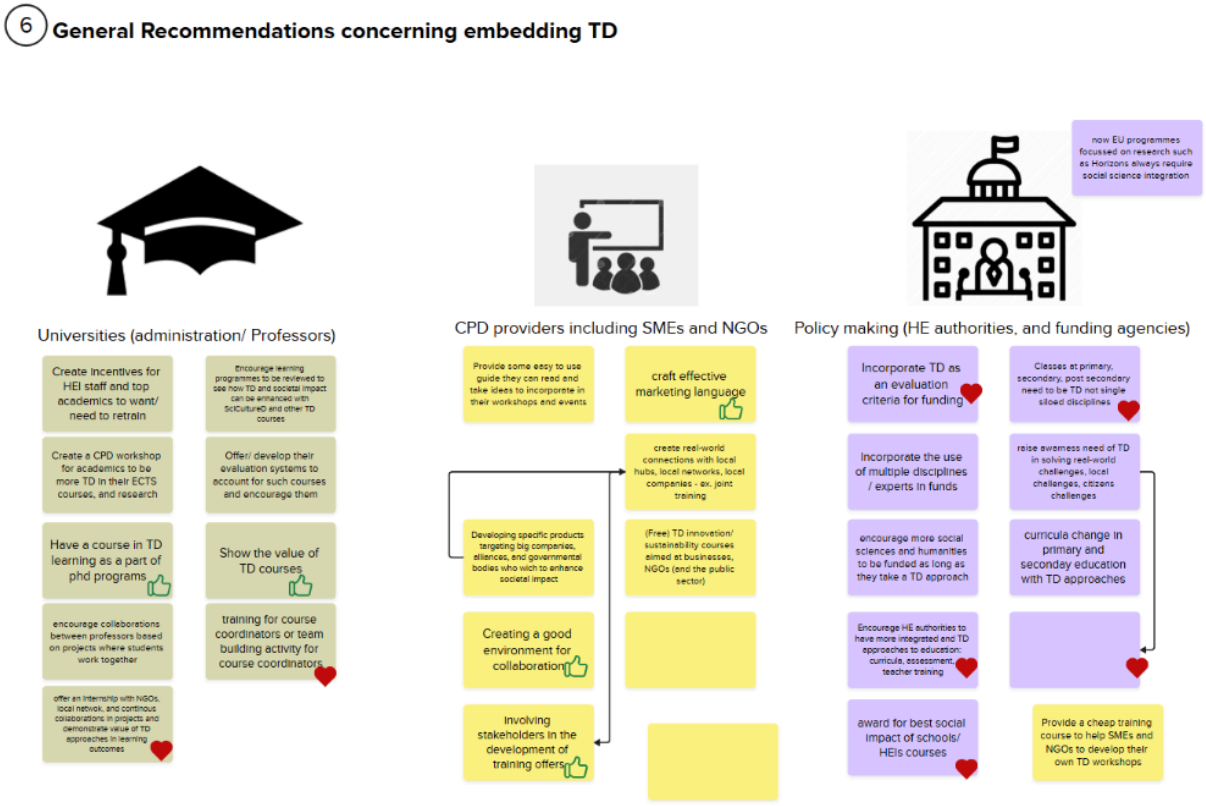


d) Session 5: This session focused on identifying actionable strategies to incorporate SciCultureD principles into courses and training programs offered at the partners' institutions.



e) Session 6: This session focused on developing general policy recommendations to embed transdisciplinary (TD) approaches into higher education institutions, as well as NGOs and SMEs. Emphasis was also

placed on aligning policies and funding priorities to support TD practices at all levels of education.



III. Policy Recommendations for Advancing Transdisciplinary (TD) Education in HEIs

Transdisciplinary (TD) education is vital for addressing the so-called "wicked problems", such as climate change, social inequality, and public health crises. By fostering collaboration across disciplines, TD approaches equip learners with the skills and mindset needed to develop innovative, real-world solutions. These recommendations are designed to support higher education institutions (HEIs), NGOs, SMEs, and policymakers in embedding TD practices into curricula, training programs, and institutional policies.

Building on the outcomes of the SciCultureD initiative, the following policy recommendations provide actionable strategies to integrate TD education at all levels, emphasizing inclusivity, societal impact, and alignment with global priorities such as the European Green Deal and Sustainable Development Goals (SDGs). By implementing these measures, institutions can create a lasting framework for innovation, collaboration, and meaningful change.

a) Embed transdisciplinary approaches in HEIs' educational curricula

Context: The challenges of the modern world demand integrated solutions that transcend traditional academic disciplines. TD education equips students with collaborative and creative skills necessary for tackling these challenges.

Recommendations:

- Mandate the integration of TD courses at all HEI educational programmes;
- Include methodologies such as project-based learning, design thinking, and embodied dialogue in the core curriculum.

Implementation:

- Pilot TD-focused modules within HEIs over the next academic year;
- Provide professional development for teaching staff to adopt TD teaching practices. SciCultureD is particularly suitable to qualify staff in this matter.

Impact: Students will acquire collaborative problem-solving skills, preparing them for real-world challenges.

b) Incentivize faculty and teaching staff to Adopt TD Approaches

Context: Many faculties have no capacity to embed TD programmes. In addition, many educators and researchers lack familiarity with TD practices, or the resources needed to adopt them effectively.

Recommendations:

- Create incentives, such as funding opportunities, awards, or recognition, for educators who incorporate TD into their teaching.
- Establish training programs for faculty to enhance their capacity to implement TD methods. SciCultureD provides a set of methodologies and resources that are particularly useful.

Implementation:

- Launch annual awards for excellence in TD education.
- Provide professional development for faculty and course coordinators.

Impact: Encouraging educators to adopt TD practices will accelerate cultural and institutional shifts towards full implementation of TD education.

c) Foster partnerships between academia and non-academic stakeholders

Context: Collaboration with NGOs, SMEs, and local communities enhances the societal impact of TD education.

Recommendations:

- Develop partnerships with non-academic stakeholders to co-create projects addressing local and global challenges.
- Provide resources and guidance for NGOs and SMEs to design their own TD workshops. SciCulture & SciCultureD produced many useful materials that can help implement TD education.

Implementation:

- Facilitate internships and fieldwork opportunities for students with community organizations.
- Allocate funding for joint training programs involving HEIs and local stakeholders.

Impact: Real-world collaboration will provide students with practical experience and improve the societal relevance of academic research and learning.

d) Align policy and funding priorities with TD objectives

Context: Institutional and funding structures often prioritize single-discipline approaches, limiting the adoption of TD practices.

Recommendations:

- Require TD approaches as part of evaluation criteria for research and education funding.
- Encourage funding agencies to support multi-disciplinary and socially impactful projects.

Implementation:

- Revise evaluation frameworks for national and EU-level funding programs, such as Horizon Europe, to include TD criteria.
- Provide dedicated funding streams for TD initiatives, especially those that align with the European Green Deal and Sustainable Development Goals (SDGs).
  Impact: Aligning funding with TD objectives will encourage institutions to prioritize and scale TD initiatives.

e) Increase accessibility and promote inclusivity in TD education
Context: TD education must be accessible to diverse participants, including those from underrepresented backgrounds or non-academic

sectors.

Recommendations:

- Develop flexible learning formats, such as virtual field trips and online modules, to reach a broader audience.
- Incorporate non-traditional (non-verbal) disciplines, such as arts and drama, into TD frameworks.

Implementation:

- Launch outreach programs to engage diverse groups, including community members and early-career professionals.
- Create scholarships or funding opportunities for underrepresented participants in TD programs.

Impact: Expanding access to TD education will foster inclusivity and ensure that diverse perspectives contribute to collaborative problem-solving.

f) Establish evaluation and follow-up mechanisms

Context: TD initiatives often lack frameworks to measure impact or sustain long-term outcomes.

Recommendations:

- Develop evaluation tools to assess the effectiveness of TD courses and projects. SciCultureD produced valuable evaluation criteria that can be used to assess and enhance the quality of TD courses or training.
- Create follow-up pathways to integrate participant experiences into long-term institutional practices.

Implementation:

- Develop metrics to assess societal impact and refine TD practices.
- Establish networks to help participants implement their ideas and sustain outcomes.

Impact: Evaluation and follow-up mechanisms will ensure TD initiatives remain impactful, sustainable, and adaptable over time.